

Proceeding



iMAACs

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2019**

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INTELLIGENT 19

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*Sustainability Towards
New Era of Industrial
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Preface



Assalamualaikum wr wbth.

I am really glad to welcome all participants to this program which is the first symposium organized by Malaysian Academic Association Congress (MAAC). I am also honored to acknowledge that even though this is the first symposium organized by MAAC, but there are some international participants who have sent their papers for presentation.

iMAACS 2019 is organized as a platform for researchers, industries and academicians to share their knowledge and experiences. This is important because in order for us to be in the frontier of knowledge, we have to conduct research and creative works. These works are later shared in several mechanisms such as books, documentaries, journals, seminars, conferences and symposiums. Thus, iMAACS 2019 is being planned and organized to give opportunities to all in sharing their knowledge and experiences.

Apart from the sharing process, the opportunity to present will also be able to enhance the participants skill and competency to conduct presentations.

In this symposium, there are papers presented from 4 main clusters which are Engineering and Technology, Teaching & Learning (Physical), Teaching & Learning (Digital) and Social & Entrepreneur.

The organizer hope that all participants will benefit from the Symposium and on behalf of the organizing committee, I would like to thank Politeknik Sultan Mizan Zainal Abidin (PSMZA) especially director Politeknik Sultan Mizan Zainal Abidin Dungun, Universiti Tun Hussein Onn Malaysia (UTHM), UTHM Holdings Sdn Bhd, Malaysian Academic Association Congress (MAAC) and staff PSMZA who have been working hard in preparing this program. Last but not least, I would also like to thank all reviewers in ensuring that all papers are of an acceptable standard and quality.

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ENGINEERING & TECHNOLOGY

Portable IoT Energy Monitoring and Control

Isamudin Mamad^{1, a}, Muhammad Ridzuan Idris^{1, b}

¹Electrical Department, Politeknik Sultan Mizan Zainal Abidin

^aisamudin@psmza.edu.my, ^bm.ridzuan@psmza.edu.my,

Abstract. Electrical appliances can be controlled and monitored using IoT technology from any place in the world. In order to accomplish this goal, a complete front-end to back-end system that includes a smart device application, a cloud-based database, and a hardware development is proposed. Portable IoT Energy Monitoring and Control (PiEC) is one of the application of IoT technology. This project using SCT013 sensors and ESP8266 Wemos D1 R1 mini as their microcontroller for retrieving data from sensor nodes and sending data to server via internet, CloudMQTT as a IoT server and Node-Red as a platform to monitor and control. The function of PiEC is to monitor current usage, kWh and the estimation of bill rate. It also can control electrical appliances such as lamp and fan. It will be cut off the source for appliance if the monitor shows high current usage. PiEC is suitable to use for monitor and control at small building.

Keywords: Internet of Thing (IoT), energy meter, energy meter monitoring system.

Introduction

The Internet of Things (IoT) is becoming more widely used technology nowadays. IoT is being used in various areas, such as automotive industry, logistics, healthcare, smart home system and home security system. Recently, electric energy consumption growth has risen significantly and thus, needed greatly increased energy supply in the coming decades due to increasing population and economic development. This is leading to a demand-supply deficiency [1]. In many developed countries, automatic meter reading (AMR), advanced metering infrastructure (AMI) or smart energy meter with real-time energy information report have been implemented at the household level [2-4]. Thus, consumers will be able to see their usage in real-time, eventually encouraging them to use less energy to save money [5]. In this work, we have developed the Portable IoT Energy Monitoring and Control system that utilize Wi-Fi, and MQTT (Message Queuing Telemetry Transport) protocol. The developed system can provide detailed measurement of energy usage and the patterns of energy consumption. Hence, the users can understand their electricity usage patterns and then can adapt their behavior to reduce their energy profile.

System Overview

The system comprises of energy monitoring nodes that use the SCT013 sensors and ESP8266 Wemos D1 R1 mini as their microcontroller for retrieving data from sensor nodes and sending data to server via internet. The measured data will then be submitted to server via Cloud MQTT as a IoT server and Node-Red as a platform to monitor and control. The Arduino was chosen to run as a local server. Thus, users can access to get information of their energy consumption via web application locally or via Internet. Then the consumer can switch on or off appliance follow the data collection by PiEC. The system overview is shown in Figure 1.

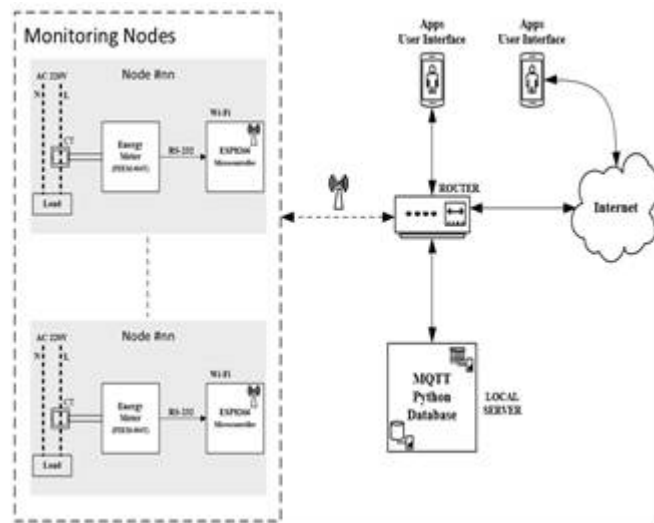


Figure.1 : The system overview

Energy Meter and Monitoring

In order to monitor energy usages, we utilize Node-Red as a platform to monitor and control. The data collect by SCT013 sensors. Its operation is based on the principle of current transformer. It uses a precision AC current transformer coil as a sensing part that has the output of 100A/100mA. The SCT013 sensors provides RMS voltage, RMS current and calculates active power and total energy usage over time or accumulative power consumption calculate by phyton adruino. It has very good measurement accuracy.

In order to send measured data from the SCT013 sensors to the network or the internet, we employed the ESP8266 Wemos D1 mini to communicate with SCT013 sensors. Figure. 2 illustrates the prototype of SCT013 sensors is connected with the Wemos D1 mini. The firmware for Wemos D1 mini was developed using the Arduino software environments. The main function of the Wemos D1 mini is used to collect energy data from the SCT013 sensors and send recived data to the server wirelessly, through Wi-Fi. The data will be sent to the server approximatly every 20 seconds.

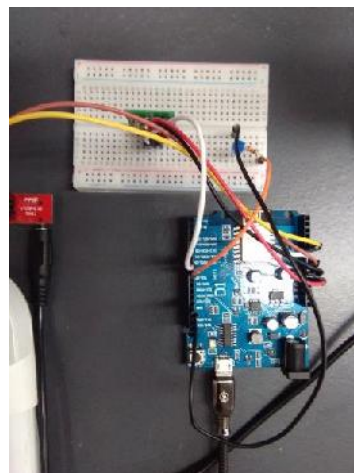


Figure. 2 : The prototype of SCT013 sensors

Energy Calculation

Energy consumed per day can be determined in (1). The energy E in kilowatt-hours (kWh) per day is equal to the power P in watts (W) times number of usage hours per day (t) divided by 1000 watts per kilowatt. It shown in Figure. 3.

$$E_{\text{kWh/Day}} = P_{\text{(W)}} \times t_{\text{(h/d)}} / 1000_{\text{(W/kW)}}$$

E= kWh/Day

P= Watt (W)

t= hour(h)/day(d)

```
WiFiClient wifiClient;
PubSubClient mqttClient(wifiClient);

void loop() {

    double Irms = emon1.calcIrms(1480); // Calculate Irms only-calibration

    int maxCurrent = 0;
    int minCurrent = 1000;

    double RMSCurrent = Irms*100; //tukar sini utk calibration
    int RMSPower = 240*RMSCurrent; //Calculates RMS Power Assuming Voltage 220VAC, change to 110VAC accordingly
    if (RMSPower > peakPower)
    {
        peakPower = RMSPower;
    }
    kilos = kilos + (RMSPower * (2.05/60/1000)); //Calculate kilowatt hours used
    bill = 0.250*kilos; //calculate bill

    mqttClient.loop();
    float h = RMSCurrent;
    // Read temperature as Celsius
    float t = bill;
    // Read temperature as Fahrenheit
    float f = dht.readTemperature(true);
```

Figure. 3 : Energy Calculation

Local Server

The Adruino nano is responsible to run server software packages at local network, the software include MQTT broker, Python, database server, and data visualization.

MQTT Communication Protocol

MQTT is a publish/subscribe protocol, which is very simple and lightweight messaging, designed for constrained devices and low-bandwidth, unreliable networks. It is a good solution for our design since it provides an easy communication between the server and many IoT nodes [13-16]. The central server is so called a broker, and sensor nodes can subscribe to the topic and the topics are created automatically. It can also publish the data to topics of any kind of data. The broker then distributes the data to any node that has subscribed to that topic.

Node-Red

Node-Red in its simplest form is an open source visual editor for wiring the internet of things produced by IBM. The system contains "Nodes" which look simply to be icons that you drag and drop on to the canvas and wire together. Each Node offers different functionality which can range from a simple debug node to be able to see what's going on in your flow, through to an Arduino Nano node which allows you to read and write to the GPIO pins of your Arduino. The Node-Red is shown by Figure. 4.

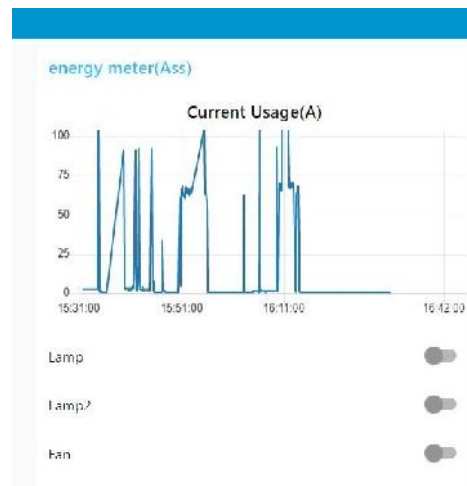


Figure. 4 : The Node-Red

Software

Since, the sensor data are constructed data type as MQTT messages that will be published to a self-hosted MQTT broker. Therefore, we wrote python scripts to subscribe to that MQTT topics and then stores all messages in time series data in the database.

Result and Analysis

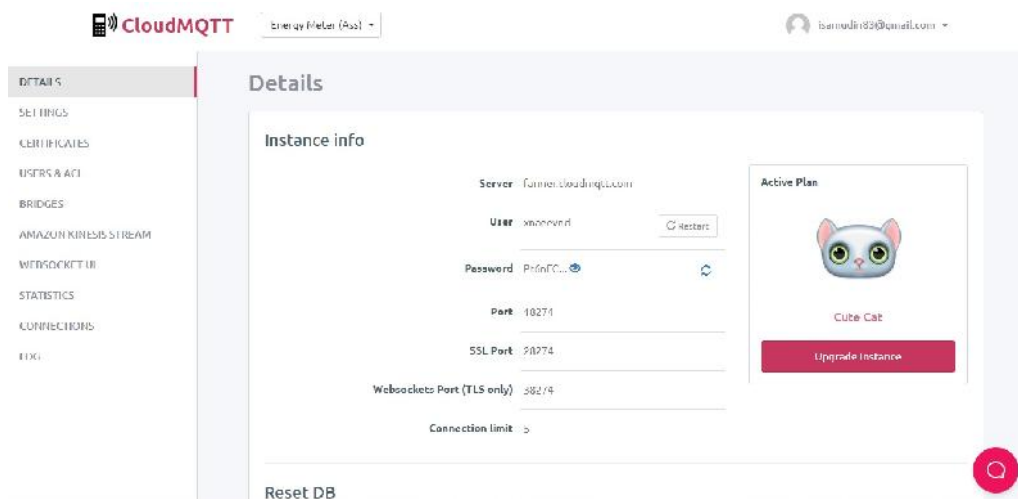


Figure. 5

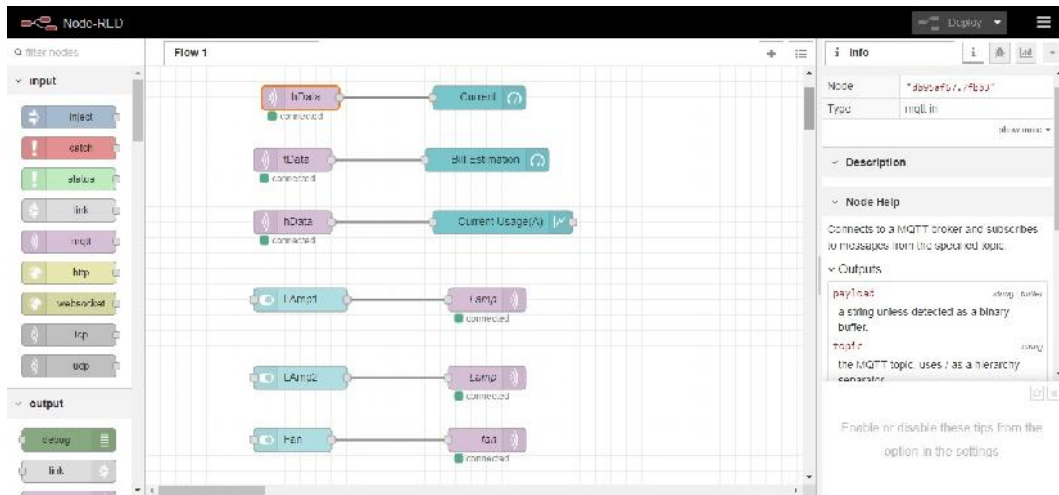


Figure.6



Figure. 7

Conclusion

The design of a low-cost IoT energy monitoring system is presented. This proposed system is suitable for energy monitoring and tracking applications. The sensor node is based on low-cost energy meter, PZEM-004T, CT sensors and ESP8266 Wemos mini microcontroller. The Raspberry pi 3 model B is used to serve as local server and store data in InfluxDB, a time series database. The experimental results showed that the developed energy monitoring system can successfully monitor voltage, current, active power and accumulative power consumption. In future work, this system could be further developed to get more insight on energy usage profile and learn to automatically detect which appliance is in use.

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Development of IOT Heartbeat Monitoring System Using Blynk Application

Nur Adlina Mohd Rani ^{1, a}, Nur Farhah Atiq Jaafar ^{1, b} and Marini Zakaria ^{1, c}

¹Politeknik Sultan Mizan Zainal Abidin, Malaysia

^aadlina@psmza.edu.my, ^bfarhahatiq@yahoo.com, ^cmarinizakaria@gmail.com

Abstract. A Heartbeat Monitoring System was specially designed to monitor the heart rate of the patient. This project presented the design and development of a new integrated device for measuring heart rate using fingertip to improve estimating the heart rate. Many studies have been done across the world to monitor health condition in the easiest way. As complicated and expensive devices becoming a burden to the user to monitor the heart, researchers kept finding methods to replace the usage of the devices and monitoring the heartbeat anytime and everywhere. This research was designed and implemented of a new remote heart rate monitoring system by using Arduino and IOT with WIFI Module by using *blynk application*. IOT was integrated with the heartbeat detector and automatically updated the heartbeat of the patient over the internet. This system consists of two main parts which are heartbeat controller and sensor temperature. The heartbeat is detected using Pulse Sensor Amped by measures subtle changes in light from expansion of the capillary blood vessels to sense the heartbeat. Then, it will transmit pulse data to the Arduino Nano for processing. After that, the signal is sent to the LCD and it will be display the data. Then, Arduino Nano is used as the brain of the entire system same as microcontroller where it will compare the threshold value with the heart beat rate in the Pulse Sensor Amped. If the heart rate is normal, then the patient health condition is good. If the patient heart rate is more than threshold value, it is considered as abnormal.

Keywords: IOT, Heartbeat Monitoring System, Arduino, WIFI Module, *blynk application*

Introduction

Heartbeat rate means the number of heartbeat per unit time, usually expressed as beats per minute (BPM). The human heart pound to pump oxygen rich blood to the muscles and carry cell waste products away from the tissues. Heartbeat rate can vary according to the demand of the muscles to absorb oxygen and excrete carbon dioxide changes such as during exercise or sleep. It also varies significantly between individuals based on age, fitness and genetic. This means that heartbeat rate gives a strong indication of how effective the exercise is to the body [1]. The patient monitoring system is one of major improvements in the global health care program because of its advanced technology. A patient monitoring system measures the heartbeat by using embedded technology. The trend of cardiovascular disease has shown that heart attack rate plays a key role in determining the possibility of a heart attack while an increase in the body temperature can induce fever on a patient. Heart disease such as heart attack coronary heart disease, congestive heart failure and congenital heart disease are leading causes of death for men and women in many countries [2]. Most of the time, the aged people of the society are more prone to heart disease problems than the younger ones. For people who live alone with no one to constant monitoring of their health status, it is developed to monitor and alert the doctor about the heartbeat and of a patient. It is developed to give patients a timely and proper health care. These day it is not easy for doctors and nurse to remain close to a patient bed side to monitor their health condition in the past, a huge and fixed monitoring device was used (only in the hospital) to know the health status of a patient when on a bed. These monitoring devices are only available in the hospital and are constantly many of the patient on them are not user friendly so it is important that the doctors and family members will have a handy device that can always monitor their patient when they are not around [3]. Normally it is difficult to keep track of the abnormalities in the

heartbeat count of by manual means. Patient are not well versed with the manual treatments, which the doctor normally use for tracking the count of the heartbeat.

Objective

The aim of the project is to design and develop the IOT heart rate monitoring system. This general objective can be broken down into two more specific objectives that would together achieve the overall aim of this project as follows:

1. To apply the wireless transferring data using arduino.
2. To design a portable wireless device on measurement of heart rate by using *blynk* Application

Problem Statement

Nowadays, doctors and specialist still use the old system to record the data by written. They have difficulty to monitor condition of each patient because need to go and check directly to the patient. Besides, the database information not in the system and all information for conventional system are saved in the file and not secure. All the information had been compiled and maintained by health care provider, many assume that the information in medical records is sensitive and personal information should be protected by the expectation of privacy, and there are ethical issues and public law involved in their management. Another problem that occurs nowadays is it is difficult to keep track on abnormalities in heartbeat count for patient itself manually. This situation always happened on pregnant women and also the patients that are not well versed with manual treatment which doctors normally use for tracking the count of heartbeat. So there must be some device which would help patient to keep track on their health by themselves. There are various instruments available in market to keep track on internal body changes. But there are many limitations regarding their maintenance due their heavy cost, size of instruments, and mobility of patients. Not only that, there are patients that falsify the heartbeat readings without doctor's attention. With all the problems stated, this project is designed to overcome all the problems that occurs.

Scope of the Project

This project focus on the rate of the heartbeat readings. To develop this project, reseachers are focusing on the part of IOT monitoring system using arduino with '*blynk*' application.

Concept of Project

The system is builds upon the integration of wireless communications into medical applications to revolutionize personal healthcare. The objective of this project is to build a wireless heart beat monitoring system using *Arduino*, which could potentially be an integral part of a suite of personal healthcare appliances for a large-scale remote patient monitoring system. As its name implies this is a Health monitoring system, with a feature of sending the information of heartbeat rate to doctor and patients relative in event of emergency, hence the system can be used at hospitals, as a trainer to bio-medical engineering students, as well as at home. The fixed monitoring system can be used only when the patient is on bed and this system are huge and only available in the hospitals in ICU development of a microcontroller based system for wireless heartbeat and temperature monitoring using '*blynk*' application. The system is developed for home use by patients that are not in a critical condition but need to be constant or periodically monitored by clinician or family members synchronous with Industrial Revolution 4.0 (IR 4.0)

Principle of Heartbeat Sensor

The sensor consists of super bright red LED and light detector. The LED needs to be super bright as the maximum light must pass spread in Figure 1 and detected by detector [4]. Now, when the heart pumps a pulse of blood through the blood vessels, the finger becomes slightly more dimmer reached the detector with each heart pulse the detector signal varies. This variation is converted to electrical pulse. This signal is amplified and triggered through an amplifier which output +5V logic level signal. The output signal is also indicated by a LED which blinks on each heartbeat. The sensor is connected to DC power supply of 5 Volts. Black wire is ground wire, next middle wire is Brown which is an output and Red wire is the positive supply. These wires are also marked on PCB. To test the sensors, we need the power supply source on the sensor by connect two wires +5V and GND. When the LED is off the output is at 0V as in Figure 2 [4]. Then, put the finger on the marked position and you can view the LED is blinking on each heartbeat. The output is active high for each beat and can be given directly to microcontroller for interfacing applications.

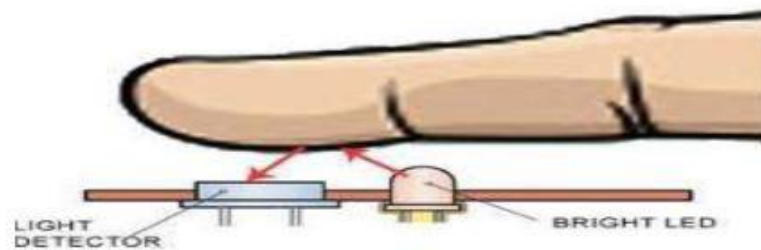


Figure 1: Heartbeat sensor

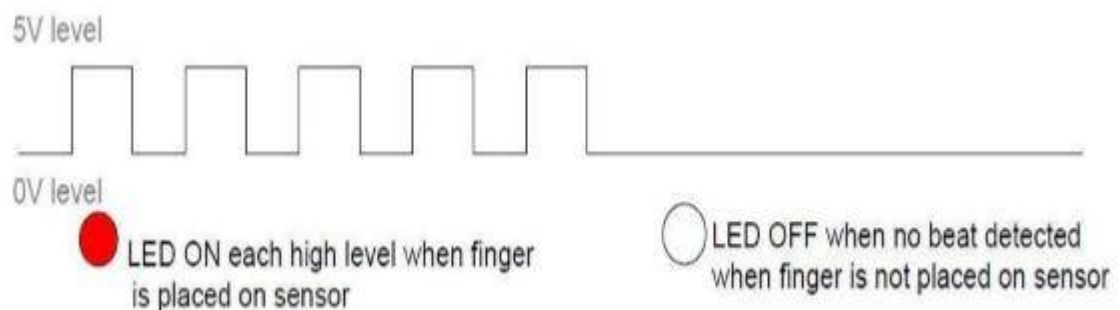


Figure 2: Heart beat output signal

Mean Arterial Pressure

The human heart is a pulsatile pump in that its function is characterized by alternating periods of contraction and relaxation. During the contraction phase (systole), blood is ejected from both the left and right ventricles and pumped into the systemic circulation and pulmonary circulation, respectively. During the relaxation phase of the heart (diastole), the ventricles are filled with blood in preparation for the next contraction phase. While the left and right ventricles contract nearly simultaneously, each pumps blood into a different artery. Contraction of the left ventricle leads to the opening of aortic semilunar valve in order to eject blood into the aorta and, hence, the systemic circulation. Contraction of the right ventricle leads to the opening of pulmonary semilunar valve in order to eject blood into the pulmonary trunk (which branches out into the right pulmonary artery and left pulmonary artery) and,

hence, the pulmonary circulation. To prevent back flow of blood into the ventricles, the semilunar valves close during ventricular diastole. The cycles of ventricular contraction and relaxation lead to maximum (systolic) and minimum (diastolic) levels of blood pressure as shown in Figure 3 [5].

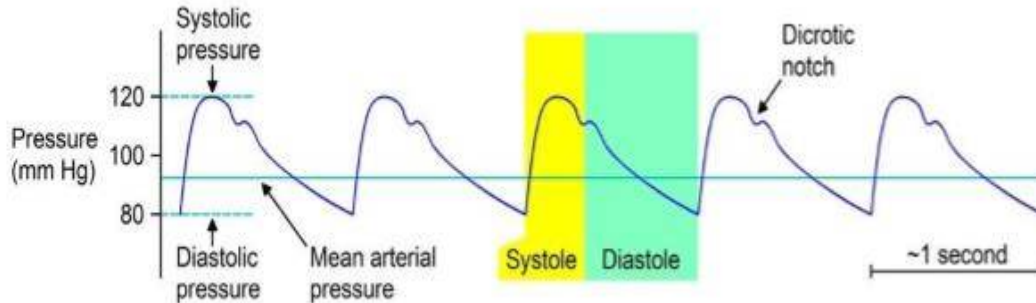


Figure 3: Normal blood pressure fluctuations in the aorta

Temperature vs Heart Rate

The typical body temperature is 37.0 C- 0.4 C (98.6 F - 0.7 F) [5]. When the temperature is high, the blood vessels within the skin expand (dilate) to carry the excess heat to the patient skin surface. One may begin to sweat, and as the sweat evaporates, it helps to cool his/her body. When one is too cold, the blood vessels narrow (contract) so that blood flow to skin is reduced to conserve body heat. This may cause an involuntary shivering in some people due to cold which is a rapid contraction of the muscles. The extra muscle activity helps to generate more heat. Under normal conditions, thus keeping one's body temperature within a narrow, safe range. Body temperature is regulated by a neural feedback mechanism which operates primarily through the hypothalamus. The hypothalamus contains not only the control mechanism, but also the key temperature sensor. Under control of these mechanisms, sweating begins almost precisely at a skin temperature of 37 C and increases rapidly as the skin temperature rises above this value. The heat skin temperature drops below 37 C a variety of responses are initiated to conserve the heat in the body and to increase heat production. These include Vasoconstriction to decrease the flow of heat to the skin. Another vital thing to monitor in a patient is the heartbeat rate. It is very important that the heartbeat is to be normal. That is 72 BPM. If there is any abnormality, then the patient is in distress. Heartbeat rate means the number of heartbeats per unit of time. The normal heartbeat rate of a resting person is about 70 bpm for adult males and 75 bpm for adult females. The average heartbeat per minute for 25 years old ranges between 140-170 beats per minute while for a 60 years old it is typically between 115-140 beats per minute and body temperature is 37 degree Celcius or 98.6 Fahrenheit.

Hardware Implementation (Arduino Circuit)

In this project of Heartbeat Monitor, we used Arduino Circuit as the microcontroller in this project. Figure 4 shows the Project Diagram and Figure 5 shows the project circuit that had been done in *Proteus Software*.

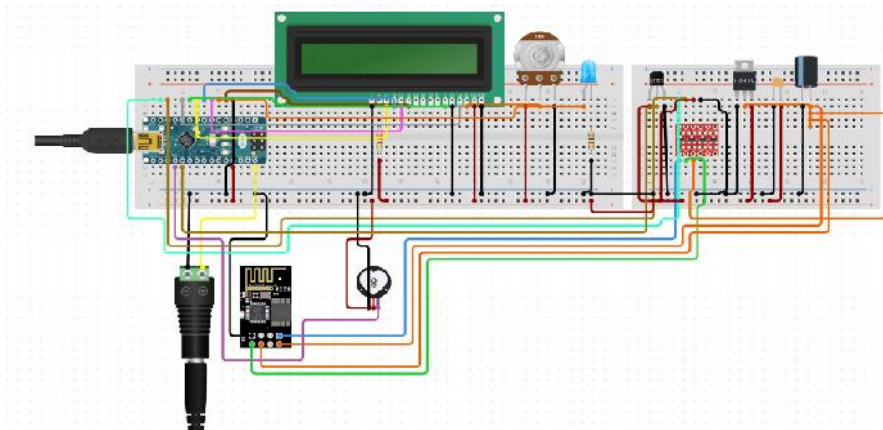


Figure 4: Project Diagram

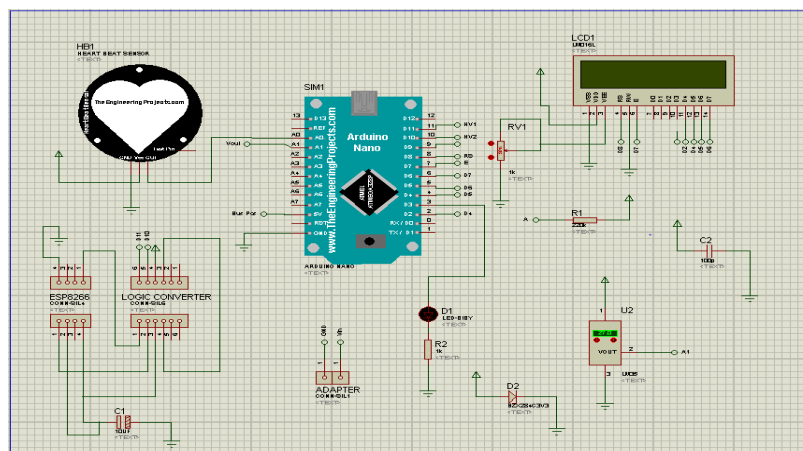


Figure 5: Project Circuit in *Proteus Software*

Blynk Application

Figure 6 show the IOT part in *blynk* application. This application is used to monitor the rate of heart beat and body temperature. So that, the doctors and also the patients can monitor the heart rate at anytime and anywhere using their smartphones.



Figure 6: Graphical User Interface (GUI) in *Blynk Application*

Market Analysis

Our market analysis is the possible use of the economy and the type of development on particular economic development such as this modern era. This is because many of today's people love the new technologies. Our target is more focused to patient to determines the condition of the heart, because this is the easier way to monitor the heart rate is to use a heartbeat sensor with low cost in production. The total cost to produce this product is only at RM 150.00.

Summary

This project was successfully build base on their objectives were accomplished at the end of the research and development. This project has potential for commercialization because of using low cost and reliable system.

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IBS Steel Formwork For Housing Project

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Hj. Safri Omar ^{1, d}, Abdul Razak A. Aziz ^{1, e}

¹ Politeknik Sultan Mizan Zainal Abidin,

Km 8, Paka Road, 23000 Dungun, Terengganu, Malaysia

^a yuzhapsis@gmail.com, ^b mieza1444@gmail.com, ^c hilmei@psmza.edu.my,
^d safri@psmza.edu.my, ^e razak.aziz@psmza.edu.my

Abstract. In Malaysia almost 80% of building construction projects are made for concrete reinforced with reinforced steel. The main ingredients in concrete production are cement, silt and water mix together. This material is mixed and formed to become such as column, beams, floors, footing, stump and so on. To obtain the desired shape of the mixture it is placed in a special container called formwork. Usually this formwork made on the site (pre cast) using wood and plywood known to be low durability. This research deals with alternative materials that can be used to replace conventional wood based formwork. Alternatively, the researcher used a steel plate to make the formwork. This steel plate is used to produce durable and long lasting formwork. One more special about formwork it is all the building members manufactured in a precast or better known as an industrial building system (IBS). This method of IBS is widely practiced in our country but mostly for members of the big building. Only. Researchers created an IBS steel formwork specially designed for small building such as residential homes. The steel formwork is made for column (125 mm x 250 mm x 4020 mm), beam (125 mm x 300 mm x 4020mm), stump (250 x 250mm) and footing (900 x 900mm). The specialty of this steel formwork is that it is designed to be adjustable. Researchers have successfully obtained PPRN research grants as the main funding for the project. This project is being carried out in collaboration with Noha Niaga Sdn. Bhd. and My IBS, CIDB Malaysia. The results of the research have also been recognized by CIDB and the formwork has been used widely by construction companies under the Kelantan State Housing Contractor Association (PKPK). Now, Noha Niaga Sdn. Bhd. has set up a factory for the manufacture of home-based products at Kok Lanas, Kota Bharu, Kelantan. So far, the company have been completed 20 housing projects in Kelantan state. The bigger project using this product is redevelopment chalet at Perhentian Island Resort, Perhentian Island, Terengganu. This project has been approved by the Marine Park Section, Ministry of Environment Malaysia. The next expectation is to obtain a material testing certificate from the Department of Works Laboratory (CREAM), Malaysia. This declaration certificate is essential for expanding the use and market of this IBS products.

Key words: Concrete, IBS Steel Formwork, adjustable, residential homes.

Introduction

An Industrialized Building System (IBS) refers to a technique or technology of construction whereby components are manufactured in a controlled environment - either onsite or offsite - placed and assembled into construction works [2].

According to history, components, elements or members of the pre cast concrete have been in place in Malaysia since 1964 with the launch of two earliest construction projects consisting of the development of Tunku Abdul Rahman Flat in Kuala Lumpur and Rifle Range Road Flat in Penang [9]. The IBS steel formwork for housing research project was triggered by a problem faced by a home-based construction company in the east coast Malaysia. They are having problem using IBS technology as a result and the existing supply is focused on large scale construction only. In addition, the location factor is also a hindrance as IBS plants are abundant in the western coastal states of peninsular Malaysia.

As a result of the strategic collaboration between Civil Engineering Department (CED), Sultan Mizan Zainal Abidin Polytechnic (PSMZA) and a company under the controlled of the *Persatuan Kontraktor Perumahan Kelantan* (PKPK), this innovative research was successfully realized. PSMZA researchers in collaboration with Noha Niaga Sdn. Bhd has successfully fabricate IBS steel formwork dedicated to small buildings such as residential homes. This research project has been funded by the Public – Private Research Network (PPRN), Ministry of Education (MOE) based on the offer letter (Ref: KPT. 600-6 / 12/569 (20). The completion period is 4 months from March 10 - July 10, 2019 (see attachment 1).

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The problems faced by the company is the time of construction is too long and waiting list for ready buyer become delay. This is because for every stage of constructions of house it takes longer time. Another problem with the conventional system is it requires more wastage materials such as wood and plywood that can increasing of cost. As we are aware, use more wastage material and working hours will increase the costs of the company. In addition, with using the IBS component, the buyer waiting time and the price of building will decrease drastically.

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- To design the IBS steel formwork (column, roof beam, ground beam, stump & pad footing).
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This research is about how to overcome the slowness of completing a construction project at an economical cost. Researchers are focusing on small-scale buildings. The main scope involves design, fabrication, casting, installation and testing the IBS steel formworks. The overall sizes of formwork is special designed for housing demand.

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In this methodology, all the planned and prosedure to gain the reasearch reveals. To make the research run in smooth, lite and eazy. Research methodology was written in right way. All the risk must be expected early and all activities must be in the right track.

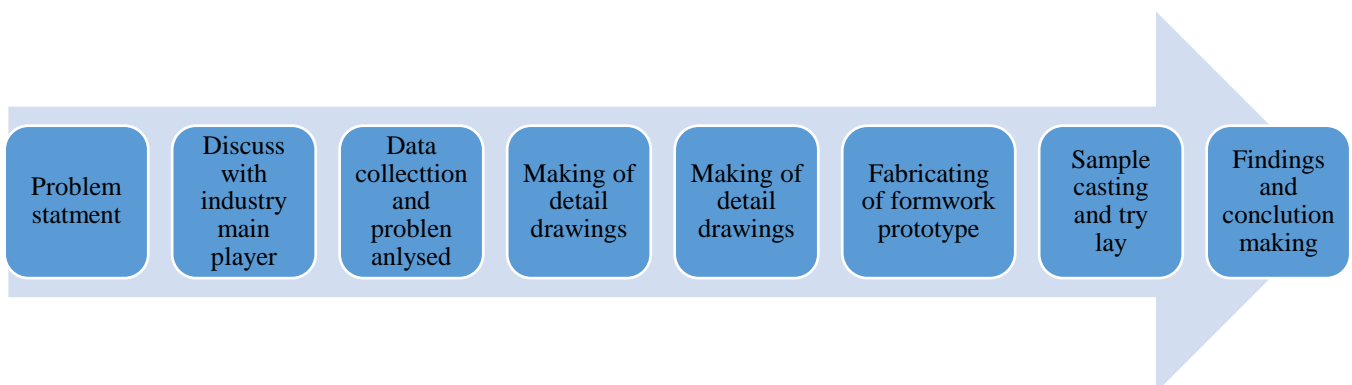


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The main material is steel plate in 4 mm thick provide with steel plate base and special clips. The workers (no need special skill) can adjust the size depend of architect and working drawing. The formworks also complete with special hooks to easily lift and transfer from site to site. Figureure 2 below are shows the overall parts located in building system.

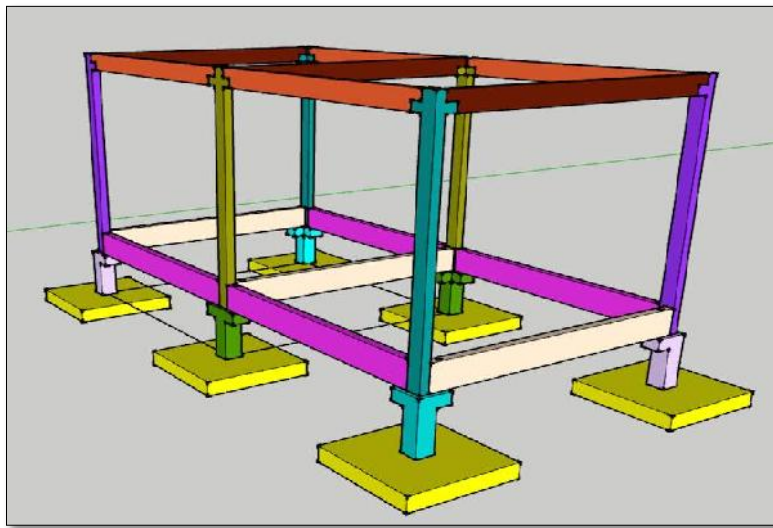


Figure. 2. Building Modelling (Size13' x 16')

Adjustable Steel IBS Formwork

The Figureures below show all the adjustable steel formworks that have been produce and also shows the products or members of IBS made using these adjustable steel formworks.



Figure. 3. Column Steel Formwork



Figure. 4. IBS Column



Figure. 5. Roof beam Steel Formwork



Figure. 6. IBS Roof Beam



Figure. 7. Ground Beam Steel Formwork



Figure. 8. IBS Ground Beam



Figure. 9. Stump Steel Formwork



Figure. 10. IBS Stump



Figure 11. Pad Footing Steel Formwork


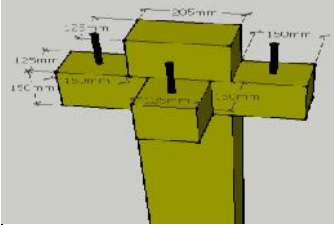
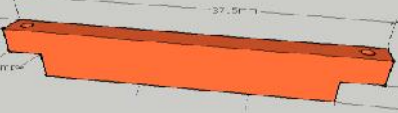
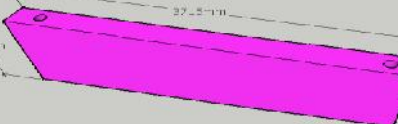


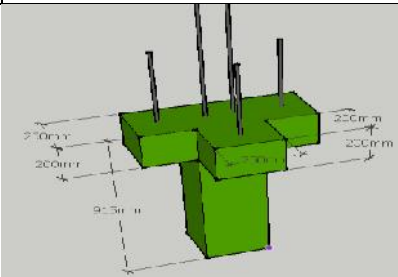
Figure 12. IBS Pad Footing

IBS Member's Size

Table 1 below shows the details of the size and dimension of the steel formworks that was produced. The research found that this proposed size and dimensions is ideal for most homes with two storey or below.

Table 1: IBS Member's Size and Detail Dimensions

COLUMN								
CODE	MEMBER'S SIZE (mm)			CORBEL (mm)			STARTER BAR (mm)	STARTER BAR HOLE (mm)
	W	D	L	W	D	L		
C 01	205	125	4050	125	150	150	1Y12 75 & 62.5 - from edge	Ø50 51.25 & 62.5 - from edge  
ROOF BEAM								
CODE	MEMBER'S SIZE (mm)			CORBEL (mm)			STARTER BAR HOLE (mm)	TYPICAL DIAGRAM
	W	D	L	W	D	L		
RB 01	125	150	3715	-	-	-	Ø50 75 & 62.5 - from edge	
GROUND BEAM								
CODE	MEMBER'S SIZE (mm)			CORBEL (mm)			STARTER BAR HOLE (mm)	TYPICAL DIAGRAM
	W	D	L	W	D	L		
GB 01	125	450	3715	-	-	-	Ø50 75 & 62.5 - from edge	

STUMP							
CODE	MEMBER'S SIZE (mm)			CORBEL (mm)			STARTER BAR (mm)
	W	D	L	W	D	L	
ST 01	250	250	915	250	200	250	3Y12 125 & 100 - from edge 2Y16 273.75 & 125 - from edge
							

Conclusion

Steel formwork designed as a result of research and innovation has been successfully completed within a defined time frame and standard. The use of steel plates as the main material of formwork is expected to extend the life of the product. Steel plates itself are durable and resistant to weather changes [8]. Additionally, the use of steel plates can also guarantee the accuracy, square shapes and durability of the product.

The size of each member of the building varies according to height and total wide of floor area. To solve the problem of various sizes, these column and beam steel formwork are designed to be adjustable to a maximum length of 14 feet. This formwork is also easy to carry around (mobile) as it is made piece by piece.

This formwork was used by the company Noha Niaga Sdn. Bhd to produce IBS members for a company-run housing project. So far around 20 homes have been set up and completely using this system. In addition to the residential project, the company is also preparing a project for a upgrading resort at Pulau Perhentian, Terengganu. Construction Industry Development Board, Malaysia (CIDB) has developed an IBS scoring system to recognize construction projects. According to government circulars in 2017, all construction projects are expected to reach over 50% [2]. By using this system (Footing, Stump, Beam and column) a construction project will easily achieve IBS score of over 60%.

Base of time reduction, it was proved that using industrialized building system can provide faster completion of projects due to advance technique of construction and simplicity of installation process [1]. In advance, the speed of production cannot effect by weather conditions.

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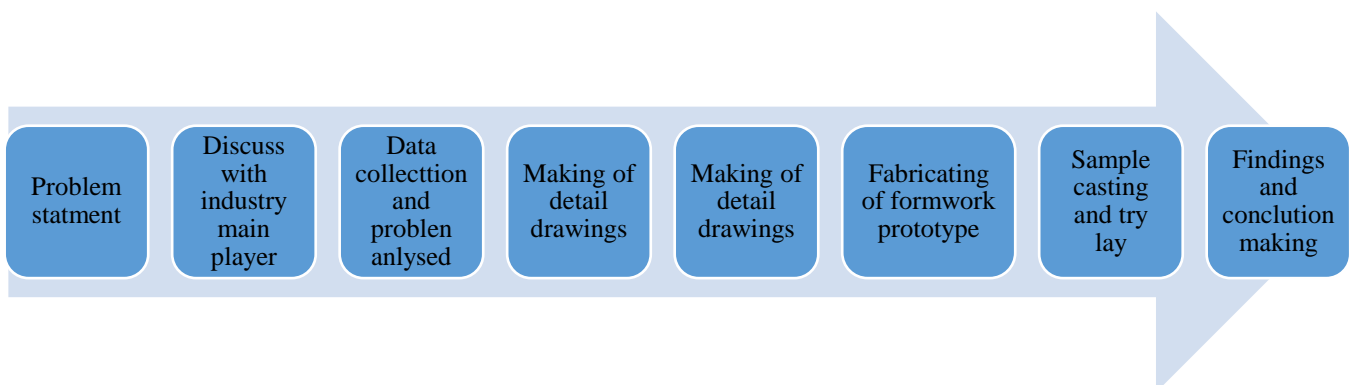


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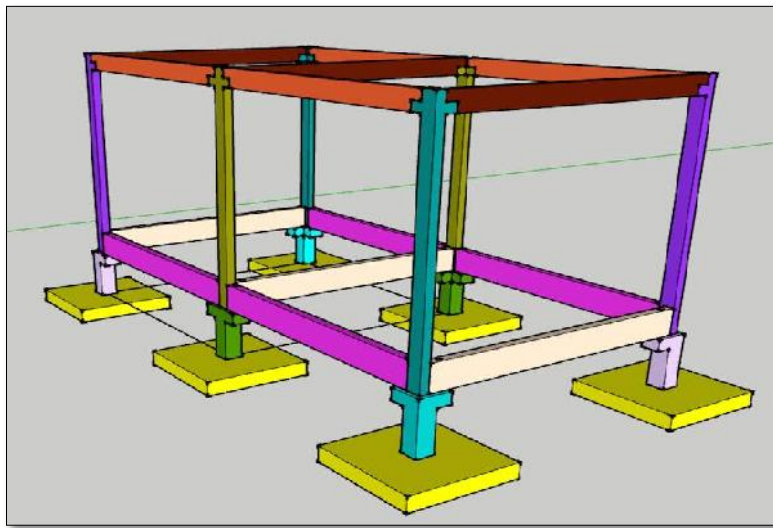


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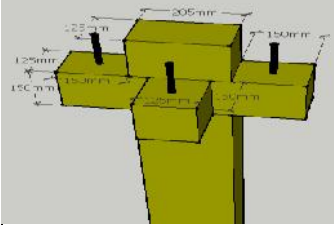
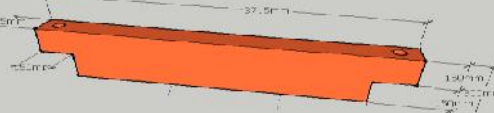
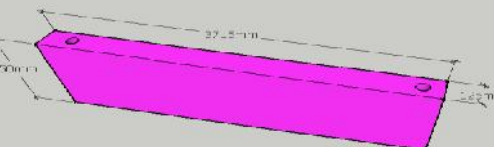


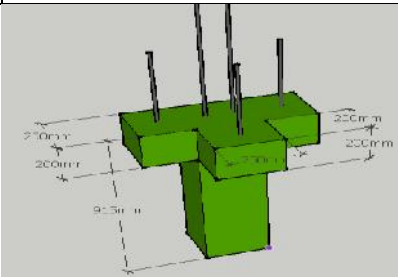
Figure 12. IBS Pad Footing

IBS Member's Size

Table 1 below shows the details of the size and dimension of the steel formworks that was produced. The research found that this proposed size and dimensions is ideal for most homes with two storey or below.

Table 1: IBS Member's Size and Detail Dimensions

COLUMN								
CODE	MEMBER'S SIZE (mm)			CORBEL (mm)			STARTER BAR (mm)	STARTER BAR HOLE (mm)
	W	D	L	W	D	L		
C 01	205	125	4050	125	150	150	1Y12 75 & 62.5 - from edge	Ø50 51.25 & 62.5 - from edge  
ROOF BEAM								
CODE	MEMBER'S SIZE (mm)			CORBEL (mm)			STARTER BAR HOLE (mm)	TYPICAL DIAGRAM
	W	D	L	W	D	L		
RB 01	125	150	3715	-	-	-	Ø50 75 & 62.5 - from edge	
GROUND BEAM								
CODE	MEMBER'S SIZE (mm)			CORBEL (mm)			STARTER BAR HOLE (mm)	TYPICAL DIAGRAM
	W	D	L	W	D	L		
GB 01	125	450	3715	-	-	-	Ø50 75 & 62.5 - from edge	

STUMP							
CODE	MEMBER'S SIZE (mm)			CORBEL (mm)			STARTER BAR (mm)
	W	D	L	W	D	L	
ST 01	250	250	915	250	200	250	<p>3Y12 125 & 100 - from edge</p> <p>2Y16 273.75 & 125 - from edge</p>
							

Conclusion

Steel formwork designed as a result of research and innovation has been successfully completed within a defined time frame and standard. The use of steel plates as the main material of formwork is expected to extend the life of the product. Steel plates itself are durable and resistant to weather changes [8]. Additionally, the use of steel plates can also guarantee the accuracy, square shapes and durability of the product.

The size of each member of the building varies according to height and total wide of floor area. To solve the problem of various sizes, these column and beam steel formwork are designed to be adjustable to a maximum length of 14 feet. This formwork is also easy to carry around (mobile) as it is made piece by piece.

This formwork was used by the company Noha Niaga Sdn. Bhd to produce IBS members for a company-run housing project. So far around 20 homes have been set up and completely using this system. In addition to the residential project, the company is also preparing a project for a upgrading resort at Pulau Perhentian, Terengganu. Construction Industry Development Board, Malaysia (CIDB) has developed an IBS scoring system to recognize construction projects. According to government circulars in 2017, all construction projects are expected to reach over 50% [2]. By using this system (Footing, Stump, Beam and column) a construction project will easily achieve IBS score of over 60%.

Base of time reduction, it was proved that using industrialized building system can provide faster completion of projects due to advance technique of construction and simplicity of installation process [1]. In advance, the speed of production cannot effect by weather conditions.

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NOTiFIRE Tracker System using PIC18 and Visual Studio C#

Nor Firdaus Zakaria¹, Md Hafriz Fikrie Md Hussin²

¹Department of Electrical Engineering,
Politeknik Kuala Terengganu,
Terengganu, Malaysia

nufiez@gmail.com, hafriz.fikrie@gmail.com

Abstract. It is often reported that fire events caused disaster and it has a very dangerous effect on the community such losses of lives. Information received by firefighters is often slow and inaccurate causing a slow rescue process. Therefore, the NOTiFIRE system is built to allow the fire to be detected and reported immediately. This project used two type of detectors; temperature sensors. The signals are processed and sent using a transmission system via Global System for Mobile Communication (GSM900A). Any information obtained automatically will be sent directly to the authorities such as firefighters, police and also users (owner). The system comes with a NOTiFIRE Apps by using Visual Studio C# 2010, for firefighters to track directly the location of the actual fire. It facilitates firefighters to get information and take action early to extinguished fire and save life.

Keywords: Temperature sensor, NOTiFIRE, GSM, Visual Studio C# 2010.

Introduction

This Smart house project is nothing new in world full of technology. Smart house technology often referred to a device that can provide the owner comfort, safety, energy saving and many more by allowing those devices controlled by a smart device, often by a smart phone [2]. In 1980, this project was initiated and more are being design to this day with various applications and communication systems used [1]. Smart home technology is real and it's becoming increasingly sophisticated. Home security system project is one of consequence of smart house project. The community nowadays sees the importance of home security system especially to protect and secure their family and property from burglaries as the possibilities of intrusion are increasing day by day. Besides, this system can also protect homes from fires as well. By installing heat detector as example, this component can detect the fire incoming and notify to the owner.

Recent years, various systems regarding to home security is developed using various method. Microcontroller is one of the method widely used as a 'heart' of the system which it will integrate with sensor and communicate with communication devices such remote [2]. The communication system used depending on the aim of the project designed. Bluetooth technology is one of famous communication medium implemented to communicate the android phone to the appliances in a short range as it is more convenient and cheaper than others communication technology [5]. However, to monitor and control houses at a long distance, Global Network for Mobile Communications (GSM) system is mostly used as it is the standard system in cellular phone networks worldwide [2]. Most project is designed to notify the user via Short-Message-Service (SMS) and the information is ended to the owner of the house.

This paper presents a NOTiFIRE System controlled by PIC to notify the user (homeowner) and also the authorities. This project is a system that used temperature sensors to determine the heat of a fire and allows the use of GSM in order to submit such information to the responsible parties in the event of an emergency. With this system, safety can be increase and helps the fire rescue to solve the problem beside than can facilitate various parties in the event of emergencies and early action can be taken. It is called NOTiFIRE System because it provides notification, owner information, location and a map whenever it detects any fire. This system is divided into two sub-systems; the first sub-system is located in the house while another one is located at fire station. This system used

PIC18F2550 as a main controller to get the data from sensor and analyses it before send it to user mobile phone via GSM network. As it focused on fire detection, thus temperature sensor, LM35 is used. The operating temperature range of the sensor is from -55 to 150 Celsius and it has low-self heating. If the sensor detects any temperature changes over than 90 Celsius, data will be send to microcontroller [4]. The program that embeds in PIC recognize the value as the triggered value to notify the user. The triggered value, combines with other information, such the coordinate of the house (longitude and latitude) will be convert to a signal before transmitted to the mobile phone [7]. GSM module works to send the information to the user and the authorities. The authorities such as firefighter will get the information directly for further action.

Research Methodology

The whole system designed consist of software and hardware as shown in diagram below.

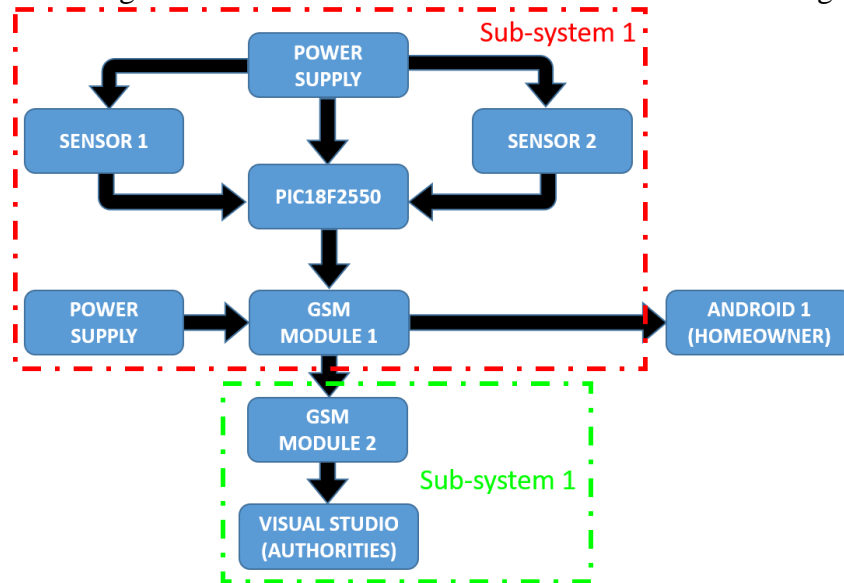
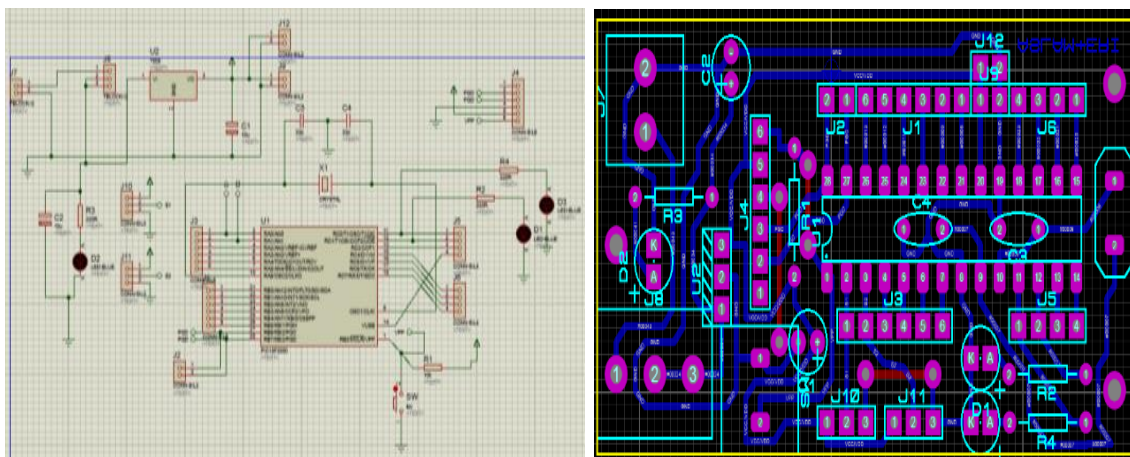


Fig.1: Block diagram for the whole NOTiFIRE System

Hardware Implementation

The schematic of microcontroller PIC18F2550 is designed using Proteus 7.10 ISIS. Fig.2 shows the design of the circuit using Proteus 7.10 (ISIS) later converted to a PCB design using Proteus 7.10 (ARES).



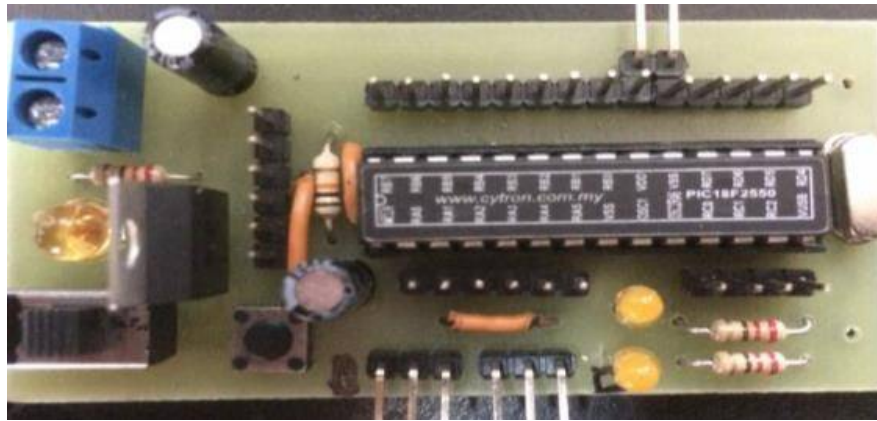


Fig.3: PIC18F2550 Circuit Board

Software Implementation

Among the software used in order to accomplish NOTiFIRE System are Proteus 7, MPLAB, PIC KIT3 and Visual Studio C# 2010. Proteus 7 is used to make NOTiFIRE system and simulation, MPLAB is also used to write programming, besides PIC Kit3 is used for software and hardware interfacing and finally visual studio C# 2010 is used to make NOTiFIRE application system.

In this system, MPLAB v8.83 software is used to develop programs for PIC microchip. This software is made up of PIC C18 programming, thus it can be used for built programs in C language. The program is divided into sections, for GSM module and for fire detection. In other to make a communication between sensor to the homeowner, a program involving TX and RX (UART) for GSM 900A module, was developed with a 9600 baud rate connection system, 8 data bits, No-parity and 1 stop bits.

Table 1: Serial Port Configuration

<i>Protocol Setting for Serial Communication</i>	
<i>Baud rate</i>	9600
<i>Data Bits</i>	8
<i>Parity</i>	No
<i>Stop Bits</i>	1

The other program module is to detect the temperature by using two temperature sensors on PORTA pin 0 and pin 1. The last program module is for a notify the homeowner that acts by sending the message to the android phone if the emergency occurs which the fire is detected. The program will send "Fire is detected in kitchen area (for sensor 1) with temperature (recent temperature)!". If sensor 2 is detecting a fire, the program will send "Fire is detected in Bedroom1 area with temperature (recent temperature)!".

Visual Studio C# 2010 is used to build NOTiFIRE Apps. This application displays five parts of information, which are GSM SETTING, FIRE NOTIFICATION, RESCUE ACTION, INFO / LOCATION VICTIM and MAP. GSM SETTINGS should be fulfilled by the fire bridged to set up and choose ports on computers and GSMs used. FIRE NOTIFICATION show receiving message to fire department that include the data and information about the victim such the address, temperature and part of burning house. RESCUE ACTION serves as a sending of fire messages to other responsible parties such as police and Civil Defense Force. INFO / LOCATION provide information about the owner of the house such name, phone number, latitude, longitude and the address of the

house otherwise the time and date of the incident. For the MAP part, it shows the map and route to the victim's house. It really helps fire bridged to enhance the efficiency of the rescue process by avoiding possibility of congestion traffic area.

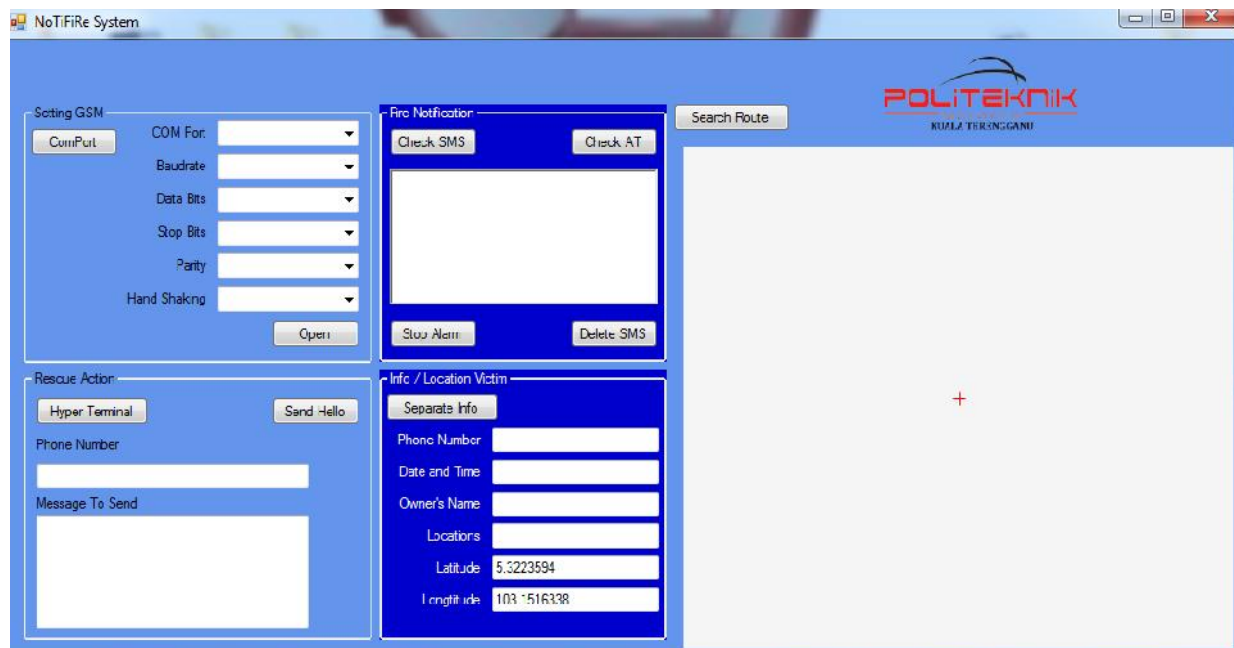


Fig. 4: NOTiFiRe Apps Display at Visual Studio C#

Result and Discussion

The result of this project is shown in Fig.5 below. There are two temperature sensors used in NOTiFiRe System by setting the temperature over 90°C. The sensor is connected to the PIC to process the signal received. If the temperature exceeds the limit designated, which will be processed by PIC and send the signal to the GSM message-shaped to the owner.

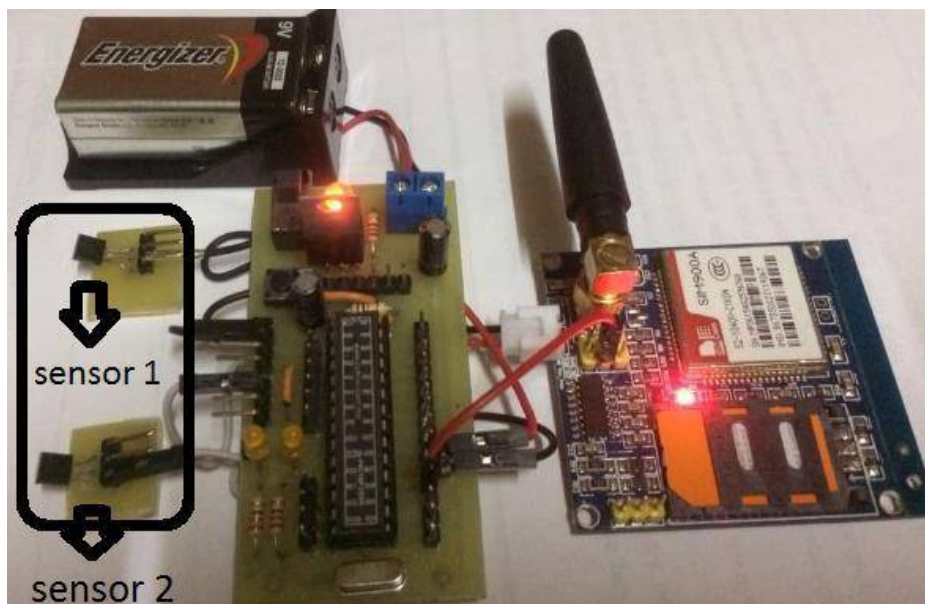


Fig. 5: NOTiFiRe Circuit with GSM Module

When the temperature set is reached, a signal is processed and then, sent to the user and the fire brigade with an information using GSM900 applications. Sensor 2 is tested and the notification via SMS received by the homeowner on their android phone shows in Fig.6 below.

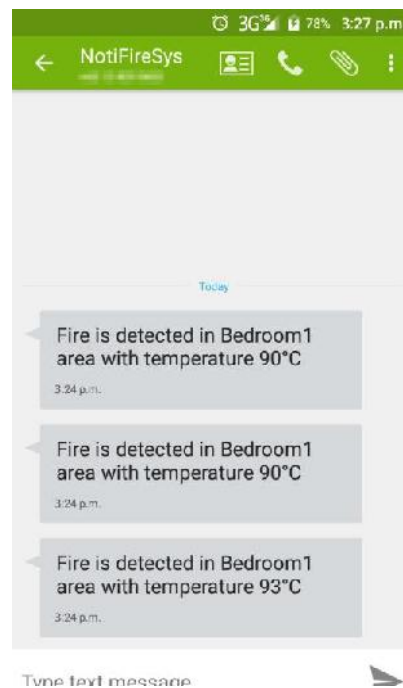


Fig. 6: Alert message received at homeowner android phone

The notification received by the fire brigade via GSM module which attached to the computer through serial connection (Fig. 7) and displayed by using Visual Studio C# 2010 applications.

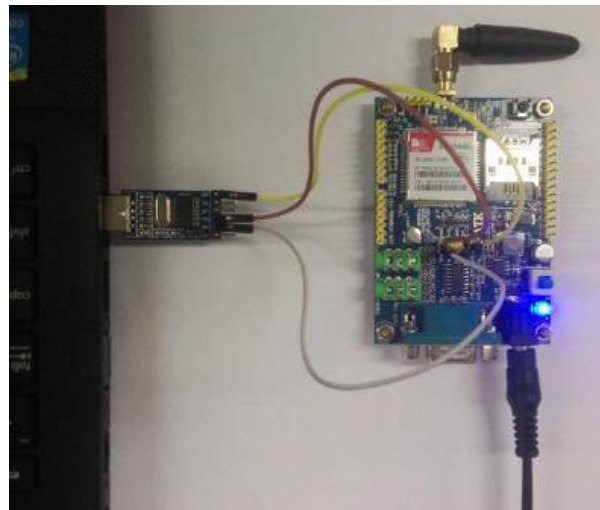


Fig. 7: GSM module attached to the computer

Result shows the fire notification received and viewed at NOTiFIRE App in Fig. 8. This app is located in fire station to helps fire bridged to take faster action in their rescuing. First highlighted box shows a message, "JKE PKT, Kuala Terengganu" is a name and location set as the homeowner information including the phone number and temperature value reads. At the second highlighted box, shows other information such latitude, longitude and time the fire detected. The map from the fire station to "Kuala Terengganu" as the target location extract from google map are packed together to show the possible route to get there.



This NOTIFIRE SYSTEM is successfully implemented and it can provide many benefits to the owners and responsible parties by having a secure system of security. With this NOTiFIRE SYSTEM it can provide early information to the responsible party to take appropriate action and it also reduces the rate of damage to property. In addition to having a safe security system it can give an early warning to the owner to save themselves indirectly it can avoid a serious accident occurs.

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Embedded Flower Pollination Evolutionary Programming Based Technique for Voltage Stability Enhancement with Distributed Generation Installation

Nik Nuruljannah Mansor^{1,a}, Ismail Musirin^{2,b}, Nik Roslini Nik Ibrahim^{3,c}

^{1,2}Faculty of Electrical Engineering, University Teknologi MARA, Shah Alam, Selangor, Malaysia

³Department of Electrical Engineering, Politeknik Kuala Terengganu, Terengganu, Malaysia

^anikjannah.mansor@yahoo.com, ^bIsmaibm1@gmail.com, ^crini123n@gmail.com,

Abstract. Load increment in power network could possibly lead to several contingencies including power system collapse. In avoiding such circumstance the existing power system was designed to operate according to standardize margin value before the system breakdown by considering the cost and total saving of operating the power network. In this study, a new optimization technique is developed termed as Embedded Flower Pollination Evolutionary Programming (EFPEP) which integrate the Flower Pollination element into the original EP algorithm. The proposed technique was used to enhance the voltage stability in power system. In this case, 33-Bus Distributed system was utilized as the test specimen. Comparison between the embedded flower evolutionary programming technique and evolutionary programming was done and results obtained from the study revealed that the proposed technique is better than EP in terms of optimizing the sizing of DG and location.

Keywords: Evolutionary programming, Flower pollination, Voltage stability

Introduction

Increasing loading condition in a power system network had driven the power system operating close to its stressed condition leading to unfortunate power contingencies occurrences such as power system collapse. There are several aspects that may lead into a power system collapse. The impact of voltage stability in a power system stability can be taken into consideration as it is very crucial to prevent the power system from voltage instability while ensuring maximum loadability could be deliver to user [1]. For this study purposes, in order to optimized the maximum voltage stability value, distributed generation was injected at appropriate location with certain power sizing (MW) in order to boost that power system efficiency [2]. Voltage stability studies was becoming crucial as power system had to operate near stability constraint in order to save the investment cost. While the maximum voltage stability value is calculated line by line and any out of range value could become major problem in power system stability.

The main purpose of distributed generation installation serves as maintaining acceptable voltage range during normal condition and disturbance occurrence [3]. Voltage instability could occur in conjugate to contingencies occurrence beforehand thus making it crucial to have the overall voltage stability monitored in a power system [1]. In accordance with the IEEE power system committee standard, voltage stability is also defined as the ability of power system in maintaining the stability range of the voltage when load admittance is increasing in the power system consulting in increasing the overall loading condition of power system thus resulting in making the power and voltage both controllable [4].

This paper presents the embedded flower pollination evolutionary programming-based technique for voltage stability enhancement with distributed generation installation. By using the combination technique of evolutionary programming and flower pollination algorithm the maximum FVSI value during maximum loading condition was evaluated and the most stable index value after placement with suitable DG sizing was obtained. Validation was conducted on the IEEE 33-Bus Distribution System and results revealed that the proposed technique outperformed EP in terms of voltage stability enhancement. Larger test system can be the future test system using the similar proposed technique.

Methodology

There are two types of voltage stability in small disturbance voltage stability analysis, which are known as the static voltage stability and dynamic voltage stability however in this project, static voltage stability was chosen as it contained a load flow equation for simulation purposes [5]. In calculating the voltage stability of power system, fast voltage stability index (FVSI) method was proposed by Musirin *et. al* [6]. The voltage stability index margin ranging from zero until one. The FVSI implies a stable system at its minimum value, close to zero; while its value close to 1.0 implies an unstable condition. e.g.

$$FVSI = \frac{4Z^2 Q_r}{V_s^2 X} \quad (1)$$

This formula however used by considering the use of the following assumption:

$$\sin \delta \approx 0, \cos \delta \approx 1, R \sin \delta \approx 0, X \cos \delta \approx X$$

A. Distributed generation

Distributed generation is also known as on-site generation/ dispersed generation/ embedded generation or decentralized generation [7]. DG main purpose was to solve power system quality problem by improving system efficiency, eliminate high cost peak load voltage profile, reducing system losses, system continuity and reliability by contributing active and passive power into the system [8]. Systematic planning strategies are important in allocating DG unit so power system will not be facing further increase of system losses which include high network capital and operating cost aside from decreasing the network losses and increasing the power quality supply [3][9]. There are several methods and formulation involved in finding the most optimum placement and sizing of the distributed generation including analytical tools and also heuristic optimization methods. In finding the most suitable location for DG placement, some of the most common strategies are by assessing the power losses parameter in system or based on the voltage bus index stability [10] which may be achieved by using evolutionary computational technique yet for the purpose of analysis in this paper, randomize location and sizing of DG was done and overall voltage stability value was calculated using each injected power by this DG which eventually resulted in the lowest possibly voltage stability value.

In determining the best location and sizing for DG considering the maximum loading condition, optimum location and sizing variables were randomized and total maximum voltage stability index (FVSI) was calculated from each randomized value which in eventually the lowest of the voltage stability value was considered in obtaining the optimal placement and sizing of DG.

In this study, supposedly renewable energy sources were used as distributed generation in the system analysis. For that assumption made for all four DGs in the analysis were used in this study was solar thermal type. Since the emerging of solar farm technologies around the globe student used this type of DG in the study with the power range for these solar farms were set to 50MW for all four types of DGs.

B. Computational technique

In enhancing the voltage stability margin, computational method was introduced in calculating the lowest possible maximum voltage stability index (FVSI) in conjugate to the placement and sizing of installed DG. In this study, however the main technique used which is the embedded evolutionary flower pollination algorithm introduces the combination of evolutionary programming and flower pollination algorithm for optimizing the FVSI. Yet comparison between the embedded technique and existing evolutionary programming-based technique was made to justify the most effective technique used between the two methods.

1. Evolutionary programming

The Evolutionary Programming is a population based metaheuristic optimization search technique that is a part of Evolutionary Computation technique. This technique uses the optimization process is the development or adjusting any fitness to improve it using a mathematical procedure that will search for minimum and most optimum value. It was commonly used to solve problem involved complicated constraint and design parameter [11]. Evolutionary programming is a more robust approached stochastic optimization techniques. This technique use a global multiagent minimization method [12] in finding the optimal solution using initial random guess or by creating numbers of population over the numbers of iterations which eventually set by the limit margin of proposed optimized criterion [13].

Initialization process where the population for the variable of placement and sizing of the installed DGs was generated randomly before running the load flow for the 33-Bus system and maximum loading condition value was injected into the system to obtain the maximum FVSI value. For fitness 1, each data for location and sizing were obtained from the initialization process and the value for the FVSI should be the same. During mutation process of the 20 new individuals, offspring, which is the latest variable value were generated from the parent, fitness 1 value using this formula:

$$X_{i+m,j} = X_{i,j} + N(0, \sigma^2_{i,j}),$$

$$\sigma^2_{i,j} = \beta (X_{j \max} - X_{j \min}) \left(\frac{f_i}{f_{\max}} \right) \quad (2)$$

$$x_{i+m} = \text{offspring}$$

$$x_{i,j} = \text{parent}$$

$$N(\mu, \sigma^2) = \text{Gaussian random variable with mean } \mu \text{ and variance } \sigma^2$$

$$\beta = \text{mutation scale. } 0 < \beta < 1 \text{ which can be adjusted for more accurate result}$$

$$x_{j \max} = \text{maximum value of random number for each variable}$$

$$x_{j \min} = \text{minimum value of random number for each variable}$$

$$f_i = \text{fitness for the } i^{\text{th}} \text{ of randomize number}$$

$$f_{\max} = \text{maximum value of overall fitness}$$

Mutated offsprings and parents were then combined and gone through selection process depending on the smallest maximum voltage stability value which 20 best value from the selection process was chosen depending on the ascending voltage stability value.

For this project the convergence criterion of the voltage stability index was set to be less than 0.00001 so the accuracy of result was more precise.

2. Flower pollination algorithm

Flower pollination algorithm and evolutionary programming both are known as the stochastic technique. The rules for formulated the flower pollination is a modern optimization, the evolutionary technique based on the characteristic of flower pollination mechanism was inspired by nature that effectively deal with continuous combination problem [14][15].

In this technique, it is inspired from the flower pollination concept and related to reproduction via pollination which involved the transfer of pollen, the following are the characteristic of flower pollination algorithm characteristic [16]:

- Cross pollination and biotic is a global process of pollination which the pollinators carry the pollen and was performed by L'evy flights
- Self-pollination and abiotic are the local pollination technique.
- Flower constancy is the reproduction probability that proportional to similarities of two flowers involved.
- In terms of controlling between the local and global pollination, the randomized switch probability was used which is [0,1].

Flower pollination concept and equation involved was embedded into the evolutionary programming solution in order to optimize the overall result. This project however also includes the concept and formulation of the local and global pollination in generating converged output solution and the probability switch value used classified solution into either the global or local pollination was 0.8. Maximum and minimum set point for each parameter was also set so the pollinated value will not search off the range limit. Equations used in the analysis study are listed as follow:

As for global pollination, flower pollen is carried by pollinators which may travel over long distance and this rule is represented mathematically using formula:

$$X_i^{t+1} = X_i^t + L(\lambda)(X_i^t - B) \quad (3)$$

While;

X_i^t = pollen i or solution vector x_i at iteration t

B = current iteration best solution

$L(\lambda)$ = parameter correspond to the strength of pollination or the step size

Le'vy flight also can be used to imitate this characteristic, from that we use the Levy distribution formulation which used in any flower pollination technique:

$$L \sim \frac{\lambda \Gamma(\lambda) \sin(\pi\lambda/2)}{\pi} \frac{1}{S^{1+\lambda}}, (S \gg S_0 > 0) \quad (4)$$

In modelling the local pollination of flower pollination technique, both rules (4) and (5) can also be represented by this following mathematical equation:

$$X_i^{t+1} = X_i^t + U(X_j^t - X_k^t) \quad (5)$$

3. Summary

Several studies had shown combination artificial intelligent technique of flower pollination algorithm with other artificial intelligent techniques [17][18] which eventually each will have different types of objective function and constraints so does the overall performance of these

combination techniques [19] for this paper, flower pollination concept and formulation used was embedded into evolutionary technique and the overall performance was recorded, evaluate and compared with the evolutionary programming technique.

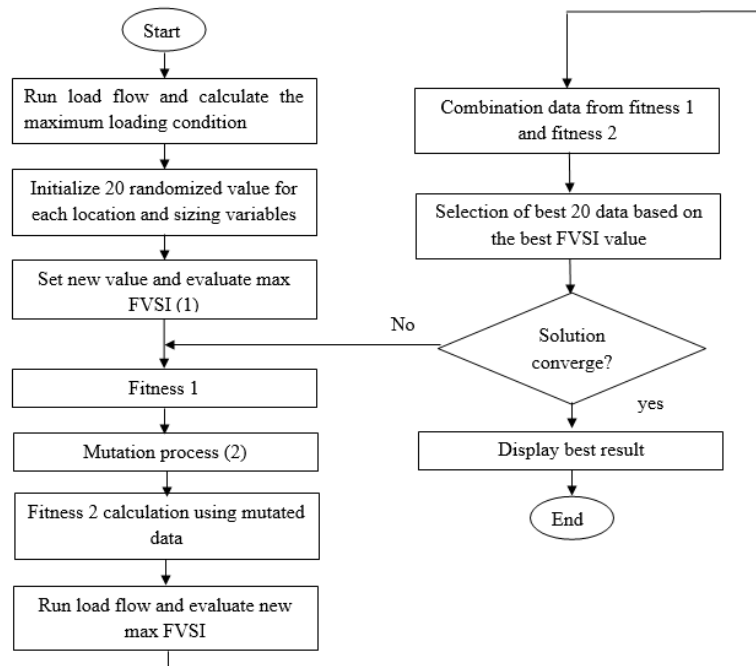


Figure 1: Evolutionary programming flowchart

Figure 1 above showing the flow graph of overall step involved by using the Evolutionary programming solution in optimizing the overall voltage stability for the IEEE 33 bus system. The proposed embedded flower pollination evolutionary programming is shown in Fig. 2.

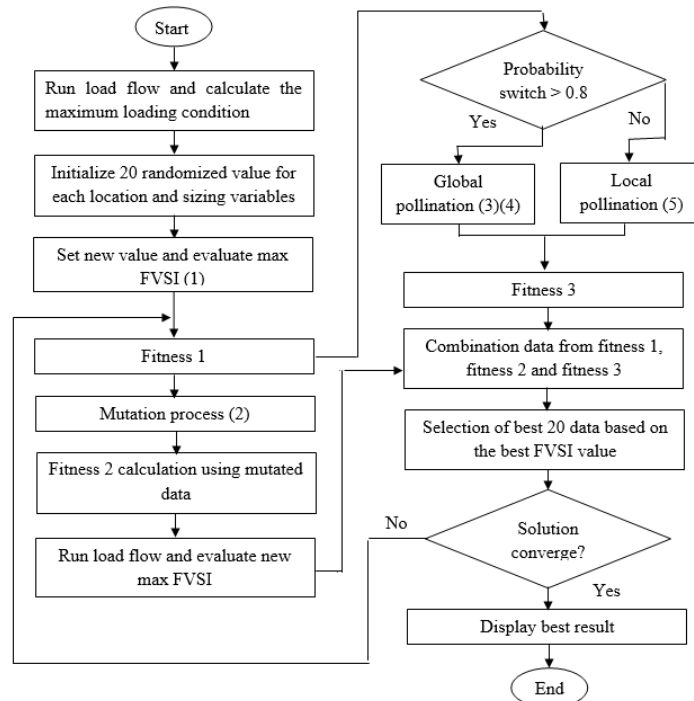


Figure 2: Embedded evolutionary flower pollination flowchart

Flower pollination algorithm concept and equations are embedded into the original algorithm of the evolutionary programming technique as seen in Figure 2 above. This embedded technique used the global and local pollination formula in generating the new solution which is fitness 3 from data fitness 1. The data gathered from fitness 1, fitness 2 and fitness 3 were then combined and the best optimization result among the overall data will be displayed.

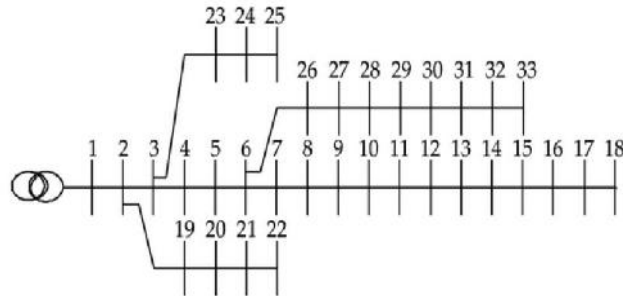


Figure 3: IEEE 33-Bus distribution system

Figure 3 shows the single line diagram of a 33 -bus distribution power system. This system has 32 connecting line between the buses with single slack bus and 32 load bus. Maximum loading condition was added at bus 10 which slightly further from the power source and located in centre of the distributed system and any insignificant instability could possibly affect the overall power system more than the one located further from generating source supply.

Result and Discussion

Evaluating the overall voltage stability after DG installation was conducted, R2017a version Matlab software was used in simulating the IEEE 33-bus distribution power system. Finalized simulation resulting in optimal placement and sizing of DG with better voltage stability value was recorded and compared which fulfill the objective of the project analysis.

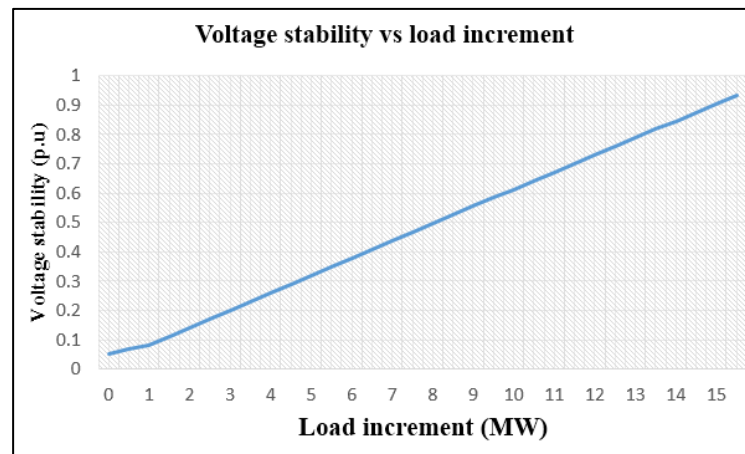


Figure 4: voltage stability vs load increament

Figure 4 presents the increament of FVSI value as the load was increased at bus 10. Voltage collapse could occur when the FVSI value had reach peak value of voltage collapse point at 1.. The maximum value of load increament before the voltage collapse in the system takes place was recorded at 15.5 p.u. Maximum voltage stability point value was recorded at 0.9161 p.u. before voltage collapse. In order to find the best optimized voltage stability, reduction of initial voltage stability value towards

0 must be done. Maximum loading condition was used throughout the analysis prior to monitoring the difference in voltage stability value before and after distributed generation was installed.

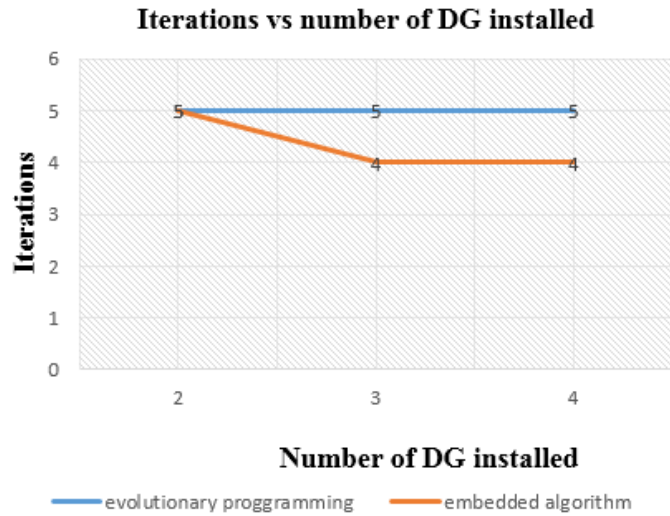


Figure 5: Comparison graph on the number of iteration with different computational method used.

Embedded evolutionary flower pollination algorithm method was better in term of number of iteration compare to evolutionary programming as the search as in the embedded method, the the parent were mutated and pollinated before the three set of data were combined to get a better convergence rate. For the embedded evolutionary pollination algorithm, the iteration rate eventually become smaller with higher number of DG installed as the search area was bigger so smallest maximum FVSI value could be calculated was easier.

Table 1: Comparison number of DG installed with the value of maximum FVSI calculated using evolutionary programming method.

Number of DG installed	DG allocation (bus number)	DG sizing (MW)	Max FVSI (p.u)	Elapsed time (s)
2	20	24.4247	0.8857	12.906167
	10	23.2005		
3	26	0.7934	0.8779	13.343797
	28	34.4228		
	6	43.4142		
4	26	34.4228	0.8722	16.5077551
	28	43.4142		
	6	31.4772		
	2	36.8112		

Tabulated data above was collected using evolutionary programming method with installed distributed generation power value ranging from 0MW until 50MW. Increasing number of DG installed did show a decreasing value of maximum FVSI which eventually improve the voltage stability of power system however the computational time for bigger number of DG installed take much longer than smaller number. However more number on DG installation might affect the overall system performance so limitation on DG added was up to 4 DG only for this analysis. With initial FVSI of 0.9161 it gradually lowered with the installation of DG units which varied from 0.8857,

0.8779 and 0.8722 p.u showing that the distributed system become more stable with more DG unit installation.

Table 2: Comparison of number of DG installed using embedded evolutionary programming method.

Number of DG installed	DG allocation (bus number)	DG sizing (MW)	Max FVSI (p.u)	Elapsed time (s)
2	30	40.6007	0.8849	15.858356
	28	40.2514		
3	18	25.9029	0.8707	14.633181
	12	21.5411		
	20	12.9408		
4	26	34.4228	0.8722	15.851034
	28	43.4142		
	6	31.4772		
	2	36.8112		

Table 2 are the tabulated data gathered from embedded evolutionary programming method in calculating the optimal placement and sizing of the in conjugate with the optimized voltage stability index, FVSI value. Comparing to the value gathered from table 1, the data for two DG placement and three DG placement shown a quite differ value as the embedded method was quite unstable as different set of value could be obtained in the first two computation process. Based on table 1 the DG placement were quite similar for three and four DG placement however by using this technique the different and most optimized DG placement could be found for two and three DG placement. This method however did show different value for each computation so the most frequent result were used in tabulating the finalized data. Yet this method shown almost the same value, iterations and computational time for four DG installed.

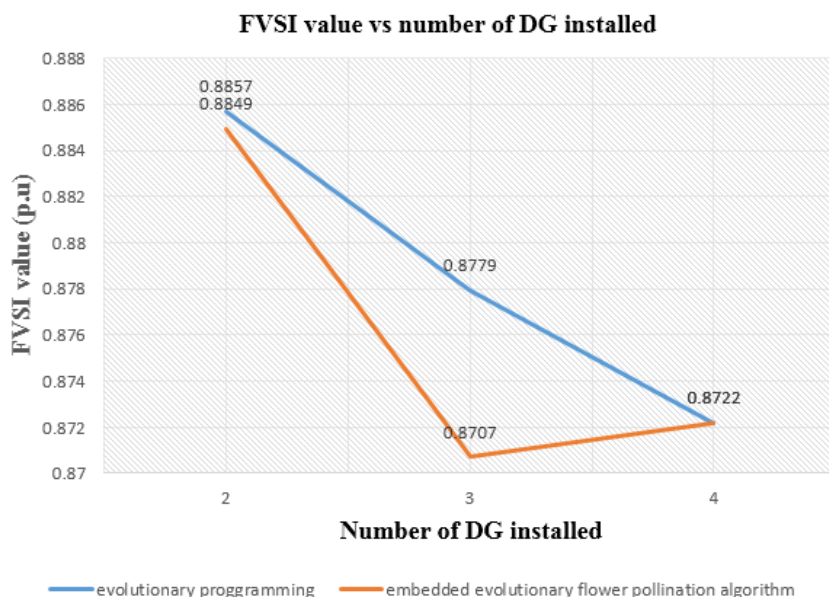


Figure 6: Comparison on the maximum FVSI value between evolutionary programming and embedded evolutionary flower pollination algorithm method.

Based on figure 6 the maximum FVSI value is better using the embedded evolutionary flower pollination algorithm as compared to the evolutionary programming itself. The maximum value was slightly lower for two DG installed however it shown quite differ during three DG installed into the power network. The embedded evolutionary flower pollination algorithm however had quite unstable result for the first time running as compared to evolutionary technique which had the same result for each computation. However with greater number of DG installed the system had better stability on the convergence rate.

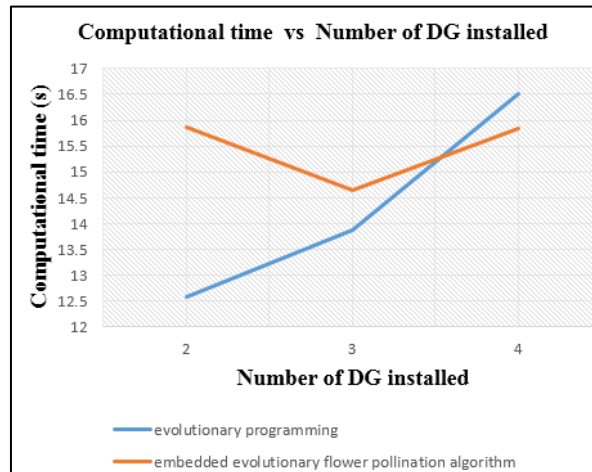


Figure 7: Comparison on the computational time taken between evolutionary programming and embedded evolutionary flower pollination algorithm method.

Comparison on the computational time taken between each artificial intelligent methods to complete each load flow calculation was also recorded as in figure 7. The time taken for Evolutionary programming had a constant increasing rate comparing to the embedded evolutionary flower pollination algorithm. The embedded method however shown quite unusual value and quite unstable for time evaluation as each time the load flow was calculated the time might differ so the most frequent and similar in time computation were recorded in the result data. The time taken for embedded evolutionary programming did show a higher value as this method had more lines to read during running the load flow compared to the evolutionary programming.

Conclusion

This paper has presented the embedded flower pollination evolutionary programming-based technique for voltage stability enhancement with distributed generation installation. Comparative studies between the technique Evolutionary Programming and Embedded Flower Pollination Evolutionary Programming were conducted. The computational between the two methods were quite different in term of evaluation and computational performance. The analyzed data show that the embedded flower pollination evolutionary algorithm had better finalized result for the voltage stability index and iteration rate for the system to converge however it is quite unstable as the final output did have slightly difference in value during the first and second time running. In the nutshell this project had shown a successful comparison result between the two-method used in optimizing the voltage stability index by installing distributed generation in the 33 distributed bus system power.

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Issues and Challenges Face By The IBS Component Manufacturer

Hazruwani A Halim^{1,a}, Amall Raihan Abdul Razak^{2,b},
Abdul Rahim Abdul Hamid^{3,c}

¹ Department of Civil Engineering, Polytechnic Sultan Salahuddin Abdul Aziz Shah, 40150, Shah Alam, Selangor, Malaysia.

² Institut Kemahiran Tinggi Belia Negara Chembong, 71300 Rembau, Negeri Sembilan, Malaysia

³ Department of Structures and Materials, Faculty of Civil Engineering, Universiti Teknologi Malaysia, 81310 Johor Bahru, Johor, Malaysia

^ayvnier07@gmail.com, ^bamallraihan@gmail.com, ^crahimfka@gmail.com

Abstract. The Malaysian construction industry plays a vital role in the country development. The IBS system is compulsory to the construction industry so that IBS manufacturer in Malaysia are able to accommodate IBS demand and supply today considering that issues, challenges and current trend. The aim of this project is to examine the supply and demand of IBS system among manufacturer in Malaysia. The objectives of this study are to identify issues, challenges, analyse trends and develop recommendations for improvement of supply and demand of the IBS components manufacturer registered with the Construction Industry Development Berhad thirty one (31) questionnaires set using five point Likert scale method has been collected among IBS components' manufacturers in Malaysia. Collected data were being analysed using frequency distribution and average index method. From the findings, the reluctance of stakeholders to convert from conventional systems is the most important issues. Meanwhile the challenges in supply and demand are insufficient financial incentives to switch IBS system in construction methods. The findings also show that supply and demand by the construction sector is the most important trends towards the production of IBS and the government must be promote innovation and creativity in IBS as recommendation for improvement of the supply and demand IBS. Also, continuous promotion and the increase of the construction project using IBS system can boost a uniform supply and demand among IBS manufacture.

Keywords: IBS, supply, demand, manufacture and construction industry

Introduction

Construction sector based on Industrialised Building System is one of the innovation in building technologies nowadays. CIDB has organized variety of programmes and promotes the application of Industrialised Building System to modernise and to improve the quality of construction in Malaysia. Therefore, the usage of Industrialised Building System component manufactured and tested in factory could attract local workers' interest in increasing the effective level of productivity, safety and high quality [14]. Construction Industry Development Board (CIDB) will put focus on increasing the application of IBS among developers and manufacturers to boost the productivity and help manufacturers to produce building design using standardised components. Government introduced Construction Industry Transformation Programme (CITP) on 2016 until 2020 to accelerate the development of industry to fill market demand, ways to transform construction sector based on knowledge, expand productivity, practising sustainable behaviour and internationalization [7]. Hence, this paper will look into the supply and demand of IBS by the CIDB registered manufacturer.

Problem Statement

The construction industry is an important branch in the economy. The use of advanced technologies such as the IBS is an effective way and the government must encourage it to be used more and more developers and contractors. IBS is one way to speed up construction. If the usage of Industrialized Building System required to developers, IBS factory in Malaysia maybe not sufficient to cover the

demand and supply at present. Otherwise, if the IBS is not used by all developers, it can lead to rising construction costs. Therefore, the issue of supply and demand in IBS will be serious [10]. With the current developments, it appears the government intends to apply the IBS in the construction industry widely across the country to be able to reduce the price of the house. However, the question of whether the significant issues of demand and supply in the IBS currently under investigation as CIDB promote the use of these components among developers and contractors aim to drive productivity in the construction sector. According to the review authors, these studies were not discussed by the researchers before. Even CIDB study related issues of supply and demand in 2008 and 2012 could not reflect the current situation. Therefore this study is necessary to answer the issues, obstacles, and ways to improve the flow of supply and demand components IBS registered under CIDB.

Aim and Objectives of Study

The aim of this study is to examine the extent of the supply and demand of the IBS component by the manufacturer registered with the CIDB. To achieve the goal of the study, the objectives of this study are:

1. To identify the issues of demand and supply of the Industrialised Building System (IBS) components.
2. To identify the barriers that exist in the supply and demand of the Industrialised Building System (IBS) components.
3. To generate the recommendations for improvement of demand and supply of the Industrialised Building System (IBS) components by the manufacturer.

Literature Review

Construction sector based on IBS is one of the innovation in building technologies nowadays where the usage of IBS component manufactured and tested in factory could attract local workers' interest in increasing the effective level of productivity of component also could ensure the safety and quality of component in controlled situation with high quality. This is due to the component will be tested before transferred to construction sites [13]. Conventional method that is applied by stakeholders requires high cost and unable to meet the demands of consumers within short period and uniform construction quality [14]. The issue of dividing one organisation during construction project is carried out. This due to high request towards construction project. Division occurs either internally or externally. This strategy came out due to less communication and feedback, low sense of identity and confrontation culture during construction process of a building. Thus, inefficiency happened during construction of the building. IBS is a high construction method.

Former studies show skills and experiences are lacking in this field compared with conventional method [11,13]. Besides, it is difficult to obtain approval of a building from local authorities due to zero uniformity in the concept of modularity, designs and installation of components [16]. Statistic shows fluctuation in market for the demand in public housing projects compared to developed countries [13]. Sustainable development is an activity that would give advantages for future generation on par with rapid development in construction products to produce innovative products [16]. Construction projects in private sector exceeding RM 50 million and government projects exceeding RM 10 million compulsory to apply IBS. Construction industry needs to encourage usage of automation and robots to reduce labours in construction. Government should also encourage the production of construction products made in "housing Modular" to increase industrial level and government should encourage creative innovation such as mould system to withstand the need of IBS [11]. In addition, ensure the usage of "Modular Coordination" in designs of IBS components and introducing Open System for construction sector in Malaysia to obtain uniformity in building components [2].

Methodology

Methodology used in this study is distribution of questionnaire survey. The questionnaires were distributed in order to meet all the four objective of the study. Thirty one sets of questionnaires were distributed. The questionnaire consists of five sections. Section 1 is the general information on the company. Section 2 is to identify issues supply and demand components IBS registered with the CIDB, section 3 is to identify challenges that exist in the supply and demand components IBS registered with the CIDB, section 4 is to analyze trends supply and demand components IBS registered with the CIDB and section 5 is to develop recommendations for improvement of supply and demand components IBS registered with the CIDB. The distribution of the questionnaire was conducted e-mail and by hand. The questions provided are based on the Likert Scale of five ordinal measures of agreement towards each statement. The data obtained from questionnaire survey were analyzed using average index.

Result and discussion

This study was conducted to examine supply and demand of IBS component by the CIDB registered manufacturer. Questionnaires sets were distributed to 31 respondents. The results from the questionnaire obtained are discussed below based on the objectives of the study. The result is divided into five parts. Figure 1 shows respondent's percentage distribution under type of organization. Analysis results indicated as 29 people (94 percentage) respondent's position as manufacturer, 1 respondent (3%) are from contractor and 1 respondent (3%) are from project manager.

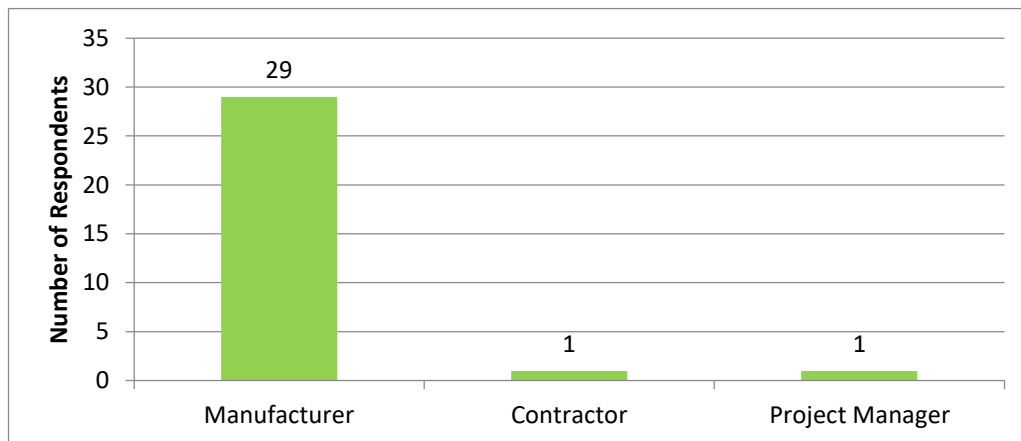


Figure 1: Respondents by type of organization

Figure 2 shows respondents under working position are manufacturer, sales manager, owner company and project manager. 6 respondents (19%) from manufacturer, 9 respondents (29%) from working sales managers and 9 respondents also from owner company and lastly 7 respondents (23%) working as project manager.

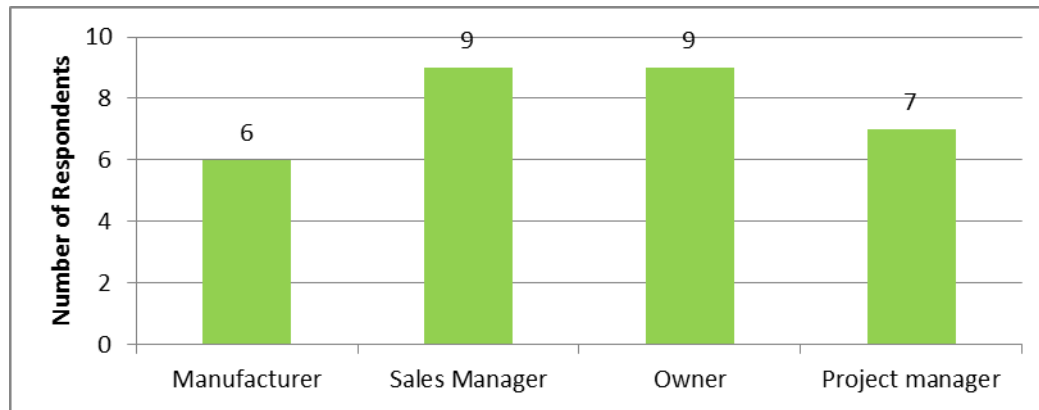


Figure 3: Respondent's distribution according position in company

The respondents under working experience needs to choose three (3) ranges of working experiences. Respondents working experience is widely affect the outcome of analysis. Respondents with high working experience might have high expertise regarding the IBS implementation compare with respondents with less working experience. Out of 31 respondents, 2 respondents (6%) are having less than 2 years, 5 respondents (16%) 2 to 5 years, 6 respondents (20%) are having 5 to 10 years and 18 respondents (58%) are having more than 10 years of working experience.

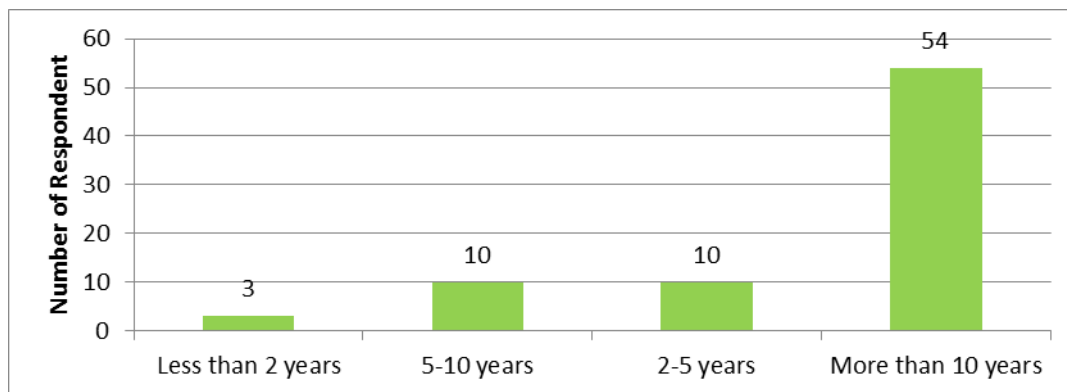


Figure 4: Respondents Percentage Accordingly Work Experience

Figure 5 shows IBS product type which manufactured by company. Analysis result shows 8 companies manufactures pre-cast concrete system, 3 company manufactures block system, 1 company manufactures wooden frame system. Furthermore, 4 company manufactures steel frame system, 3 company manufactures formwork system and 12 company manufactures innovative system. This shows company which manufactures innovative system gives highest respondents.

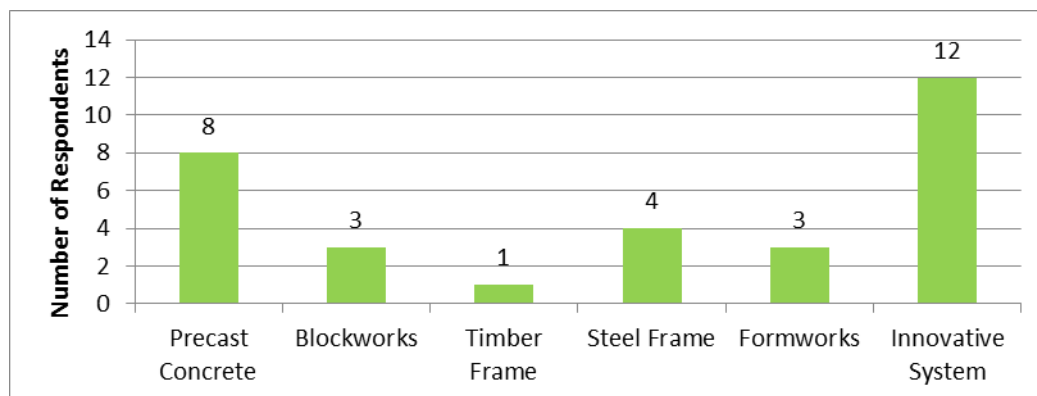


Figure 5: Respondent Distribution According IBS Product Type

Objective one was conducted to identify issues supply and demand components IBS registered with the CIDB. In literature review, issues conventional method that is applied by stakeholders requires high cost and unable to meet the demands of consumers within short period and uniform construction quality [14]. Based on 31 sets of data collected from the surveys, below are the results about the position issues supply and demand components IBS registered with the CIDB. The result is shown in table 3 issues of demand and supply of the IBS which obtained from respondent which the reluctance of stakeholders to convert from conventional systems which average value about 4.10, an alternative approach is to use an IBS project for affordable housing about 3.81 and 3.71 is a involvement of IBS producers in the early phase of development of construction project is limited. Furthermore, agreed issue from respondent is consumers are feeling unsure and unsafe with housing based on IBS because users lack information about the benefits of using IBS systems as opposed to conventional with average rate of 3.61. Objective two was to identify challenges that exist in the supply and demand components IBS registered with the CIDB. In literature review, lack of cooperation between each other and effects the quality and communication in implementing IBS projects [2]. The result is shown in table 3 challenges for agreed category which obtained from respondent which financial incentives which not enough for switch to IBS construction method which average value about 4.0. While, lack of knowledge in building designing IBS in designer circle about 3.97 and 3.81 is a challenge for lack of supply skilled worker in IBS. Furthermore, agreed challenge from respondent is lack of enforcement by authorities which related with average rate of 3.68. Objective three is to generate the recommendations for improvement of demand and supply of the IBS components manufacturer. In literature review, Government should also encourage manufacturers to much better innovation system to provide housing modularly [5]. Based on the result, there are three suggestions for improvements in the highly agreed category obtained from the respondents, the government should encourage innovation and creativity in the IBS which is an average of 4.58. While the average rate of 4.52 is to provide exposure to local workers in the IBS and to impose conditions on using the IBS in government projects.

Conclusion

The issues important in the supply and demand likes reluctance of stakeholders to change the conventional system to IBS, IBS project for affordable housing as an alternative approach, the involvement of IBS producers at early phase of development of construction projects is quite limited, consumers are unsure and unsafe with the housing concept of the IBS as users are less informed about the benefits of using the IBS than conventional and the number of contractors specifically for the IBS is limited. The challenges of supply and demand IBS as insufficient financial to change the IBS construction method, lack of knowledge on design of IBS among designer, lack of supplier of IBS and lack of enforcement by relevant authorities. The recommendations for improvement as the government should promote innovation and creativity in the IBS, implement the requirement of IBS usage in government projects, provide exposure to local workers about IBS, the implementation of the IBS act as a benchmark to produce developed countries, keep and used uniform design and complete the project according to completion period, produce quality and environmentally friendly products, create quality value and aesthetic value to customers, encourage manufacturers of IBS towards innovative systems, the government needs to launch forums, latest techniques and online portals to spread international product trends in the implementation of the IBS, sustainable construction emphasis, increase the manufacturing branch of the IBS in the rural areas, encourage automation and robotic to reduce modular construction labour and producing components using recyclable materials.

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Development of Pro Pets Feeder(PPF) using Microcontroller

Nazira Yunus^{1, a} Wan Azlinie Wan Ahmad^{1, b}

¹ Politeknik Sultan Mizan Zainal Abidin, Dungun, Terengganu, Malaysia

^anazira@psmza.edu.my , ^bwan.azilinie@psmza.edu.my

Abstract. This paper presents a project for fed pets automatically without human observations. Pro Pets Feeder (PPF) is an automated food and beverage service for pets and farm animals. PPF is designed to provide a small amount of food to keep pets from experiencing obesity problems and therefore pet health can be well-maintained. The PPF aims to help the preservation of food and drink to the animals periodically so that the supply of food and beverages is not interrupted if the animal keepers are not at home. Users will set their own meals for their pets. PPF uses '*arduino uno*' as a processor and it comes with several switches and synchronized motors. Arduino is programmed to move the motor to remove dry food when it is set. Drinks are prepared using a jar containing water where solenoid is used to pump water out and water will always flow into a catch container. Therefore, water supply will not decrease and always optimally. Animal detectors are also available to detect the presence of animals, led lamps will be lit to attract the animals to eat the food provided. The designed PPF works well and benefits many pets and farm animals.

Keywords: Pets Feeder, Arduino Uno, solenoid.

Introduction

Automatic pet feeding machines are one of the new technologies for pets. It will help to care for pets when the individual is not home or for use in abandoned or farm animals. Automatic feeders are widely used in animal experiments to dispense an accurate amount of food reward for each trial [1]. Pets want to be fed regularly and on a regular basis using these advanced technologies. Their feeding on time is an important task as they become part of our family [2]. Implementing smart pet houses will assure pets owners an increased comfort and peace of mind especially when pets are unattended [3]. Pro Pets Feeder (PPF) is manufactured using a 240V AC motor and auger screw type (auger) with the latest technology as a main component. An auger screw (auger) is a type of non-corrosive material which, when moved by a ac motor, it will fall down the animal food slowly from the food container to the container where the animal eats.

The other components are Arduino Uno, digital seven days timer, Infra-Red (IR) sensor, buzzer, solenoid and LCD display that will complement the schematic circuit of this machine. It is possible to save time and cost of individual management with the creation and innovation of this automatic machine without worrying about the nutrition schedule of the animal.

Methodology

Basically, Pro Pets Feeder consist of two parts. One part has food container for food feeding and another part is water container for water drinking. Digital seven day timer is used to setting times to fall down the food for food feeding part and ir sensor is used to flow down the water for water drinking part.

From Figure 1, we can see the operation of Pro Pets Feeder. Food is fall down depends on digital seven day timer setting. The digital seven day timer will setting until 36 times per day. So, its depends on user to setting how many food will fall down per day.

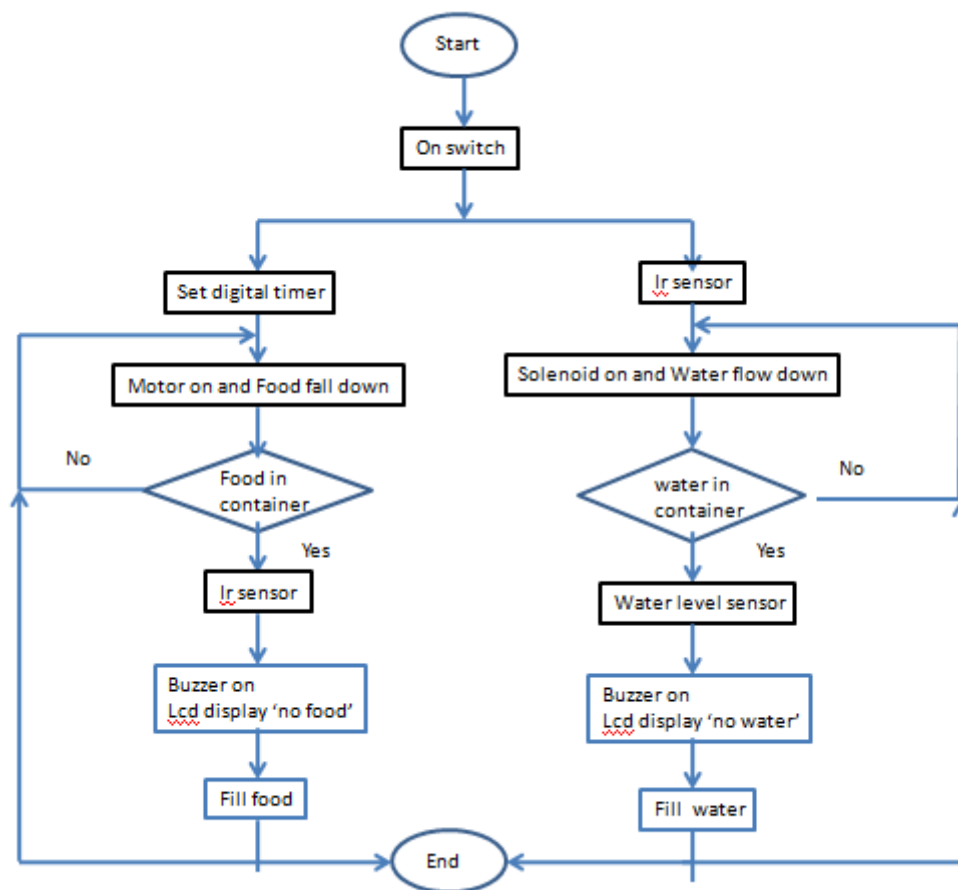


Figure 1: The operation of Pro Pets Feeder (PPF)

Component input is IR sensor, water level sensor and digital seven day timer. Component output is motor, buzzer and lcd display.

Result and Discussion

In this product, IR sensor is use to detect when the food is empty and the buzzer is on while the lcd will display 'NO FOOD'. Water level sensor will detect when the water is at minimum level and the buzzer is on while the lcd will display 'NO WATER'. Arduino is used as processor to control the operation of product. **Table 1** below show the result.

Table 1. Operation of product

Part	Input	Output	Condition
Food container	Digital seven days is setting	Motor on	Food is fall down
	Ir sensor on	Buzzer on	Lcd display 'NO FOOD'
Water container	Ir sensor on	Solenoid on	Water is flow down
	Water level sensor on	Buzzer on	Lcd display 'NO WATER'



Figure 2: Pro Pets Feeder

Conclusions

Based on the result, the product is very important especially for pet lovers to make sure their pets will get the enough food when they not at home. This product will operate automatically without observation of human. So, it can help human to protect their pets from starved to death.

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Development of Smart Wudhu' Using Arduino

Noraizan Ibrahim^{1,a}, Fatimah Rusbiahty Ahmad^{1,b}, Mohamad Khairul Aiman Daud^{1,c}, Nik Nur Athirah Syamimi Noorlan^{1,d},
Nor Afifah Ilyana Che Wan Mazuki^{1,e}

¹Jabatan Kejuruteraan Elektrik, Politeknik Sultan Mizan Zainal Abidin,
KM08, Jalan Paka, 23000 Dungun, Terengganu

^anoraizan.ib@psmza.edu.my, ^brusbiahty@psmza.edu.my, ^ckhairul@psmza.edu.my,
^dNiknurathirah@psmza.edu.my, ^eAfifah@psmza.edu.my

Abstract. Grey water is an important thing that we need to make a wudhu' ritual. As quoted in the Hadith, Prophet Muhammad reminded Muslims to avoid wastage, even when performing the cleansing ritual or ablution prior to prayer [2]. In Malaysia especially at mosque, most ablution system consists simply of a row of water taps from a water tank. The tap is always left running, so much good water is wasted in the process. Considering the unnecessary wastage, a Smart Wudhu' Using Arduino is developed to overcome this problem. Smart Wudhu' Using Arduino is designed and will be divided into three parts which is input, controller and output. Input consists of infrared sensor and water level sensor which is infrared LED as a signal sender (transmitter) and controller unit consists of Arduino Uno, and the output consists of relay, motor and LCD. Arduino Uno receives input from sensors, and microcontroller outputs on relays and solenoid valve active. Furthermore, the output of the relay went to the actuator valve solenoid valve and water tap. This Smart Wudhu' is easy for people, especially Muslims to make ablution ritual and can save good water.

Keywords: Arduino, Wudhu'

Introduction

Water is an important during the wudhu' ritual. Wudhu' ritual usually takes up several minutes at a running water facility, allowing a considerable amount of water to go to waste when only handfuls of water are collected and used at each step of the ritual. The Smart Wudhu Using Arduino was designed to reduce a wastage of water especially at mosques when people take a wudhu' ritual. This project was designed where water tap opens and closed by itself when detecting objects on the sensor side. When a sensor detects an object, the water tap will open and a water will flow. When a sensor does not detect an object, the water tap will close and a water do not flow. In addition, this project also solves problems due to the negligence of the community that often does not close the water tap after used.

Methodology

Basically, this Smart Wudhu' Using Arduino is designed to reduce wastage of water. Infrared sensors control the flow of water that when the sensor detects the presence of an object underneath then the water in the water tap will flow by itself without having to manually open the water tap. It will also stop to flow if it doesn't detect any objects. The diagram below shows the flow chart of the project.

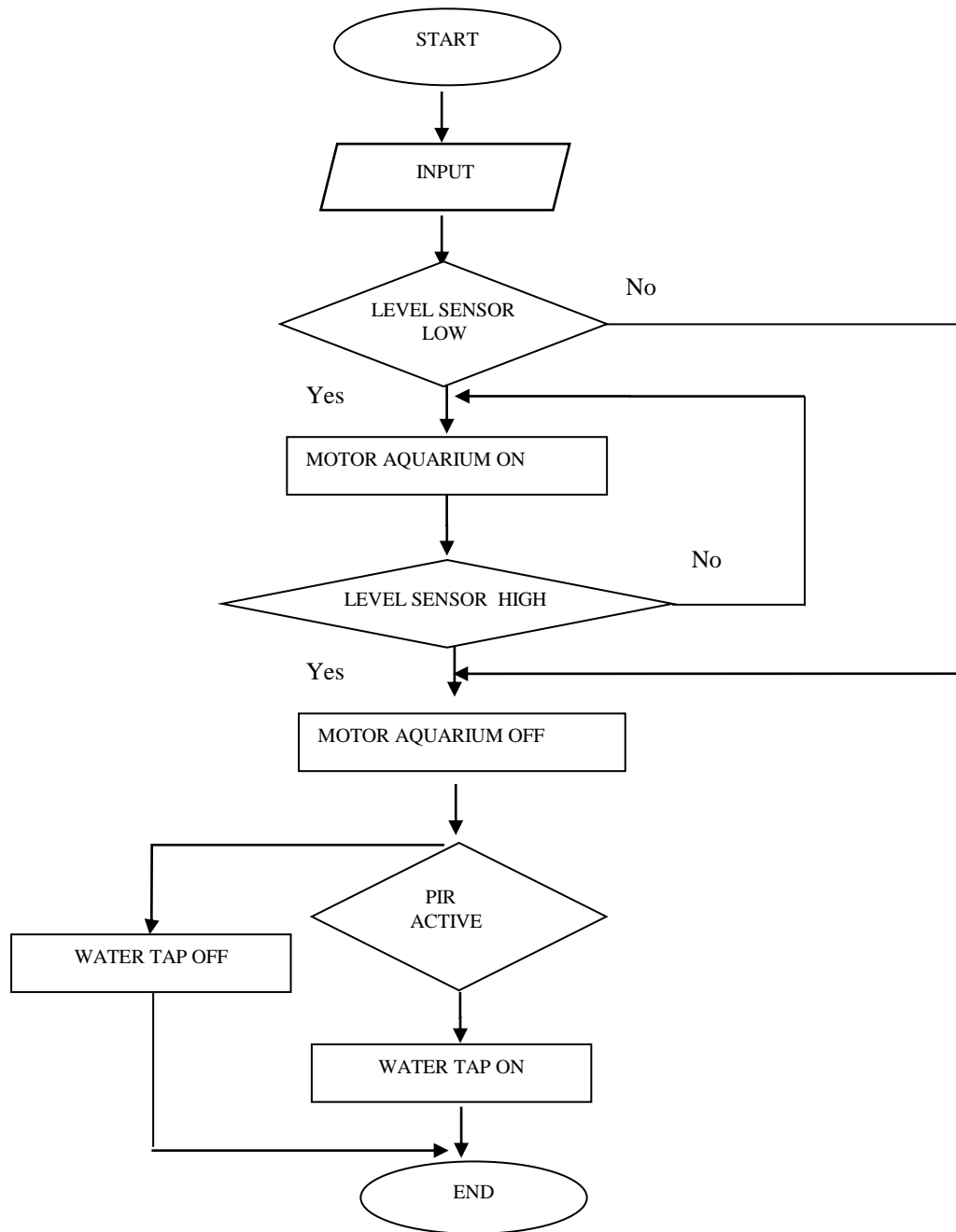


Figure 1: Flowchart

In this project, there are 3 parts which is input, controller and output. Water level sensor and infrared sensor act as an input and a controller that we use are Arduino Uno. The outputs are motor, relay and LCD.

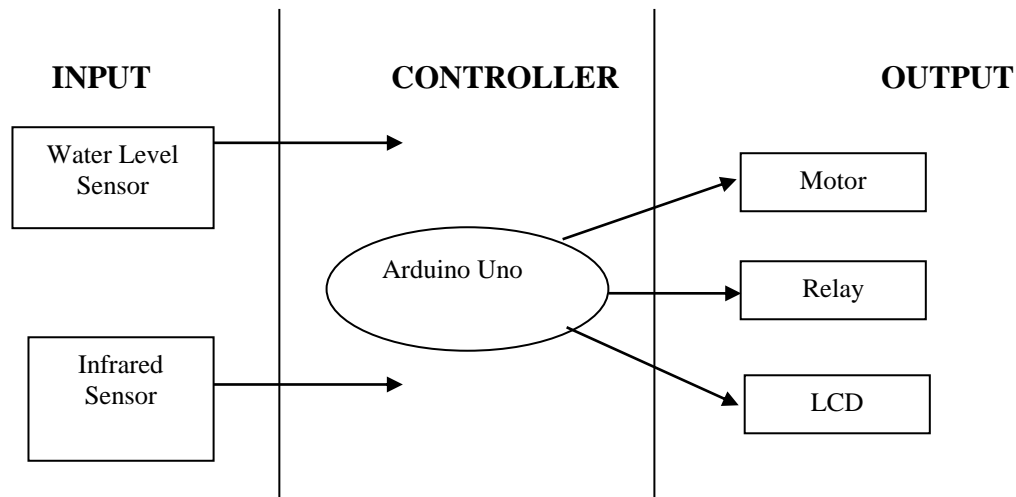


Figure 2: Block diagram of the project

Result And Discussion

In this project, the infrared sensor and water level sensor are an input. Infrared sensor will operate when it detects an object. The Arduino will process when the infrared sensor detects an object near it will activate the relay and the solenoid valve will open and water will pass through it. The LCD will display whether or not the water is flowing and the valve is active. Furthermore, when the water level detects water shortage in the storage tank it activates the second relay and the water pump operates to flow water from the storage tank to the main tank. As well as LCD displays whether motor aquarium is on or not.



Figure 3: Model of the project

Conclusions

The objective for this project is to make it easier for the user to apply the ablution, which means that the user does not have to open the water tap as it will automatically drain after detecting objects near it. Next is to easily open and close the water. This is very helpful as most users forget to close the tap after finished a wudhu' ablution. Lastly, the project is to avoid wastage of water because water will only come out when it detects objects near it and it will shut itself off.

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Engine Performance Study on Modification of Overstroke Crankshaft

Muhd Hasanul Isyraf Mat Junoh^{1, a}, Ahmad Jamsani Mahmud^{1, b} and Khairul Rijal Mustafa^{2, c}

¹Politeknik Sultan Mizan Zainal Abidin, Dungun Terengganu, Malaysia

²Politeknik Muadzam Shah, Pahang, Malaysia

^ahasanul.isyraf@psmza.edu.my, ^bjamsani@psmza.edu.my, ^ckhairul.rijal.poli@1govuc.gov.my

Abstract. In volatile global oil prices, vehicle consumers are becoming increasingly frustrated when oil prices soar as a result of lower monthly spending, especially for low-income people. This is because they have to spend more to buy motor oil and also to a lesser extent affect the prices of everyday goods on the market. A study is needed to modify the engine that will save fuel consumption and also improve the performance of the engine. In this study, four-stroke Yamaha Nouvo motorcycles engine that had undergone modification on the crankshaft (overstroke). The changes have raised this motorcycle CC from 115CC to 125CC by modification on the motorcycle stroke which originally had a stroke of 57.9 mm and was modified to 62.9 mm which was increased by 5mm. The test run of standard engine with modification engine to compare fuel consumptions and engine performance was conducted on. The result shows fuel consumptions and performance of modified engine is better than standard engine. It saves oil consumption by up to 23% and increases its speed by 20.5% and also acceleration by 42.8%.

Keywords: Crankshaft, Overstroke, Fuel Consumptions, Engine Performance

Introduction

There are a variety of products that offer protection and performance for motorcycles and small engines at present. But most have high power and will cause a lot of fuel consumption. There are plenty of marketing products that can increase the power of a motorcycle engine, but do not save fuel consumption when it reaches high speed.

A four-stroke engine is an internal combustion (IC) engine in which the piston completes four separate strokes while turning the crankshaft. A stroke refers to the full travel of the piston along the cylinder, in either direction. Over stroke means the stroke distance is longer than the bore. This vehicle will produce excess quick initial pull and hefty torque and minimized fuel usage. This research is expected to be able to optimize combustion in the combustion chamber so as to reduce fuel consumption and noise [1].

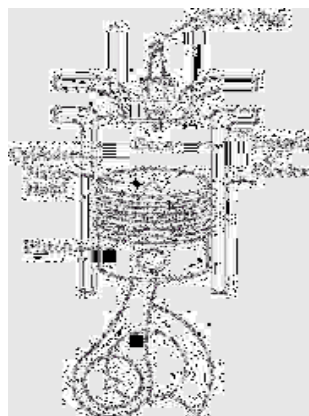


Figure 1. Four-Stroke Engine

This stroke crankshaft modification is in accordance with the needs of the vehicle. The difference in power generated due to changes in the length of steps made on the crankshaft by shifting the position of the big end connecting rod to be higher. This will make the compression ratio higher. If the compression ratio is increased, the combustion pressure will increase and a large output from the engine will be obtained. Machines with high rotation, the power produced is also large but if the rotation is too high the power produced will decrease. If at a certain rotation maximum power is produced, then it is called "maximum power". Seen significant differences ranging from lower to upper rpm [1].

Motorized vehicles are one of the tools transportation, which requires engine as first mover, both wheels and wheels four. The motor fuel is one engine used as the prime mover, which is an energy conversion machine that changes heat energy becomes mechanical energy. As is heat energy as a producer of energy then it should require fuel and combustion system that occurs as a source of heat the. In this case fuel is frequent used on motor vehicles and engines the industry is gasoline and diesel, though a lot. Therefore, necessary there is a thought in designing an engine with high efficiency [2].

One way to improve the torque is to increase engine capacity. Increasing engine capacity can be made by increase the diameter of the piston or by way of a stroke up (extend step) on the machine. Enlarge the diameter of the piston (bore up) can increase by 10% at the time maximum power [3]. The objective of this project is to increase the engine's performance and save fuel at high speed by making modifications to crankshaft. Yamaha Nouvo 115 cc four-stroke engine are used to study by make some modification at the existing crankshaft and change the position of the existing crankshaft. Table 1 shows the standard specification of Yamaha Nouvo 115 motorcycle.

Table 1 Yamaha Nouvo 115 specification

Type	Air-cooled, 4-stroke, SOHC, 2-valve
Displacement	113.7 <u>cm³</u>
Cylinder arrangement	Single cylinder
Bore x Stroke	50 mm x 57.9 mm
Carburetion	Mikuni BS25/1 type <u>carburettor</u>
Compression Ratio	8.8:1
Power	6.54kW (8.9 PS)/8,000rpm
Torque	8.63N-m (0.88kgf-m)/7,000rpm
Final Drive	<u>V-belt</u> drive
Starting system	<u>Electric</u> and <u>Kick</u> duo
Ignition	<u>DC-CDI</u>
Lubrication	<u>Wet sump</u>
Transmission	Stepless <u>CVT</u> (automatic)

Methodology

The original Yamaha Nouvo S 115c engine was dismantled and crankshaft removed. Then the original crankshaft was loosened and the new crankshaft hole was moved 5mm from the original position. Welding is used to close old holes. Crankshaft installed on new hole. Then the engine

assemble again to the motorcycle to run the 2 types of test it is fuel saving test and performance test. The process of modification are shown in Figure 2 and Figure 3

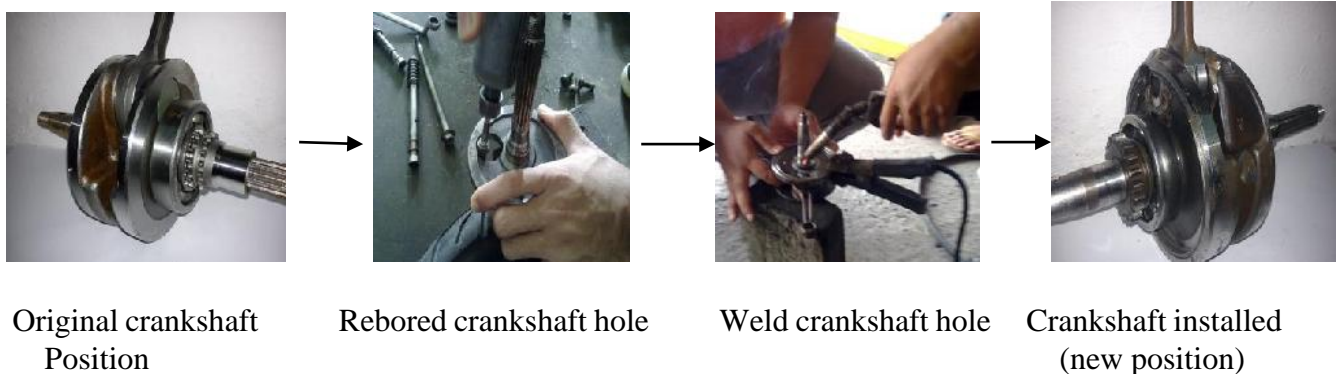


Figure 2 Modification of overstroke crankshaft

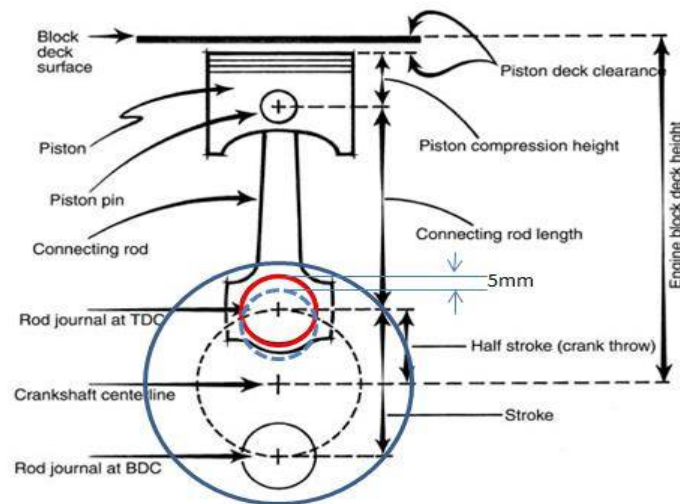


Figure 3 Overstroke crankshaft move up 5mm

Fuel saving test

This test method was performed on two of the same type of motorcycle, the 4-stroke Yamaha Nouvo. The first motorcycle was a motorcycle that used all of its original engine components and the other was modified using a crankshaft overstroke. The fuel tanks of both motors were emptied and the petrol was refilled in 100ml.

With the same road conditions and the same speed, the tests were carried out on both motorcycles by traveling within walking distance with only 100ml of petrol. The speed tested for the percentage reduction in petrol use on motorcycles varies from 50km/h, 60km/h, 70km/h, 80km/h and 90km/h.

Performance test

Performance test method was performed to obtain the percentage of increase in power between the 4-stroke Yamaha Nouvo motor which had original engine specifications with the crankshaft modified (overstroke crankshaft).

This test is done by setting a distance of 100 meters. Each motorcycle will accelerate within that distance and time will be taken once the motorcycle has passed the specified distance. In this test each motorcycle is accelerated with full throttle to know the time required to travel a distance of 100 meters. Road conditions and load on motorcycles are the same as using the same motorcycle rider to test both motors. This test method was run 3 times to obtain the average percentage increase in power.

Result

Table 2: Comparison of fuel consumption between standard and modified engine

Velocity (km/h)	Fuel Volume (ml)	Distance (m)		Fuel consumption (ml/m)		Fuel consumption reduction (ml/m)	Percentage of fuel consumption reduction (%)
		Standard	Modified	Standard	Modified		
0-50	100	1600	1900	0.063	0.053	0.010	16
0-60	100	1500	1800	0.066	0.054	0.012	18
0-70	100	1300	1600	0.077	0.063	0.014	18
0-80	100	1200	1500	0.083	0.067	0.016	19
0-90	100	1100	1450	0.090	0.069	0.021	23

According to Table 2 as a result of the analysis carried out on both motorcycles, there is a difference in distance that can be obtained using 100 ml of fuel volume. It turns out that a modified motorcycle can go a long way in comparison to the original (standard) motorcycle. On average modified motorcycle can go about 300 metres more than standard motorcycle. It also can save about 23% of fuel consumption. Figure 4 shows fuel consumption of overstroke engine is lower than a standard engine.

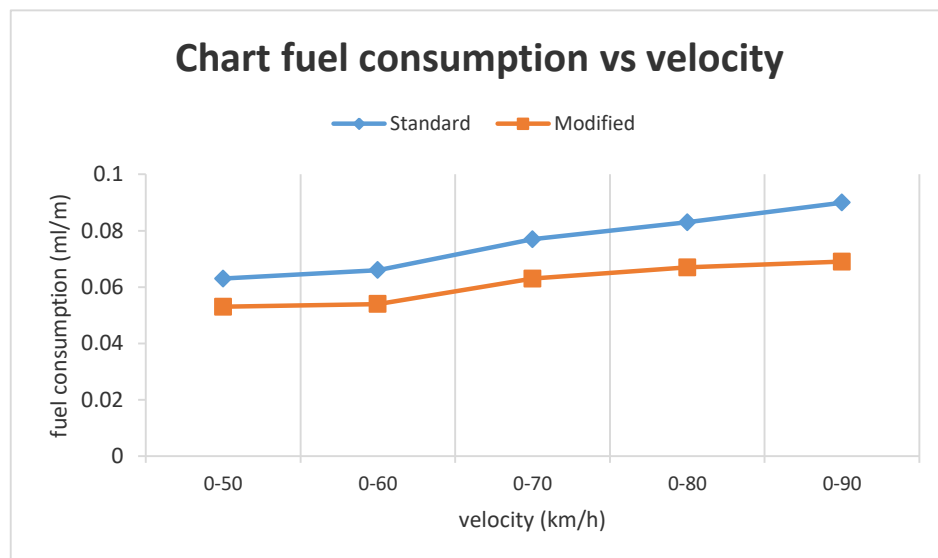


Figure 4 Fuel consumptions graph

Table 3 shows a times taken in full throttle test for standard engine compared modified engine for 100m of distance. The results obtained show that the time taken by the modified engine is lower than the standard engine as shown in Figure 5. It shows that there is an increase in velocity when overstroke modification is performed on the engine.

Table 3: Comparison of engine performance between original and modified Nouvo S engine

Engine	Distance (m)	Time (s)			
		First trial	Second trial	Third trial	Average
Standard	100	12.0	12.1	11.9	12.0
Modified	100	9.9	10.0	10.1	10.0

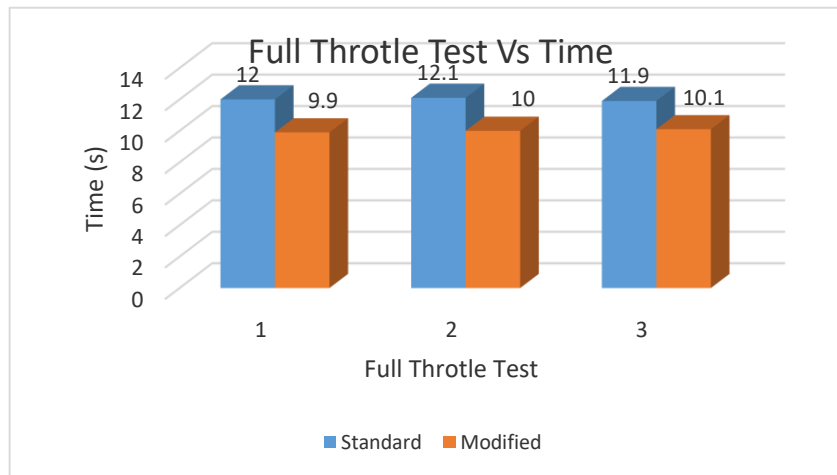


Figure 5: Engine performance graph

Table 4 shows comparison of velocity and speed which analyzes from the data of the test runs. The result shows the velocity of the overstroke engine motorcycle increase about 20.5% and also increase the acceleration around 42.8%.

Table 4: Comparison of velocity and speed

Engine	Velocity (m/s)	% Velocity increasing	Acceleration (m/s ²)	% Acceleration increasing
Standard	8.3	20.5%	0.7	42.8%
Modified	10.0		1.0	

Formula to calculate engine cubic centimetre (CC)

Engine CC = 0.785 x bore diameter(cm) x bore diameter (cm) x stroke length x no. of cylinder

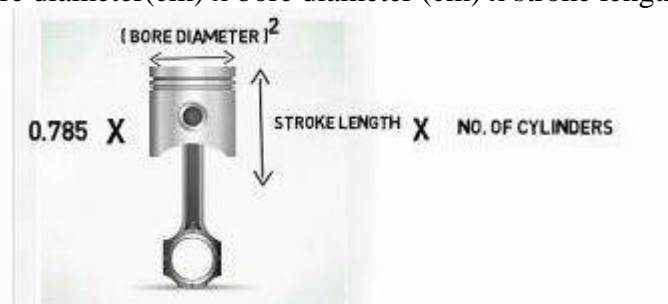


Figure 6 Engine cubic centimetre (CC) calculation

Based on the value of bore and stroke engine, the calculation of engine cubic centimeter (CC) are shown below.

$$\text{Standard engine's CC} = 0.785 \times (5\text{cm})^2(5.79\text{cm})(1) = 113.629 \approx 115\text{cc}$$

$$\text{Modified engine's CC} = 0.785 \times (5\text{cm})^2(6.29\text{cm})(1) = 123.441 \approx 125\text{cc}$$

From the calculation found that the new CC of modified engine is 123.441 or become to 125 CC increase about 10 CC from standard engine 115CC.

Conclusion

The main objectives of this overstroke crankshaft modification are successfully achieved where the modified motorcycle can reduce fuel consumption about 23% , improved performance of motorcycle engine in terms of speed about 20.5% and acceleration 42.8% while increasing the engine's CC to 125 CC .

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Milimeter Wave Patch Antenna Using Thick Su8 Photoresist Technique

Basliza Mohamad Noor^{1,a} and Dr Noor Asniza Murad^{2,b}

¹Kolej Komuniti Paya Besar, Jalan Gambang, Gambang, Pahang, Malaysia

²Universiti Teknolgi Malaysia, Johor Bharu, Johor, Malaysia

^abasliza.kk@1govuc.gov.my, ^basniza@fke.utm.my

Abstract. Millimeter wave is defined as waves with a wavelength of less than 10 mm, which cover a signal with a frequency range from 30 GHz to 300 GHz. At these high frequencies, losses are considered high compared to the radio frequency microwave band. As a result, common patch antenna widely used in microwave bands may have different profiles and complications in realisation. This work is designed and manufactured with a rectangular patch antenna at 30 GHz frequency using layers of thick SU-8 photoresist technique. In this work, the antenna is designed on the air substrate to reduce losses due to the loss of the substrate. However, the design must consider the limitations and how to maintain the position of the suspended structure. In the S parameters and the radiation pattern the output of the antenna is simulated using CST Software. The designs were found to match good impedance. The result shows that the antenna has a better result in terms of return loss and bandwidth, which is found to be -17.46 dB and > 2% at frequency 30 GHz. The optimised antenna is manufactured using a thick SU-8 photoresist technique without a clean room.

Keywords: Millimeter wave, antenna and Su8 Photoresist Technique.

Introduction

The main curiosity of the antennas has emerged from microwave frequencies into millimeter waves. Millimeter wave is defined as wave travelling at less than 10 mm wavelength, a signal with a frequency range from 30 GHz to 300 GHz. Recently, antenna designs have shifted from conventional discrete designs to Antenna-in-Package (AiP) and antenna-on-chip (AoC) solutions for higher integrated radios operating at mm-wave frequencies [1]. It will reduce the size of the antenna resulting in a reduction in costs and energy savings. Antennas are the main components of a wireless system. The purpose of the antenna as a device for transmitting and/or receiving electromagnetic waves. Usually antennas are resonant devices that operate efficiently over a relatively narrow band frequency. The Maxwell's equations present the properties of the transmitting and receiving antennas [1].

Many studies have been conducted in patch antenna compared to other antenna field since it was first proposed in the early 1970s. The antenna can be mounted in its simplest form by etching a rectangular metal pattern on a substrate. Patch antenna has a lot of functions and many applications have used its functions, ranging from simple telemetry to sophisticated radar systems. The experiment shows that the low frequency of the patch antenna would result in poor performance. This is due to higher losses of the substrate which have had a lower radiation efficiency effect on the mm-wave scale. As a result, many studies have tried to remove partial substrate in order to reduce losses.

SU-8 is one of the technologies developed for the manufacture of microstructures. It was designed specifically for the manufacture of high-aspect ratios microstructures produced by IBM in Yorktown in the late 1980s. It has recently been commercially available from Microchem Corporation (Westborough, MA, USA) and Gersteltec Sàrl (Pully, Switzerland) in various formulations with thicknesses ranging from 1 to 600 μm [2]. In practice, according to the supplier, the SU-8 is very sensitive to processing parameters. It required the specified protocol to be implemented during the fabrication of microstructures [2],[9].

The method of etching the substrate under the radiating patch was used in [3] micromachining technology. In addition, a post-supported patch antenna is provided in [4]. This method leaves nothing under the radiating patch except the air. A post-supported patch antenna fabricating method

free of dielectric substrates is used in this article. It is based on the process of micromachining and flip-chipping. A 30 GHz patch antenna has been designed as an experiment.

Usually, the use of a low-frequency patch antenna is preferred in microwave technology. However, there is a lack of performance due to high substrate losses and low radiation efficiency at the millimeter wave frequency. Micromachine technology is familiar with the etching of these substrates. There is nothing but air, under the radiating patch. Thus, the need for a substrate is removed. Yet the micromachining process is multifaceted and the structure of the radiating metal patch can be easily broken.

By having an antenna at higher frequency, the problem of higher losses due to the elimination of dielectric is a very difficult one. The design of an antenna using a SU8 photoresist technique that requires a high-performance, high-precision and high-efficiency antenna is also challenging.

Design Consideration

A description of the different parameters is required to define the antenna capability. There are several parameters that are interrelated and do not need to be fully described on the performance of the antenna [5]. The antenna is a device which transmits and/or receives electromagnetic waves. The method of transmission is by emitting electromagnetic energy into space and by being able to collect electromagnetic energy from space during reception. The same antenna can be used for transmission and reception during two-way communication. Generally, almost all antennas are resonant devices that function competently in a tapered band frequency. The antenna must be changed to a similar frequency band in which the radio system is to be operated. Otherwise, the receiver and/or transmitter will be affected. The physical size of the radiant element is proportional to the wavelength. The higher the frequency, the smaller the antenna size.

In a practical system, the maximum power loss during the transfer of such a conduction is the dielectric loss caused by the loss of the transmission line and antenna. The losses caused by the reflection of the power (mismatch) are also transmitted to the antenna under conjugate matching. Standing wave caused by interference between the forward waves and the reflected wave. As a result, the standing wave is produced and energy is the pocket.

If the maximum intensity of the standing wave field is large enough, the transmission lines may be curved. Line losses, antennas and unwanted standing waves. It is therefore important to choose low line losses, lower resistance loss antenna, RL and impedance to match the antenna (load) to the characteristic impedance of the line.

A few of the previous works on the micromachine antenna, based on a few publications, have been introduced. Liu, Wendong, et al, Micromachine 40 GHz Post-Supported Patch Using Thick SU8 Photoresist [6], [10]. It has an impedance bandwidth ($|S_{11}| < -10$ dB) of 3.5 GHz from 38 to 41.5 GHz. Problem in terms of mechanism rotation, the radiation shape can not be measured at a lower elevation angle, production in cleanroom facilities, free dielectric (line suspension). Simulated results at a frequency of 40 GHz, showed a RL value of -28 dB and operated at a wider BW, 8.75%. The result is shown in Figure 1 below.

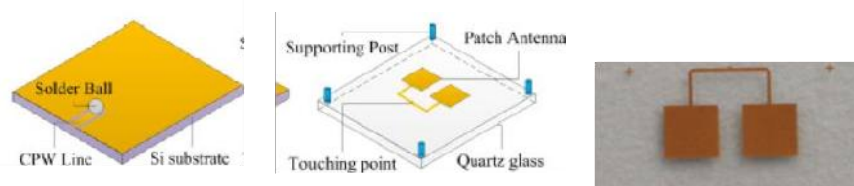


Figure 1: Micromachined 40 GHz Post-Supported Patch Using Thick SU8 Photoresist

N. Murad, M. Lancaster, Y. Wang, and M. Ke, Micromachined Millimeter-wave Butler Matrix with a Patch Antenna [7]. Frequency operated at 63 GHz, 5 layers thick SU8, fabricating with cleanroom facilities, unlicensed frequency, free dielectric (line suspended). When displaying a 63 GHz frequency, the RL is equal to -12 dB operated within BW 3-4% from Figure 2.

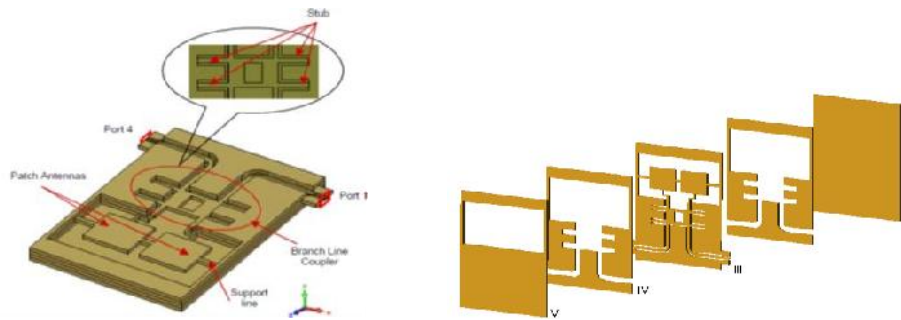


Figure 2: , Micromachined Millimeter-wave Butler Matrix with a Patch Antenna

Preeti Sharma & Shibani K Koul , Design and Development of Millimetre-Wave Micromachined Patch Antennas [8]. Ka-band micromachine patch antennas using Monolithic Microwave Integrated Circuit (MMIC)-compatible process technology. The 10-dB impedance bandwidth achieved is typically 3.4% - 4.4% in the Ka-band (~35 GHz) and the gain is 9-10 dB, fabricated on bulk high-index substrates with cleanroom facilities, with a thin dielectric membrane. The simulated results are shown in Figure 3.

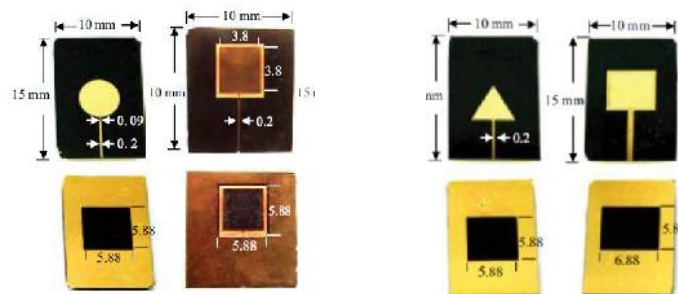


Figure 3: Ka-band micromachined patch antennas using monolithic microwave integrated circuit (MMIC)

MathCAD version Professional and Computer Simulation Technology (CST) is the software used to conclude this project. These papers contribute information to the definition of the parameter, the material used and the category SU-8 used in photoresist techniques to improve knowledge. The literature reviews, explaining the relationship with this proposed study and research, were prepared in advance, were a catalyst for antenna design in line with current research. Initially, the single element antenna patches were designed at a frequency of 30 GHz by CST Microwave Studio.

The patches antenna is then designed for a similar frequency and simulation software. There will be 2 patch antennas designed for millimeter wave mobile communication. If the simulation result does not meet the requirement to operate at a frequency of 30 GHz, the redesign and re-simulation of the patches antenna should be performed. The design of the MPA structure will be the next stage of the process, if the outcome has satisfied the prerequisite. The output of the parameters, such as radiation pattern, S11 return loss, VWSR, bandwidth and other parameters, will be observed and analysed.

A gold material is used for the proposed antenna in this project. It has a thickness of about 0.1 mm, which is worthy of a compact size antenna. There are several specification parameters for the design of an antenna at higher frequencies, such as width, length, height and thickness, material substrate, radiation pattern and return loss. The antennas are designed using the CST Microwave Studio 2015 software and the MathCAD software has been used to calculate the parameters.

The antenna is designed at a operating frequency of 30 GHz and returns a loss of less than -15 dB. The operating frequency of 30GHz is preferred as the millimeter wave occurs only when the wave travels at a wavelength of less than 10 mm. The antenna is capable of transmitting data using a bandwidth spectrum with low power consumption and lower transmission losses. The design shall comply with the target specifications as set out in Tables 1(a) and (b).

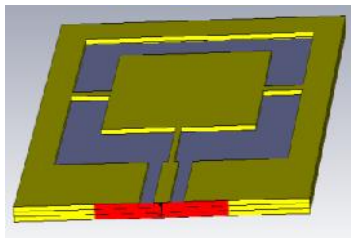
Table 1(a) : Design specification

Parameter	Value
Efficiency	$\geq 90\%$
Operating Frequency	30 GHz
Return Loss	$< -15\text{dB}$
Gain	$< 10\text{ dB}$
Bandwidth	1-2%

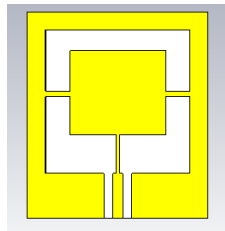
Table 1(b) : The design parameters of antenna

Parameter	Value
Width, W	5 mm
Length, L	4.3 mm
Height, h	100 μm
Impedance Transmission line, ZT	94.8 Ω
Impedance input, Zin	50 Ω
Impedance Line, ZL	180 Ω

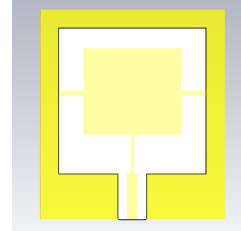
Computer Simulation Technology (CST) software provides an accurate method, effective computational solutions for analysis and electromagnetic design. It is user-friendly, which allows us to indicate the most applicable technique for the design and optimisation of devices operating in a wide frequency range. This project will be used in full-wave three-dimensional solvers and optimisation tools in CST STUDIO SUITE to design a patch antenna for millimeter wave frequency. Figure 4 below shows the antenna design.



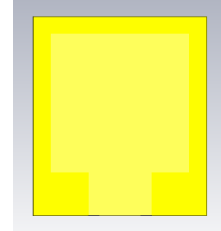
(a) The patch antenna in 3D design for single element



(b) Patch



(c) Air Substrate

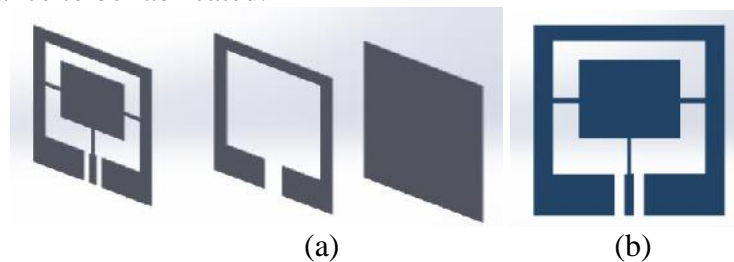


(d) Ground

Figure 4: The patch antenna in 3D design for single element

Result & Discussion

The simulation of the result was analysed in order to select the best fabrication performance antenna. The antenna is simulated and optimised to match its performance. If the condition is not met, the PA must be redesigned and re-simulated either to change the material used or to change the physical size of the PA. If the design meets the pre-requisite result, the design will be chosen as the finest type of performance to be fabricated.



(a)

(b)

Figure 5: Three layers rectangular patch antenna structure; (a) Three layers exploding view; and (b) top view showing the overall of rectangular patch antenna

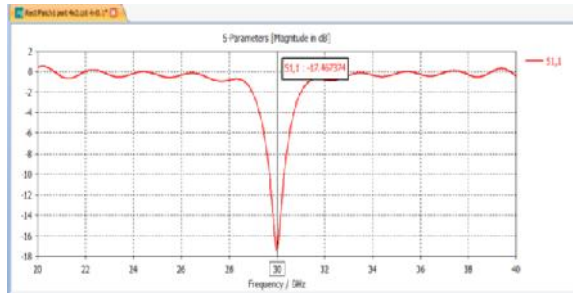


Figure 6: Return Loss for single element

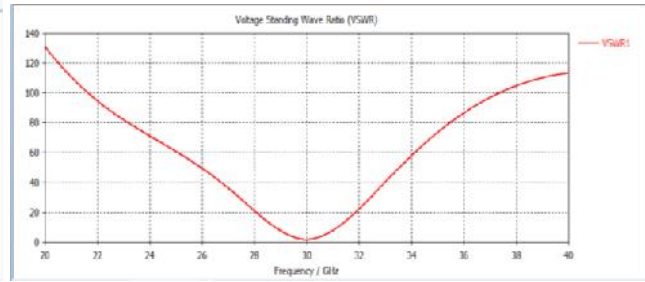


Figure 7: Voltage Standing Wave Ratio (VSWR)

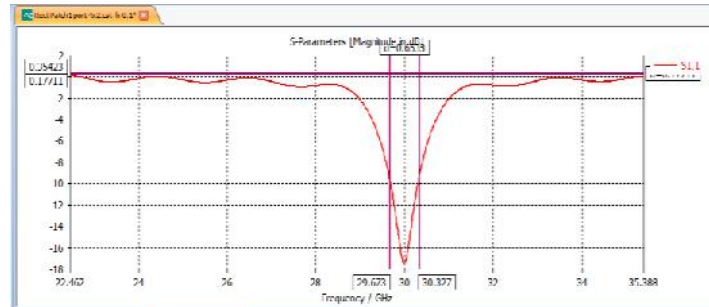
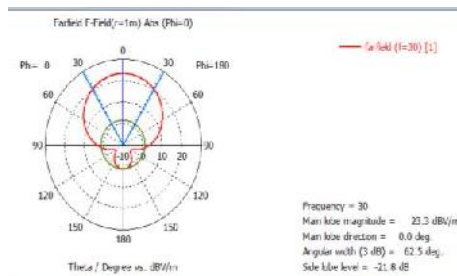
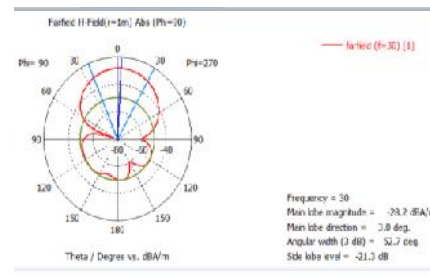


Figure 8: The bandwidth for single element



(a)



(b)

Figure 9: (a) Radiation pattern for E-field at constant $\phi=0^\circ$ and (b) Radiation pattern for H-field at constant $\phi=90^\circ$

Figure 6 shows S_{11} as the coefficient of reflection of the antennas. From the first two figures we can see the cause of the minimum return loss, the R_L value of the 17.46 dB antenna is proportional to the ratio of the reflected antenna input power. Antennas commonly radiate efficiently for a specific frequency range. At this frequency, the radiated power should be almost equal to the input power. The lower the value of R_L , the higher the value of the coefficient of reflection.

The Voltage Standing Wave Ratio (VSWR) is a sign of how well the impedance matched. Figure 7 shows that the value of $VSWR = 1.309$, is almost equal to 1 which means that it is almost perfectly matched. A higher VSWR is a clue that the signal is being reflected earlier than the antenna. VSWR and reflecting power are different means of measuring and expressing a similar entity. A VSWR with a ratio of 2:1 or less is considered to have matched good impedance. However, most commercial antennas are specified to have a ratio of 1.5:1 or less.

The comparative strength of the radiated field in any direction of the antenna must be considered as a pattern of radiation or antenna. Figure 9 (a) and (b) show that the radiation pattern simulated at E-field and H-field is -21.8 dB and -27.6 dB of the side lobe level. In terms of percentage transmitting power, for the antenna designed, the transmitting power is almost perfect, as we can see that the total percentage is 98.205%.

The design of antenna with a thick SU-8 photoresist technique at a operating frequency of 30 GHz is discussed. A patch antenna based on air substrate is designed in the previous section. The thickness

of 0.1 mm is used for each of the layers, the ground, the air and the patch itself as well as for the development of the gold material. The start of the project is the design of a single patch antenna was operating at 30GHz. Due to the unfinished fabrication process, it is not possible to measure the patch antenna. Advance research is intended to identify that unfinished fabrication and improve the result.

Conclusions

Millimeter wave is classified as wave moving at a wavelength of less than 10 mm, covering the signal from 30 GHz to 300 GHz with frequency ranges. Concentration is on the rise in new three-dimensional (3D) fabrication techniques – structures such as surface micromachining, bulk micromachining, thick SU-8 photoresist and wafer bonding. 3D structuring offers the advantage of side-stepping the effects of adjacent lines in some designs and allows to minimise losses by using air substrate, such as in the design of patch antennas. Thus, this work was done for the simulation and investigation of the air substrate patch antenna at the millimeter wave range, in particular at 30 GHz. In this work, the antenna is designed on the air substrate to reduce losses due to the loss of the substrate. However, the design has already considered limitations and how to maintain the position of the suspended structure. The antenna is designed and simulated with CST software. It has also been carried out in order to investigate the improvement in performance. The designed antenna has already been fabricated in layers using the SU-8 photoresist technique without a clean room but has not yet been finished due to insufficient material and lack of facilities to test the product. Thus, the ability of this technique to produce a structure with comparable performance is only discussed in terms of simulation. It is good that the antenna was operated at the required frequency with good matched impedance.

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Intelligent Library Lockers Using Coin Detectors

Nik Muhammad Azif Arifin^{1,a}, Muhd Hasanul Isyraf Mat Junoh^{1,b},
Akmal Abdul Rahman^{1,c}, Mohd Zahari Puteh^{1,d} and Saifuddin Abdul Rahman^{1,e}

¹ Politeknik Sultan Mizan Zainal Abidin.

KM 8, Jalan Paka, 23000 Dungun, Terengganu

^aahammar4@gmail.com, ^bhasanul.isyraf@psmza.edu.my, ^cakmal@psmza.edu.my,

^dzahari@psmza.edu.my, ^esaifuddin@psmza.edu.my

Abstract. Most libraries have lockers, which students can use to keep their bags. However, lockers that do not lock can lead to the loss of stored items, either due to negligence or theft. An intelligent library locker is an automatic system has been developed to send the value of the coins in the container and the full-coin level to the dashboard. The existing coin acceptors that are usually used with vending machines do not have any system that can notify the owner regarding the status of the coins in the container. As a solution, this project was designed to detect three types of coins, and to show the current value of the coins in the LCD display and dashboard for the owner to monitor. A level sensor was put in place to detect of capacity of the container so that the owner can be notified of the amount of money that has been collected. This system was then tested on an intelligent library locker, and it was found that the system can be run successfully in terms of controlling and monitoring the coin acceptor.

Keywords: library, lockers, coins

Introduction

The library is very useful to the community as a resource centre for building knowledge. It functions as a service centre, providing facilities to assist consumers in learning, teaching and research. The library in a polytechnic is one of the most important facilities or services for students as they have access to many reference materials that are needed for them to complete their assignments. In addition, the library not only provides book-lending services or reference materials but also other facilities such as discussion rooms, IT corners, newspapers, reading rooms, branch libraries, lockers and service delivery systems. It also makes available a wide variety of reading materials and audio-visual materials such as books, magazines, micro-materials and media to supplement efforts for more effective and efficient learning.

Library lockers are a safe place for students to keep their personal belongings or equipment temporarily whilst working in the library. The lockers are to be used by the students solely for the purpose of storing their personal belongings, including library materials which have already been issued to the users, and for no other purpose [1]. The user should not allow any other person to have access to the locker. The locker should not be used for the storage of any materials that are deemed to be inappropriate by the library. Lockers in the library usually have no doors or, if they do, the doors are not locked. However, lockers that do not lock can result in the loss of stored items, either due to negligence or theft. Therefore, it is recommended that the lockers that are placed in the library of each polytechnic should be the type that can be locked when in use and where payment is made through coin-operated vending machines. Users can use the lockers by inserting coins into the vending machines that come with coin discriminators.

Usually, the collection for use of a locked locker is based on the length of time for which the amount of coins is put into the dashboard. However, it is difficult to tell whether the dashboard is full or not, which can be a problem for the locker owner. This study was aimed at designing an innovative method for locking library lockers using the concept of collecting coins. An automatic system was developed to send the value of the coins in the container and the full-coin level to the dashboard. The existing coin acceptors that are usually used on vending machine do not have any system that can notify the owner regarding the status of the coins in the container. As a solution, this project was designed to detect three types of coins and display the current value of the coins on the LCD and dashboard to be monitored by owner.

Coin Detectors

Firstly, based on Figure 1 connects coin acceptor to power supply and use a level sensor to detect the coin. Therefore, use the Node MCU (open-source IOT platform) to control the system. Then, upload the programming to the MQTT (Message Queue Telemetry Transport) dashboard application, MQTT is a protocol for device communication that Adafruit IO supports [2]. The function of Adafruit IO is to display the data in real-time, online. It also can make the project internet connected Control motors, read sensor data, and more. Furthermore, the notification will sent to email.

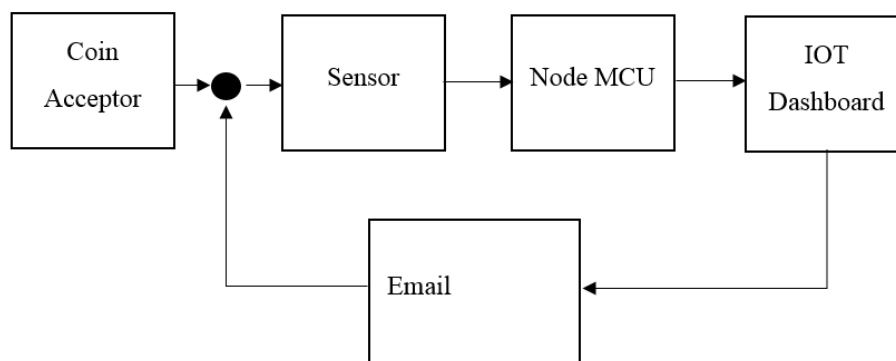


Figure 1: Block diagram of full detection

Result and discussion

Based on Figure 2 shown above is the flowchart system of the full coin detector when the coin acceptor is start to operated. When this on, the system will in standby mode. To start the operation must detect the coin. For coin detection, the coin must be insert first because when there are no coin inserted, the coin acceptor will not get any coin detection. When the coin detected, it will update at the LCD display and dashboard. This project (Figure 3) managed to detect three types of coin. The coin acceptor will read the data and know the value of coin inserted. If still not full, keep going insert the coin. The value of coin will be always update every time coin inserted and it will updated at the LCD and dashboard. For example, if the value of coin already reach RM 75.00 or above, that's mean the coin's container is already full and it will send the notification to tell the owner to collect the money immediately.

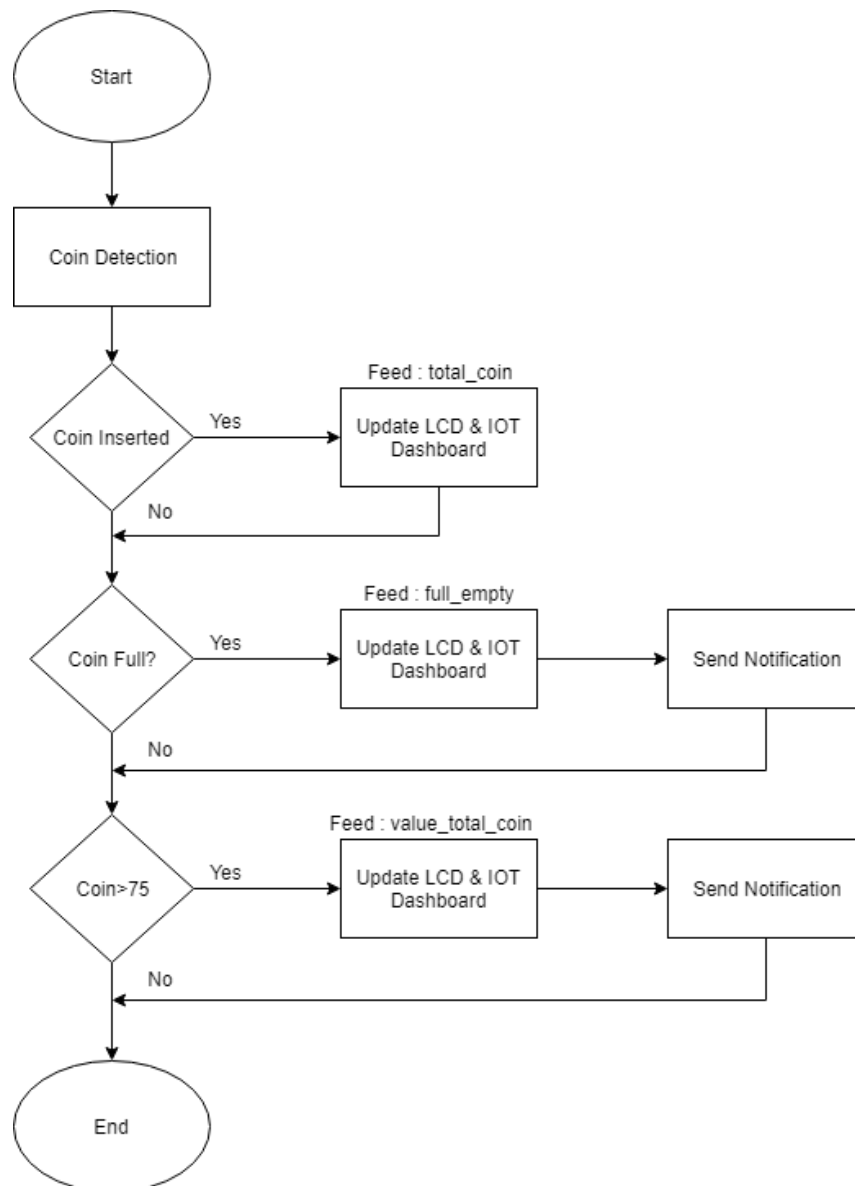


Figure 2: Flowchart system of the full coin detector



Figure 3: Project of locker using coin detectors

Based on Table 1 it is analysed that the lower limit of the coin to totally fill the container is RM46.00 and the upper limit is RM79.50 and the previous experiment will combine to get the data and will be sent to the email from Adafruit IO as the notification. So, if get any new data such as “The Coin is ALMOST Full”, “The Coin is STUCK!!” and “The Coin is ALREADY Full”, than sent to the email as is Figure 4.

Table 1: Result of lower limit and upper limit at coin’s container.

Type of Coin	Total
10	RM 79.50
20	RM 57.00
50	RM 46.00

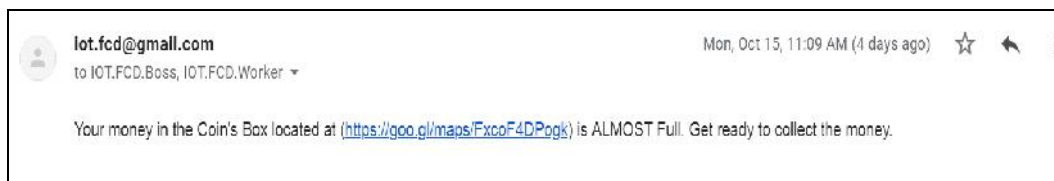


Figure Error! No text of specified style in document. : The coin is almost full displayed via email

This is a project for library locker that has successfully done assembling the programming and electronics parts. For perform the functionality of this project. Firstly, connect power supply and insert the coin in coin acceptor. Then, keep insert coin until it is full in the coin’s container or using MQTT dashboard apps in smartphone and publish full value using that apps. If the coin reach at the level sensor, so it will display at the LCD that “The Coin is ALMOST Full”. If the coin is full and get stuck at coin acceptor, it will display “The Coin is ALREADY Full. Then, if the coin acceptor get stuck while it is already not full, at the LCD will display “The Coin is STUCK!!”. By the way, all the notification that display at LCD will sent to the dashboard by Node MCU. Therefore, use the Node MCU to control the system.

Conclusion

This intelligent library locker has been developed as an automatic system to send the value of the coins in the container and the full-coin level to the dashboard. For example, it can detect three types of coins, the current value of which will be displayed on the LCD and dashboard. This project provides two ways to detect the coin capacity, namely, by using a sensor to detect the level and the total amount of coins in the container. All the notifications are sent via email. This project has been implemented using a lightweight MQTT protocol that only requires a low-speed Internet. This full coin detector was tested to run successfully in terms of controlling and monitoring the coin acceptor system.

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A Study On Anthropometry And Seating Layout Of Welding Workstation

Ahmad Rashidi bin Razali^{1,a} Mohd Fais bin Ismail^{1,b} and Mohd Zaidi bin Endut^{1,c}

¹Department of Mechanical Engineering, Politeknik Sultan Mizan Zainal Abidin, KM08
Jalan Paka, 23000 Dungun, Terengganu, Malaysia

^arashidi@psmza.edu.my, ^b fais@psmza.edu.my, ^czaidi@psmza.edu.my

Abstract. This study was conducted to determine the anthropometric database in order to evaluate and to propose a new design of ergonomic welding workstation. The study was carried out by anthropometric measurements (popliteal height, hip breadth, arm reach and elbow height) by using Anthropometric Measuring Set and weighing scale. Based on the anthropometric measurement, an anthropometric database with mean, standard deviation, 5th percentile and 95th percentile was determined. Therefore, a new ergonomic welding workstation design parameter was proposed based on the 5th percentile to 95th percentile anthropometric database. In conclusion, an ergonomic welding workstation in the higher learning institutions is considered as an important element of comfort to the teaching and learning process.

Keywords: anthropometric database, welding workstation.

Problem Statement

The welding process is required the welder to maintain their posture in certain time that could possibility faces to physical workplace risk factor or musculoskeletal disorder (MSD) disease. Anthropometry is the study of the dimensions and certain other physical characteristics of the human body such as weights (or masses), volumes, center of gravity, inertial properties of body segments and strength of various muscles groups [2]. However anthropometric data are used in ergonomics to specify the physical dimensional workplaces, equipment, furniture, as well as clothes so as to 'fit the task to a human' and also to ensure that the physical mismatches between the dimensions of neither the equipments nor the product and the corresponding dimensions are avoided. This range can be covered by applying the concept of fit [4]. In fit (in vertical, lateral and horizontal directions) is to be achieved by adjustable surfaces only, it shall be able to accommodate a minimum range from the 5th percentile female (at the lower setting) to the 95th percentile male (at the upper setting) of the intended user population. According to the [2], there are two types of dimensions that determine what the design dimension should be clearance and reach dimension. Which is the minimum space required for a human being to perform work activities in the workplace and design of furniture to accommodate a specified user population shall achieve fit for the range suitable for the intended user population.

Literature Review

Anthropometry is the one of the human sciences dealing with measurements of the size, weight and proportions of the human body to achieve comfortable condition, fit and usability. To get an ideal design process, anthropometrics is compared with relevant product and workplace measurements, for example, popliteal height with chair height.

Moreover, anthropometric data show specific characteristic depending on race, gender, age and physical measurements of the human body. Therefore, Malaysian products, their workspaces or laboratory place should be designed with proper recognition of the Malaysian body dimension. From this point of view, many Malaysian industries and researchers have faced ambiguity in applying a design guideline for Malaysian products. Figure 1 shows the illustration of the key anthropometric dimension of seated control console [5].

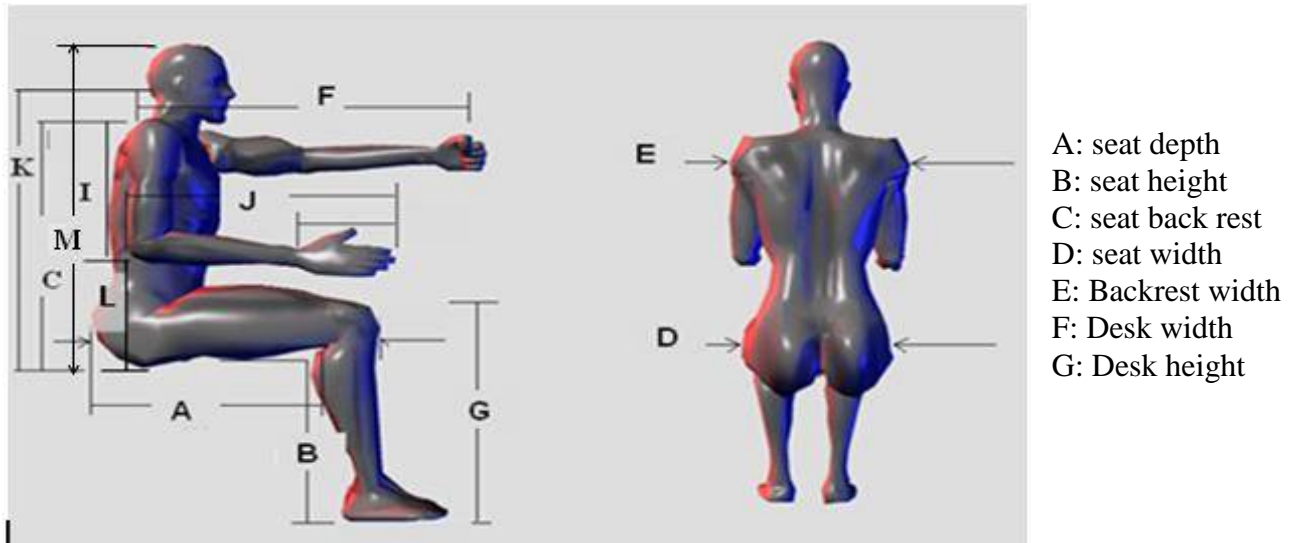


Figure 1: Anthropometric dimension of seated control console

a. Use of selected anthropometric dimensions.

The relationship between anthropometric dimensions and some specified design parameters is summarized in Figure 1. The selected anthropometric dimensions are used to design seat depth, seat height, seat width, desk width, desk height, desk length, for welding work station.

b. Anthropometric data distribution.

Sliding calipers are used to measure hand and foot. Sitting dimension measurement is measured by swivel stool which can rotate on a pivot attached to a 4 star welded steel base. To accommodate people with different sizes and shape, work chair design usually come with mechanical adjustment. But this adjustment has its own limitations. If the adjustment mechanism is too big or large, the chair should face the stability problem.

A chair that is designed to meet the necessity of the hypothetical 50th-percentile person becomes less and less accommodating as it is adjusted toward the essential of the (equally hypothetical) 5th-percentile female or 95th-percentile male. Furthermore, our own field observations show that the greater the range of adjustment provided, the greater the chance that a person will use the chair at an inappropriate setting. People are more likely to get suitable support from a chair that requires only minor adjustments to get the best fit.

c. Workstation design

There are three basic design philosophies utilized by ergonomists as they apply anthropometric data to design for their specific population. The philosophies are design for the average, design for extremes and design for range. The most common design philosophy of the agronomists is to design for a range of population. A typical range of the 5th percentiles to 95th percentiles of the population is used [2].

Methodology

There is none information about anthropometric data of students studying in this polytechnic. Therefore, an effort was done in order to collect an appropriate student's anthropometric data.

a. Sample size for anthropometric database

A sample of 500 PSMZA student was randomly drawn from variable department. No attempt was made to include the race students since Malay students represent the majority of student in this Polytechnic. Sample size of (500 student) was found to correspond with sample sizes published in Krejcie and Morgan (1970) (Appendix A).

b. Instruments for anthropometric data collection

There are a few methods could be used for anthropometry measurement. From hi tech measurements tools such as 3-D scanner until traditional tools such as metering tape and caliper. But due to the financial constraints, the traditional anthropometric tools which are simple and less expensive are used in this study. In this study, 2 set of Harpenden standard anthropometer was used to measure the body dimensions

c. Ideal welding workstation design

The welding workstation is responding to the desk and chair which is used by the student during their learning process. An idyllic chair and desk should fit the 5th percentile to 95th percentile of the students' anthropometric dimension. The design of welding workstation is based on collected anthropometric data. There are 4 section body part of anthropometric data will be used to design ideal design of welding workstation, which are popliteal height, hip breadth, arm reach and elbow height (Table 1).

Table 1: Anthropometric dimension for designing ideal welding workstation

Apparatus	Description	Suggested percentile	Student Anthropometric Dimension
Chair	Seat height	5 th to 95 th	Popliteal height
	Seat width	95 th	Hip breadth, sitting
Desk	Desk width	N/A	Refer to [1]
	desk height	95 th	Elbow height

Results and Discussions

A total of 500 students (340 males and 160 females) data has been taken in this study. 4 body parts measurement of each student has been taken to succeed this study. Table 2 and Table 3 represent the 5 percentiles, 95 percentiles, mean and standard deviation of all 4 body dimensions for both males and females.

Table 2: Male student of anthropometry data (N=340), all unit are in mm

No	Dimension	5 %tile	95%tile	Mean	SD
1	Popliteal height	392.4	433.5	411.2	12.6
2	Hip breadth	261.5	375.5	311.4	39.6
3	Arm reach	670.5	805.5	740.7	42.3
4	Knee height	451.4	540.3	494.1	26.2

Table 3: Female student of anthropometry data (N = 160), all unit in mm

No	Dimension	5 %tile	95%tile	Mean	SD
1	Popliteal height	334.0	426.5	391.5	26.1
2	Hip breadth	255.1	383.83	310.7	42.2
3	Arm reach	595.8	733.2	669.7	39.1
4	Knee height	410.7	500.3	455.8	27.5

Conceptual workstation design

The ideal welding workstation design is presented in this section. Commonly, the dimension of this ideal welding workstation design is related to the anthropometric dimension in Table 2 and Table 3. Because of the design for the table is circle, the best size of the desk refer to [1] since the size is bigger than 95% tile of male students. The overall dimensions for design workstation that best fit for the student populations are presented in Table 4

Table 4: Dimensions of welding workstation that fit the student population.

Apparatus	Description	Suggested percentile	Student Anthropometric Measurement
Chair	Seat height	5 th to 95 th	Popliteal height 334 – 433.5 mm
	Seat width	95 th	Hip breadth, sitting 375.5 mm
Desk	Desk width “refer to[1]”.		900 mm
	Desk height	95 th	500.3 – 540.3 mm

Based on the result in Table 4, a detailed dimension of a suitable welding workstation for the polytechnic students is the proposed as shown in Fig 2, 3, 4 and 5.

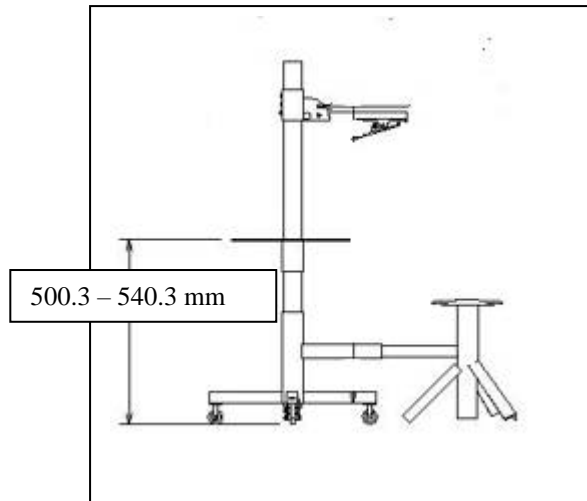


Figure 2: Side view of the design

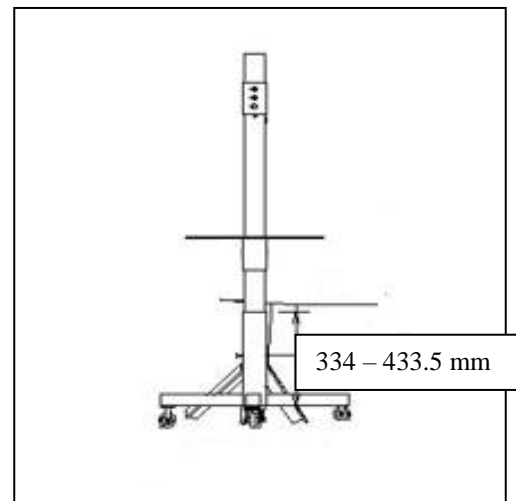


Figure 3: Front view of the design

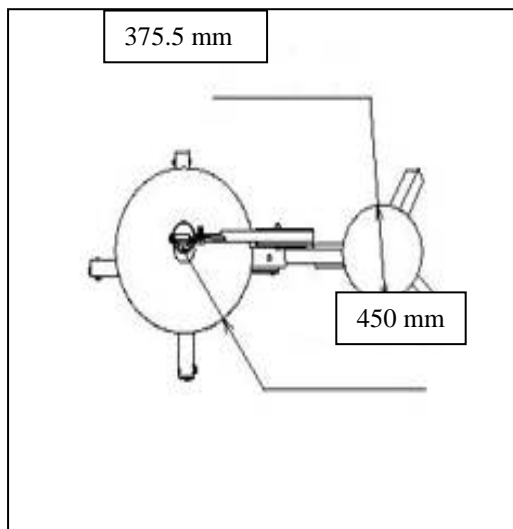


Figure 4: Plan view of the design



Figure 5: Welding workstation design

Conclusions

This study is about designing ideal welding workstation in polytechnic. By using this 500 data of anthropometric (340 male and 160 female), it should be considered acceptable to succeed this study. The best suitable dimension for suitable welding workstation is proposed based on the anthropometric collected data. This design criteria of chair and desk are considered and implemented on the proposed design by previous study. Hopefully the research finding will improve the performance and quality of teaching and learning process in polytechnic, mainly in Politeknik Sultan Mizan Zainal Abidin.

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Development of Lightweight Concrete from Kenaf Using Glue Concept

Nor Asiah Alias^{1, a}, Muhammad Asy Sibli Hassan^{1, b}

and Asma Salsabila Mohd Zawawi^{1, c}

¹Jabatan Kejuruteraan Awam Politeknik Sultan Mizan Zainal Abidin, Dungun, Terengganu, Malaysia

^anor.asiah@psmza.edu.my, ^basysyiblihassan@gmail.com, ^casmasalsabila99@gmail.com

Abstract. Particleboard from kenaf fiber is a project undertaken to solve problems in the construction industry of building structures that are using timber. The idea of making this product came about because chipboard is commonly used in the construction of flooring and counter tops. Apart from that, the construction industry can expand the use of kenaf in the national construction sector. This is because the exposure to kenaf in the construction industry has not been thoroughly studied. Next, kenaf fibers generally has some advantages such as eco-friendly, biodegradability, renewable nature and lighter than synthetic fibers. Besides, the use of kenaf fiber can replace the use of timber in the construction industry and protect the environment and prevent the destruction of human activities. In addition, the cost of timber is the higher than cost of kenaf fiber. This study was conducted through several stages beginning with the introduction, literature review, methodology, data analysis and summary. The kenaf chipboard is made by pressing layers of recycled fiber together to form a larger piece of material and mixing kenaf fiber together with a resin and forming the mixture into a sheet. In a nutshell, the use of kenaf chipboard is essential to meet market demand and commercially available.

Keywords: Chipboard, flooring, counter tops, biodegradability, synthetic.

Introduction

Kenaf 's scientific name is *Hibiscus Cannabinus* L, it is a short-term plant and is a non-woody shrub. It belongs to the Malvaceae category and belongs to the genus *Hibiscus* which has similarities to the shrub and cotton. Among the varieties of kenaf grown are V36, FH 992 and Q1. The kenaf plant is native to Africa (West Sudan). The plant is also grown on a small and commercial scale in Bangladesh, China, Indonesia, India, Myanmar and Thailand. The height of the kenaf tree is approximately 2m-5m, which is about 6 feet- 15 feet. Kenaf trees contain 30% fiber (fiber) on the Bast (outer skin) and 70% Core (pods) of the inside of the trunk. For biomass harvesting is between 75-120 days after planting. Harvesting for seed production is between 135 -150 days after kenaf tree planting.

This kenaf plant has two very useful types of fiber, the outer fibers and the inner fibers. The outer fibers or so-called skin joints comprise 40% of the weight of the dry stalk and the length of this fiber is usually 2.6 mm when processed. Meanwhile, the inner fibers, which are white core fibers contain 60% of the weight of dry stalks. When processed, they are capable of producing 6 mm fibers. Kenaf plants can thrive on most lands in the country and can produce up to 60 tonnes of wet stems (20 tonnes of dry stems) per acre. Fiber and Core kenaf can be used to produce eco-friendly products such as fiber boards, shingles, geo- textiles, textiles, automotive components and building materials components. kenaf trees can also be used as livestock feed.

There is a growing tendency towards recycling kenaf waste and using it to produce composite wood products such as particleboard. On the other hand, lack of forest resources has increased demand for this type of product. The use of renewable materials for the manufacture of particle boards can contribute to the solution of the shortage of raw materials for the particle industry. Environmentally friendly or green building materials are becoming more widely used as our community is aware of the dangers associated with the use of standard practices in industrial production. These materials are nontoxic and are made from renewable or recyclable sources. Many

manufacturing units throughout the country are involved in the production of particle boards in small sectors.

Today, there are many new applications for kenaf including paper products, building materials, absorbers and animal foods. In Malaysia, recognizing the wide range of products commercially available from kenaf, the National Kenaf Research and Development Program was established in an effort to develop kenaf as a new industrial crop for Malaysia. The Government has allocated RM12 million for further research and development of industrial kenaf under the 9th Malaysia Plan (2006-2010) in recognition of kenaf as a commercially viable crop. (Salleh et al., 2012).

Raw Material Of Kenaf

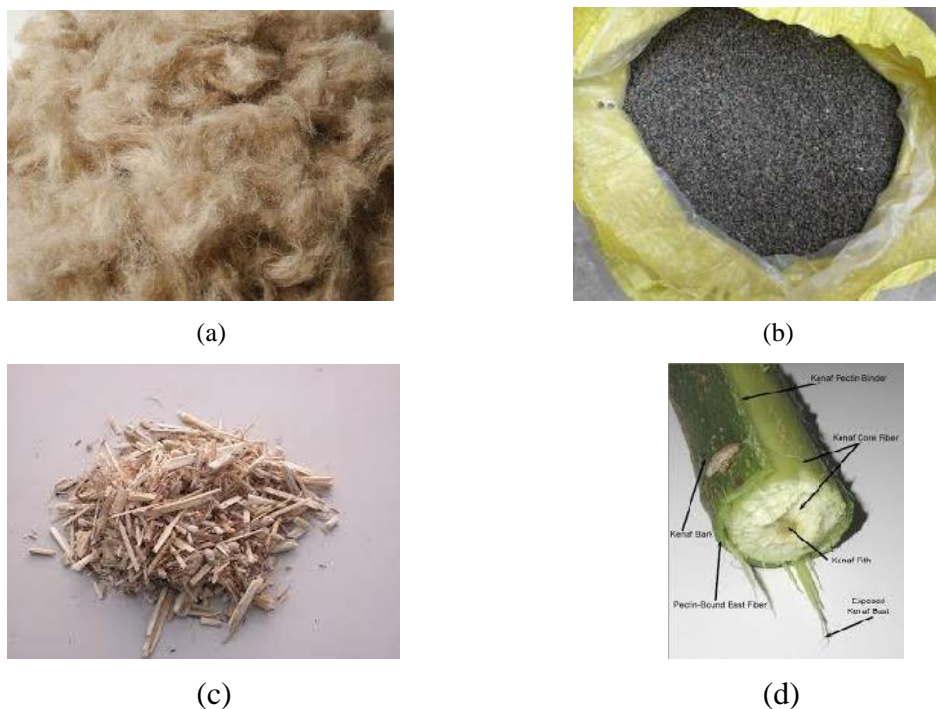


Figure 1: Type of Kenaf parts (a) Fibres, (b) Seeds, (c) Cores and (d) Green Stems

Features of Fiber Kenaf

Kenaf fiber containing 75% cellulose and 15% lignin and has the advantage of being biodegradable and environmentally safe (Kamani R., 1996). Malaysian cotton is made up of two different fibers, bast and core, making up about 35% and 65%. Each fiber has its own use; thus, the separation of fibers results in higher fines on kenaf stems. The main factors involved in the separation of kenaf into two parts are: size and amount of each part; type and number of partitioning machines; processing speed through machine partitioning; moisture content of the whole stem; air humidity (H.P.S.Abdul Khalil et al., 2010).

Advantages of Kenaf

The following advantages of kenaf include: -

- i) One of the renewable resources.
- ii) Resources are abundant and easy to obtain.
- iii) An alternative source of wood.
- iv) Low cost compared to other materials.

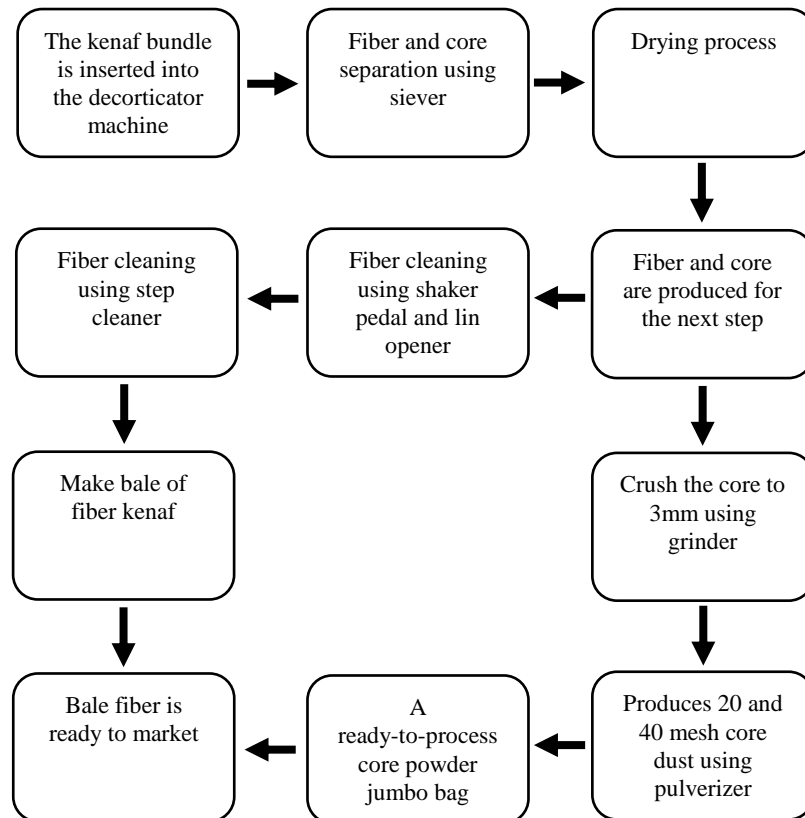


Figure 2: Fiber and Core Processing

Chemical Composition of Kenaf

Table 1: Chemical Composition of BBPPIS, Bandung (1988)







Parameter	Kenaf			
	Stem	Wood		Fiber
Ash	4.78	6.26	5.69	2.69
Silicone	0.27	0.39	0.28	-
Lignin	15.37	19.89	9.34	8.95
Holoseululosa	74.45	72.60	73.28	85.37
solubility in :				
Hot Water	10.58	9.69	12.43	2.12
Cold Water	10.12	5.39	11.85	0.76
1% NAOH	30.87	32.90	27.23	16.61



Figure 3: Source of Kenaf

Production of kenaf seeds can only be done once a year. Between important criteria to consider in the production of kenaf seeds in this country there is a real dry season at the planting site. Some areas have been identified to have these criteria in the section north of Kedah (Bukit Stairs) and Perlis (Beseri). Dry season in Kedah and Perlis usually starting in mid-December or January and ending in mid-March or early April. The region has a significant dry season up to 2-3 months a year. Therefore, seed harvesting should be carried out in the driest month of February.

Table 2: Grade of Kenaf

No	Grade of Kenaf	Kenaf Specification	
1	Fiber Temafa	1. Short fiber 2. Colour : yellow and brown 3. Humidity : <15 % 4. Cleanliness : 90 %	
2	Fiber MR	1. Size : > 3cm 2. Colour : yellow and brown 3. Humidity : <12 % 4. Cleanliness : 90 %	
3	Core (40 mesh)	1. Size : 40 mesh 2. Colour : white/cream/brown 3. Humidity : <15 %	
4	Core (20 mesh)	1. Size : 20 mesh 2. Colour : white/cream/brown 3. Humidity : <15 %	
5	Core (3-6 mm)	1. Size : <6 mm 2. Colour : white/cream/brown 3. Cleanliness: <15 %	
6	Core (chips)	1. Saiz : >6 mm 2. Warna : white/cream/brown 3. Humidity : <15 %	

Particle Board

Particleboard is made of solid waste, agro waste such as rice husk, jute wood, waste wood, cane and kitchen waste. Particle boards have been made from various types of raw materials in the form of small particles with resins or other fasteners that are coupled with heat and pressure. The main difference between particleboard and other conventional wood boards is the materials and the manufacturing process. Particle boards can be used for residential, industrial and commercial buildings as walls, window entrances, desks, keyboards and more. (L. Muruganandam, 2014).

Particle boards are one of two commonly used composite groups of particles based on the size of the wood components and the method of manufacture. Particle boards have chips, chips, or wafers as the main compiler. Another group of particle composites is fiber boards. It has the main elements of fiber and its fiber bundles (Bodig and Jayne, 1982). The strength of the product is determined by the adhesive used and not the fiber used, although its size and shape have an influence on its strength (Kent and Riegel, 2007).

Particleboard has many desirable properties such as high density, high surface hardness, abrasion resistance, high durability and more. The influence of particle density and size can have better Physical and mechanical properties. Physical and mechanical properties vary significantly depending on the type of board. Increasing the pressure time also improves the Physical and mechanical properties of the board. The relationship between board properties and manufacturing variables is complicated by different board densities and different types and combinations of wood species, raw material forms and processing methods. The uniform distribution of particles and binders in micro-composites is a key factor for composites responsible for their enhanced properties. Particleboard can be manufactured according to different sizes, shapes, thicknesses and densities. Some particleboard uses are shelves, furniture, laminating doors and closets. Particles are commonly used for cabinets, tablets, shelves, walls and floor panels, doors, furniture, and other non-structural architectural applications.

History and Development of Particle Production

Modern plywood, an alternative to natural wood, was invented in the 19th century, but by the end of the 1940s the amount of wood was insufficient as it was widely used around the world to produce secure plywood. Therefore, the particle board is intended to replace plywood and is made from plant waste.

The founder of the German particle board is Max Himmelheber. The first particle board was manufactured during World War II at a factory in Bremen, Germany. It uses waste materials like sawdust. Most particle board manufacturers use the same process, though they use a slightly different resin. It has improved design strength and resin properties can be achieved uniformly. The finer layers are then placed off the board, with the center section made up of coarser and cheaper chips. This type of board is known as particle board. Recently, grade-grade particle boards have also grown. It contains particles that gradually become smaller as they get closer to the surface (Anon., 2010).

Factors Affecting Particleboard

The major factors that influence the properties of particle board are the type of wood, particle type and amount of adhesive, moisture content, and particle size according to the density of the board and additives (Maloney, 1977). According to Kolmann et al. (1975), the physical and mechanical properties of particle boards are influenced by several factors, namely wood type, particle type and size, type and amount of adhesive, moisture content and manufacturing process. The type of wood determines the specific gravity of the particle board. Generally, low-density wood produces a board with higher strength than high-density wood (Maloney, 1977).

Haygreen and Bowyer (1996) suggest that the most important characteristic of wood that affects its suitability for particle board manufacture is specific gravity, the lower the specific gravity of wood the higher the particle board strength of any density. The shape and size of the particles will affect the strength and stability of the particle board dimensions. The most important aspects of particle geometry are particle length and thickness to length ratio (Haygreen and Bowyer, 1996).

Particle board design directly influenced by the geometry of these particles are mechanical properties (such as continuous stiffness, compressive strength parallel to the surface and so on). Characteristics of board surfaces, reactions to moisture (such as water absorption in relation to dimensional changes). Mechanical and surface characteristics and work characteristics such as saws, drilling, acidification and fineness (Maloney, 1977). In general, particles or adhesives that mix evenly

or homogeneously will produce good quality particle boards. The mixture of particles and adhesives is quite similar, so the adhesion between particles is denser, but on the contrary if the particles are mixed with the adhesive they are not evenly mixed, so the adhesive between the particles is less solid so that the particle board produced is of poor quality. Particle water content is directly related to the process of suppressing heat. Higher water content in the surface layer will result in higher compression during compression. Water content also affects the speed of heat movement from the surface of the board to the center during high pressure, as the water content controls the speed of change in temperature gradient (Haygreen and Bowyer, 1996).

Types of Particleboard

Here are the types of particle boards: -

i) **Laminated Particleboard**

Laminated particle board is created by attaching a thin layer of laminate to the surface of the particle board. The laminates enhance the beauty and enhance the durability of particle boards. Laminated particle boards are widely used for making cabinets and shelves.

ii) **Boundary Particleboard (veneered)**

Very thin pieces of wood derived from wood. This particle board is processed by attaching a coil to the surface of the blank particle board. This bordered particle board has more resistance to warping, as it is properly sealed.

iii) **Cement bonded board**

This board uses cement as a bonding agent and has high moisture, fire and decomposition. Cement-bonded particleboard is made using cement (60%), wood waste particles such as wood chips, sawdust, wood fiber (20%) and water (20%). Due to the cement content, this board is more durable, fire resistant and resistant. The bonded cement particle board has high expansion and shrinkage properties in the presence of moisture. It is commonly used in the production of fire resistant furniture, false ceilings, interior and exterior walls and permanent coverings for concrete floors and walls.

iv) **Melamine Particle Board**

A sheet of melamine decorative paper is attached to the surface of the blank particle board under heat and pressure. In addition, melamine-urea formaldehyde resin is also used in conjunction with wax emulsions to fasten particles and make them waterproof. Melamine particles are extremely durable and are resistant to scratches. It has applications in many areas such as walls, wall panels, modular kitchens, wardrobes, and office furniture.

Use of Particleboard in the Construction Industry

Some of the uses of particle boards in the construction industry: -

i) **Use of particle board in floor**

Particle boards are used as floor material in temporary structures where there is less load. It is also widely used as a cover for wood floors, as it has low resistance to scratches. A veneer of wood veneer or laminated particle board is used on the floor where aesthetical finish is desired.

ii) **Use of particle boards in floor handling**

Particle boards are widely used as flooring or as a base for parquet floors, wood floors, or rugs. For this purpose, particle board is treated with special chemicals and resins to make it waterproof.

iii) **Use of particle boards in wall separation or heating**

Particle board is used in wall partitioning, as it is a member with no load in the structure. For a cost-effective option, particle board can be used as it has thermal and sound insulation properties. Layered particle boards are widely used in wall panels.

iv) **Use of particle board on ceiling.**

Layered particle boards and cement particle boards are widely used in false ceilings. Due to their thermal insulation properties they are widely used in fake ceilings for air-conditioned rooms. Particle

boards are widely used as ceiling tiles for auditoriums, computer centers, cinemas and theaters and as display boards in business centers. In the construction of the building, it is used in fake ceilings and panels due to its heat-acoustic insulation properties.

v) Use of particle board of core material for door.

Particle board is also used as the core material inside the door. Particle core is the most commonly used in manufacturing doors, as it provides a smooth and smooth surface for bonding to door surfaces. It also has a good screw-holding capacity for mounting hinges, unlike simple density fiber boards.

vi) Use of particle boards in furniture

These particle boards are widely used in residential and office furniture. Varnished wood particleboard is popular because it is durable and better in a humid environment than plain particleboard. It is also widely used in kitchen and bathroom areas in the form of modular kitchen cabinets, storage units, desks, wardrobes. Particularly useful particle board in the interior such as bedroom with bed, closet, storage unit.

vii) The use of particle boards in the trading industry

On a commercial scale, these particle boards are used on televisions, speakers boxes, sewing machines, display boards, car parts and other products that require supplied surfaces. Varnish boards are widely used in this industry.

Summary

The overall results of all the test results and objectives achieved during the production of particle board. As a result of our study, we found fiber kenaf is also suitable to be the main raw material in particle board production. Fiber kenaf does not meet actual standards. Lastly, the kenaf used is 100% natural and is a recycled material manufactured in Malaysia. Therefore some suggestions can also be expressed as plans for improvement. Suggestions can be expressed as a result of the discussions conducted.

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Implementing Elements of Innovation Mini High Fidelity Audio Mixer Adapter for Teacher in Teaching and Learning in the Kelantan Community College

Mat Sazilin Ayub^{1, a} and Shuhaila Ibrahim^{1, b}

¹Besut Community College, Level 2,
Baitul Ehsan Building, Jalan Besar,
22000 Jertih, Terengganu

^asazilin.kkbest@gmail.com, ^bshuhaila@kkbesut.edu.my

Abstract. The application of creativity and innovation elements in teaching and learning helps to increase the thinking, idea and quality of student learning outcomes. This study aims to identify the use of innovation tools Mini High Fidelity Audio Mixer Adapter for Teacher in teaching and learning by lecturers among Kelantan Community College. Nowadays a teaching and learning activity involving an audio system is either on board or in a lecture room, as usual the student will use a long wire or use a mic and scale to the speakers of the laptop to channel Audio from your laptop to a board or lecture room. As a result of a too long or voice-recorded wire, it becomes less obvious that the transmission of an audio-based signal has led to a voice that is channeled to the speaker system becomes less quality such as the voice of disturbance and pop sound. This investigation has three objectives. First in the knowledge phase of Mini High Fidelity Audio Mixer Adapter for Teacher in the teaching and learning process among Kelantan Community College. Second stage to know understanding using the Mini High Fidelity Audio Mixer Adapter for Teacher in the teaching process among Kelantan Community College. Thirdly knowing the stage of understanding the Mini High Fidelity Audio Mixer Adapter for Teacher application in the teaching process among Kelantan Community College. The methodology of this study used quantitative method and instrument is a questionnaire and the data collected has been analyzed using the SPSS software version 23. The survey form used has 15 items questions. Based on the results, the phase of implementing elements of the Mini High Fidelity Audio Mixer Adapter for Teacher in teaching and learning process among in Kelantan Community College is at a high level.

Keywords: Innovation, Mini High Fidelity Audio Mixer Adapter For Teacher, teaching and learning

Introduction

Malaysia is heading towards making innovation as a source of economy with the aim of enhancing competitiveness for sustainable economic growth and development. Malaysia wants to shift from a new economic model with innovation, creativity and high value added in an effort to ensure that the country can continue to be competitive and relevant in the global economic competition. In order to achieve the new economic model, Malaysia has made 2010 as a year of innovation and Creativity [1]. The emphasis on innovation and creativity will be enhanced at all levels and fields, including education. Thus the approach of teaching and learning methods (PDP) should always have changed. The latest developments show that students 'oriented learning is in radical.

Whether we are aware or not the appearance of products such as iPhone, Android, Blackberry, Twitter, Facebook and YouTube and Google's awakening are the results of innovative ideas of Western communities. This invention has changed the way lives of the current community and makes people more challenging, fun and competitive. In fact, innovation and creativity have also made

several countries as they stand out such as Korea, Finland and other developed countries. Facing the situation, Malaysia should also look forward and try to make innovation and creativity as a new direction especially among the new generation. Human capital development is among the areas given attention in the national development framework, especially in the 9th Malaysia Plan (2006-2010), (Economic Planning Unit, 2006). The Prime Minister when presenting the agenda as at 31 March 2006, explaining that human capital development should also focus on improving knowledge, creativity and innovation capabilities, which three aspects are important in us to face with the challenges of globalization, Roselina Shakir in [2]. Further, in 2010 was declared as an innovation year by the Government of Malaysia. The declaration aims to promote and recognize the culture of innovation as an important role to drive the country to achieve a developed nation's status driven by the industry sector's competitiveness.

Problem Statement

Teaching is a very heavy task as each instructor must ensure that what is taught to each student is also a struggle that requires sacrifice for a person who is called a lecturer. Thus, teaching effectively can help students in their learning and influence their life in the future. With today's current developments, effective teaching of the lecturers is currently full of numerous challenges and workload. This has led to the teaching of lecturers to be increasingly in order to spend the syllabus without taking into account the effectiveness of teaching, [3]. Therefore, lecturers need to inspire themselves to change from common thinking to more creative and innovative. The use of teaching materials (ABM) based on innovation and Learning (PDP) process is important for lecturers to ensure the delivery of information relating to the subjects taught is more clear and systematic. And be followed by students better. The application of the Innovation Element in teaching and learning (PDP) helps to enhance the thinking, ideas and quality of students' learning outcomes. In a study conducted by Yahya Buntat & Lailinanita Ahamad [4] also notes that the Ministry of Education Malaysia (KPM) advised all institutions of study to apply innovation to improve the education system in the country. The study was aimed at identifying the use of Mini-High Fidelity Audio Mixer Innovation Tools Adaptor For Teacher in teaching and learning by lecturers among Kelantan Community College. Every time the teaching and learning activity involves the audio system whether in the hall or in the lecture room, as normal students will use a long wire or use mic and are encouraged to a laptop speaker to channel a voice audio from a laptop computer to a hall speaker system or lecture room. As a result of a too long or voice-recorded wire, it becomes less obvious that the transmission of an audio-based signal has led to a voice that is channelled to the speaker system becomes less quality such as the voice of disturbance and pop sound.

Objectives of the Study

The objectives of the study are as follows:

1. Know the knowledge stage of mini high fidelity audio mixer adapter for Teacher in teaching and learning process among Kelantan Community College.
2. To know the stage of understanding mini high fidelity audio mixer adapter for Teacher teaching and learning process at the entire state of Kelantan Community College.
3. Know the stage of used mini high fidelity audio mixer adapter for teacher in teaching and learning process among of Kelantan Community College.

Literature References

Innovation in education is a new strategy and perspective used in the field of education in order to provide knowledge and understanding to the students so that they can learn more easily and faster knowledge. According to Mohd Amin [5]. A teacher must be innovative in their teaching to produce a more attractive and effective Pdp. In the study of Jasmi [6], specify ABM to function as a facilitator for the lecturers to improve the effectiveness of learning-centered education. In their studies, there were 25 per cent of the involvement of lecturers in the classroom. Thus, the various forms of ABM can enhance the understanding and achievement of students according to a topic they will learn. According to Ahmad Zanzali & Daud [7] that the use of textbooks, black boards and limestone alone is insufficient as a method of teaching of lecturers in the process of PDP, even the lecturers need to use technology in the PDP process to increase the student's interest in a study a subject is also an interactive learning towards students. The transformation process in the field of education requires a drastic change from the P&P style of old methods to the latest learning style by utilizing high-tech ABM in line with the current time growth.

Hamdan [8] states that to ensure that every objective of teaching of lecturers is achieved, lecturers must first organize their teaching strategies before the PDP process is conducted. The duration of the lesson must be sufficient with the prescribed time schedule if the lecturer was prepared with the rules, student activities and reference materials before the PDP process was carried out. Therefore, lecturers need to further enhance their knowledge and control the latest technologies that have always been variable to address the changes in PDP. Inside a lecturer must practice the culture of reading, writing culture and the culture of thinking before and during the PDP process.

The 21-century teaching of information technology (ICT) as an ABM in PDP is increasingly being said to increase the readiness of the lecturers in schools on the skills of using the technology equipment. The use of appropriate methods with the topic to be learned is very important in the PDP process. This is because, to attract students to the PDP process and at the same time students will be fully focused on a topic they will learn. Each lecturer is as a facilitator where they have to know and understand how a method or technique is able to assist in the process of PDP as well as to plan student-oriented PDP processes [9]. The importance of using ABM in the PDP process among the lecturers is to assist lecturers in communicating their knowledge in the PDP process, saving time and energy lecturers in providing ABM, assisting the lecturers to respond to the challenges that enhance the potential of the latest technology, positively impact the students in the PDP process, universality of PDP resources and the final use of ABM in PDP is aligned with the 21st century. Therefore, lecturers must have a positive attitude and prepare for the preparation and use of ABM in PDP at the Community College [10]

Research Methodology

The methods in this research used quantitative. Researchers use questionnaires to obtain the data. It is suitable for use in this study as research findings are information on events that are taking place and can be used to solve problems related to the problem. The population in this study is 52 lecturers who teach on a full-time basis. The 18 lecturers from the Tanah Merah Community College, 15 lecturers from the Kok Lanis Community College and 23 lecturers from the Pasir Mas Community College. While for the sample in this study, researchers have been able to get nearly 100 per cent of the population as respondent of the 16 lecturers of the Tanah Merah Community College, 14 lecturers of the Kok Lanis Community College and 22 lecturers from the Pasir Mas Community College. The downside of obtaining a respondent of 100 % is due to unavoidable reasons. This study used a

quantitative approach, which was a research instrument using self-administered questionnaire by the respondent. This questionnaire has 15 questions divided into three sections to know the level of knowledge, understanding and level of use of Mini quality Fidelity Audio Mixer Adaptor for Teacher in the process of teaching and learning at the among Kelantan Community College. Scale of Likert 5 score is used to measure accepted levels and do not agree to the respondent given statement. Data collected and analyzed by using descriptive analysis to know the level of application of the fidelity of the adaptor for teacher of the innovation element among in the Kelantan Community College.

Analysis and Discussions

Table 1: A Stage of Knowledge Mini High Fidelity Audio Mixer Adapter for Teacher in Teaching and Learning Process among of Kelantan Community College.

What is stage of knowledge mini high fidelity audio mixer adapter for Teacher in teaching and learning process among of Kelantan Community College.	Frequency (f)	percent (%)
Low (1)	1	1.92
Middle (2)	5	9.62
Height (3)	46	88.46
Total	52	100

Table 1 above shows the analysis of the knowledge phase of Mini High Fidelity Audio Mixer Adapter for Teacher in teaching and learning process at the entire state of Kelantan Community College. We can see that only 1 respondent (1.92%) Who have the low level knowledge of mini high fidelity audio mixer adapter for Teacher in teaching and learning process at the entire state of Kelantan Community College. 5 people who have a middle level of knowledge Mini High Fidelity Audio Mixer Adapter for Teacher in teaching and learning process at the entire state of Kelantan Community College and 46 respondents have a high level of knowledge on Mini High Fidelity Audio Mixer Adapter for Teacher in teaching and learning process at the entire state of Kelantan Community College. Thus, it shows that the knowledge stage of Mini High Fidelity Audio Mixer Adapter for Teacher in teaching and learning process at the entire state of Kelantan Community College is at a high level.

Table 2: A Stage of Understanding Mini High Fidelity Audio Mixer Adapter for Teacher In Teaching And Learning Process Among Of Kelantan Community College.

What is stage of Understanding mini high fidelity audio mixer adapter for Teacher in teaching and learning process among of Kelantan Community College.	Frequency (f)	percent (%)
Low (1)	3	5.77
Middle (2)	8	15.38
Height (3)	41	78.85
Total	52	100

Table 2 above shows the analysis of the understanding phase of Mini High Fidelity Audio Mixer Adapter for Teacher in teaching and learning process among Kelantan Community College. We can see that only 3 respondents (5.77%) Who have the low level understanding of mini high fidelity audio mixer adapter for Teacher in teaching and learning process at the entire state of Kelantan Community

College. 8 respondents (15.38%) who have a middle level of understanding Mini High Fidelity Audio Mixer Adapter for Teacher in teaching and learning process at the entire state of Kelantan Community College and 41 respondents (78.85%) have a high level of understanding on Mini High Fidelity Audio Mixer Adapter for Teacher in teaching and learning process at the entire state of Kelantan Community College of Kelantan. Thus, it shows that the knowledge stage of Mini High Fidelity Audio Mixer Adapter for Teacher in teaching and learning process among of Kelantan Community College is at a high level.

Table 3: A Stage of used Mini High Fidelity Audio Mixer Adapter for Teacher in Teaching and Learning Process among of Kelantan Community College.

What is stage of used mini high fidelity audio mixer adapter for Teacher in teaching and learning process among of Kelantan Community College.	Frequency (f)	percent (%)
Low (1)	0	0.00
Middle (2)	4	7.69
Height (3)	48	92.31
Total	52	100

Table 3 above shows the analysis of the phase of Mini High Fidelity Audio Mixer Adapter for Teacher in teaching and learning process has been used among of Kelantan Community College. 4 respondents (7.69%) who have a middle level of using Mini High Fidelity Audio Mixer Adapter for Teacher in teaching and learning process among of Kelantan Community College and 48 respondents (92.31%) have a high level of used on Mini High Fidelity Audio Mixer Adapter For Teacher in teaching and learning process at the entire state of Kelantan Community College of Kelantan. Thus, it shows that the using stage of Mini High Fidelity Audio Mixer Adapter for Teacher in teaching and learning process among of Kelantan Community College is at a high level.

Summary

Overall, there are 3 study issues that were first whether the knowledge stage of Mini High Fidelity Audio Mixer Adapter for Teacher in teaching and learning process at the entire state of Kelantan Community College. What is the understanding stage of the Mini High Fidelity Audio Mixer Adapter for Teacher in teaching and learning process at the entire state of Kelantan Community College and what is the stage of using the Mini High Fidelity Audio Mixer Adapter for Teacher in teaching and learning process among of Kelantan Community College. Thus, it can be concluded that the phase of implementing elements of the Mini High Fidelity Audio Mixer Adapter for Teacher in teaching and learning process among of Kelantan Community College is at a high level.

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Development of Firefly Headband Using Piezoelectric As Night Workout Gear

Wan Rizegillah Ab Wahid^{1,a}, Nor Hafizah Che Hassan^{1,b}

¹Electrical Engineering Department, Politeknik Sultan Mizan Zainal Abidin, Dungun, Terengganu, Malaysia

^arizegillah@psmza.edu.my, ^bhafizah.hassan@psmza.edu.my

Abstract. Piezoelectric materials may be used to convert oscillatory mechanical energy into electrical energy. Together with innovative mechanical coupling designs, this technology can form the basis for energy harvesting from mechanical motion. Piezoelectric energy can be used to convert walking motion from the human body to electrical energy. Firefly Headband Using Piezoelectric for Night Workout is therefore suggested in this paper as a safety device for persons who run at night. This tool works on the principle of a piezoelectric concept where it produces voltage when mechanical pressure is applied. The RF transmitter will be activated when the pressure is applied to the shoe and a voltage of 8V will be generated. When the RF transmitter is activated, the RF receiver will be switched on and the LED strap on the head will light up. Both RF transmitter and RF Receiver are operating wirelessly for user comfort. Hopefully with this tool the risk of accidents can be reduced among those who do exercise activities at night.

Keywords: Firefly, Headband, Piezoelectric, Night Workout, Gear

Introduction

Today, we are in an age of increasing energy costs and decreasing supplies of fossil fuels, apart from that we are also with an emphasis on protecting the environment and creating a viable source of energy are a sustainable form of having become essential now.

There are a range of renewable sources around us to generate new sources of energy such as mechanical vibrations when persons walk through. Vibration energy generates greater density of electrical energy than other energies. Electrostatic, electromagnetic and piezoelectric are some approaches that can be used to convert vibrational energy into electrical energy. Piezoelectric materials have a high priority because of its stable energy density and it does not require outside powers. Piezoelectric materials can be used as a source of energy harvester, which can be applied as a supplier of power to the sensor. In addition, the piezoelectric material has the ability to convert mechanical stress into electrical energy (H, A Sodano) [1]. The vibrations can be generated into electric energy by a piezoelectric device. Piezoelectric devices are implements that use materials exhibiting piezoelectric effects. "Piezo," in Greek, means "pressure," which explains that when you apply pressure to piezoelectric materials, you get an electric energy. It shows that the presence of waste vibration energy might have some value.

Applications for piezoelectric materials have expanded into many fields since the discovery of the effect by Curie brothers in 1880-1881 [2]. Many existing devices in market use the same system as the project we are working on. These include the Nike iPod system and the energy-generating floor. In the Nike iPod product, the piezoelectric is used as a sensor to generate current to the circuit and the Nike iPod consist of small transmitters mounted on shoes, communicating between Nike + Sports bands, receivers mounted to the Nano iPod, or directly with the second generation iPod touch, iPhone 3gs or Nike + Sports watch. If user uses an iPod or an iPhone, iTunes software used to view running or running history. Nike iPod sports kit is an activity tracker that measures and records the distance and pace of walking or running. The advantages of the iPod Nike product are that it is easy to carry anywhere and second, it uses piezoelectric to generate power and to activate the system. However, this product is quite expensive and not everyone can afford it.

Meanwhile, the power-generating floor is an environmentally friendly system that generates electricity by using the energy from the vibrations created by people walking on the floor. The piezoelectric elements incorporated inside the flooring transform pressure and vibration into electric power. Japan has already started experimenting use of piezoelectric effect for energy generation by installing special flooring tiles at its capitals' two busiest stations [3]. The special flooring tiles embedded with piezoelectric elements, which are 35 millimetres in diameter, and disc-shaped components used for loudspeakers. It uses 600 of these elements per square meter. While the loudspeaker creates sound by converting electric signals to vibrations, the floor adopts the reverse mechanism that produces electricity by harnessing the vibration power [4]. Tiles are installed in front of ticket turnstiles. Thus every time a passenger steps on mats, they trigger a small vibration that can be stored as energy. Energy thus generated by single passenger multiplied by many times over by the 400,000 people who use Tokyo station on an average day, according to East Japan Railway, which generates sufficient energy to light up electronic signboards. An average person weighing 60 kg will generate only 0.1 watt in the single second required to take two steps across the tile, but when they are covering a large area of floor space and thousands of people are stepping or jumping on them, then significant amount of power can be generated. This energy created is adequate to run automatic ticket gates and electronic displays.

The main objective in this project is to design a prototype of piezoelectricity gear that can assist people who like to exercise or walk at night. In this paper, the first part brief about the introduction and literature from previous findings. Second part explains about the methodology of the project. Next, results and discussion and then followed by the conclusions.

Methodology

The main components in this tool are four piezoelectric transducers, an LED strip, a headband, shoes, 12V power supply, RF transmitter and RF receiver. The piezoelectric transducers are placed inside the shoe where they will convert mechanical pressure to voltage. Piezoelectric transducers will be connected to each other with the wire on the shoe to create more energy for the transmitter to obtain sufficient power to activate the RF receiver and the sensor is placed between two piezoelectric transducers to provide comfort in the sole when stepping on it.

Block Diagram

In this project, four transducers are used to generate voltage when mechanical stress is applied. All piezoelectric transducers are connected to each other by wires on the shoe to create more power for the transmitter to obtain sufficient power to activate the RF receiver and sensors are placed between the piezoelectric transducers to provide comfort insoles when walking on it.

The basic block diagram of the proposed model shown in Figure 1 below.



Figure 1: Project Block Diagram

Circuit Design

Figure 2 and Figure 3 below show a wireless radio frequency (RF) transmitter and receiver circuit.

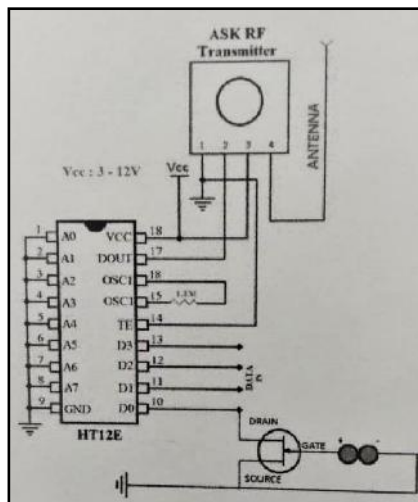


Figure 2: RF Transmitter circuit

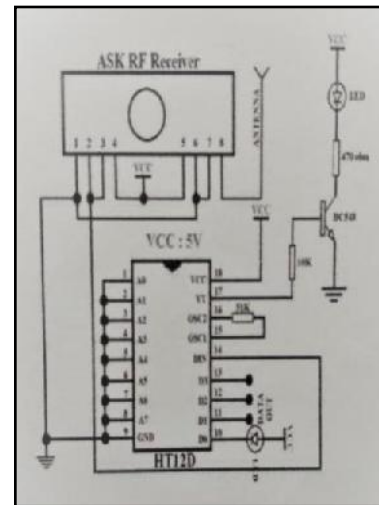


Figure 3: RF Receiver circuit

In RF Transmitter circuit, HT12E Encoder IC convert the 3 bits parallel data given to pins D1 – D3 to serial data and will be available at DOUT. This output serial data is given to ASK RF Transmitter. Pin D0 is connected to MOSFET to amplify signal that it received from piezoelectric and at the same time acts as a switch. Address inputs A0 – A7 are connected to GND (Logic ZERO) to provide data security. Status of these Address pins should match with status of address pins in the receiver for the transmission of data. Data is transmitted when the Transmit Enable pin (TE) is LOW. 1.1 MΩ resistor provides the necessary external resistance for the operation of the internal oscillator of HT12E. The piezoelectric transceiver is connected to an RF transmitter that has a voltage between 3V to 12V (maximum) and the current range is between 9 mA and 40 mA (maximum). The frequency is 315 MHz at 12V with a power transmission of only 25 mW of 150 kHz (maximum). Therefore, it can send a signal up to 40 meters in open space.

Next, the RF Receiver receives the data transmitted using ASK RF Transmitter. HT12D decoder converts the received serial data to 3-bit parallel data D1 – D3. The status of these address pins A0 – A7 should match with status of address pin in the HT12E at the transmitter for the transmission of data. The LED connected to the above circuit glows when valid data transmission occurs from transmitter to receiver. The 51kΩ resistor provides the necessary resistance required for the internal oscillator of the HT12D. The RF receiver will be in headband having 5 VDC working voltage with current working range of 5.5 mA. The frequency is between 315 MHz to 433 MHz. The 12V battery is also added to the headband together with the LED strap. Each LED is regarded as the required output of the 2V voltage to produce the light ignition. RF receiver and LED light will be a standby mode powered by 12V battery on the headband.

Result and Discussion

In this research work, it consists of one RF transmitter and one RF receiver circuit. The input for RF transmitter circuit is piezoelectric sensors that placed in the shoe insole as shown in Figure 4 below. Every time a person takes a step, he or she is using his or her weight to push on the piezoelectric elements – which then in turn convert the energy into electrical energy.

This will activate the RF transmitter along with the capacitor that stores the current at each step. After activating the RF transmitter, the receiver RF switched on and the LED strap head light turn on as shown in Figure 5 below.



Figure 4: Transmitting Part



Figure 5: Receiving Part

The first similarity between the piezoelectric LED shoe and the Nike iPod system is the use of a piezoelectric sensor mounted on the heel of the shoe. The second similarity is that both products use a wireless medium that is an RF transmitter and receiver. The RF transmitter sends the data through the IC and transmits it to the receiver while the RF receiver receives the data and then it goes to the output which is LED. The blinking LEDs will be placed on the head elastic band while for the Nike iPod system, the output will communicate with the Nike + Sports band, the receiver attached to the iPod Nano. The third similarity is that both products are user-friendly. Firefly Headband products enhance pedestrian safety during night activities and other road users can see pedestrians. For the Nike iPod system, the device measures and records the distance and pace of walking or running. The Nike iPod system is commonly used by athletes to record their abilities.

Summary

This project was implemented as an option for a product that ordinary people can afford. This device can be used in dark areas such as roads or remote areas of Malaysia. Malaysia is a developing country where energy management is a main challenge for local people. Piezoelectricity is a revolutionary green energy source. Piezoelectric elements are excellent for dynamic movement and sensor power. It can be used easily and the distance achieved by RF modules is relatively low in noise. Also, it requires its own input and output power as this product generates its own power. Thus, this product is the reason why they are now considered important as energy conversion devices and sensors used are small enough so that it will not affect the main features of the structure.

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Development of Hybrid Solar Bike

Safira Din^{1,a}, Norazlinawati Mat Yaacob^{1,b} and Wan Rizegillah Abdul Wanid^{3,c}

¹Jabatan Kejuruteraan Elektrik, Politeknik Sultan Mizan Zainal Abidin,
Dungun, Terengganu, Malaysia

^asafira@psmza.edu.my, ^bazlinawati@psmza.edu.my, ^crizegillah@psmza.edu.my

Abstract. In this era of globalization, our society has become less concerned about the importance of exercise activities. Symptoms of obesity are increasing over the years because of the less concerned about exercise activities. The hybrid solar bike project was built by modifying the used of the exercise bike which is built using a charger and an inverter circuit. The hybrid solar bike combines the use of solar energy as well as the gear and generator to charge the battery. This hybrid solar bike has been built to make easier for users to use exercise bikes and at the same time, users can charge electronic devices such as phones, power bank, laptops and so on. Furthermore, with the production of this project, electricity consumption can be reduced because the project is more towards green technology. Green technology refers to the development and application of products, equipment and systems to maintain the environment and to reduce the negative effects of human activities. The project was divided into three main parts. The first part is the input part which consists of a bicycle, generator, solar panel, and battery. While the second part converting direct current (DC) to the alternating current (AC) and the last part is the output part which consists of a socket plug. In the output part, there is also a meter to display the volume of voltage from the battery. This project is used to save electricity cost because the bike only use the energy from the user and the bike is also connected to a generator and solar panel to produce electricity.

Keywords: hybrid, green technology, solar panel, generator

Introduction

There are so many factors causing global warming. Therefore, countries need to introduce the generation of electricity with an energy that is sustainable energy such as solar energy. Environment and energy relation should be balanced for sustainability. The Malaysian Government promotes renewable energy by enacting the Renewable Energy Act 2011, introducing the Feed-in-Tariff (FiT), establishing the Sustainable Energy Development Authority (SEDA) and formulating the green technology policy [1]. Hybrid solar bike has been built to support green technology and promotes renewable energy. As we know, the hybrid vehicle combines two energy sources and for hybrid solar bike, it combines sources from generator and solar energy. A hybrid car is a vehicle that uses two or more distinct power sources to move the car [2]. The term most commonly refers to hybrid electric vehicle which combines solar energy and electrical energy. But, in this hybrid solar bike the system quite different compared to hybrid car where it is run by using the mechanical energy from gear which is connected to the paddle of the bike. When the user rides the hybrid solar bike, the gear will run the generator and convert the mechanical energy to electrical energy and charge the lead acid battery.

Another source of energy that is used in hybrid solar bike is solar energy which will become the long-term global source of energy supply. The advantages of solar power generation are low greenhouse gasses (GHG) emission, low maintenance cost, and low operation noise, and therefore it is considered as the best choice for future electricity generation [3]. Solar energy used as additional energy to make the battery always charged with the help of photovoltaic cells. A photovoltaic cell is

used to generate voltage for charging the battery where the photovoltaic involves the conversion of electromagnetic radiation into electrical energy. The battery gives the required voltage to the inverter. An inverter then converts direct current (DC) to alternate current (AC) and at the same time inverter used to ensure the output voltage is 230V. The output from the inverter is connected to the socket plug where the user can charge certain electronic devices such as handphone, laptops and so on. This project is more towards green technology because, during the development of the hybrid solar bike, it maintains the environment and reduces the negative effects of human activities. Green technology also known as sustainable technology such as that generated from solar panels. Green products are by definition, environmentally friendly because it relates to energy efficiency, recycling, health and safety concerns, and renewable resources. As we know, solar energy drives the global ecosystem and is the most constant and predictable renewable source.

The hybrid solar bike was created to solve problems that could contribute to obesity and also prevent the rising of electricity consumption as well as support green technology production. Thus, the hybrid solar bike can help the user to provide a healthy environment and also save energy. The main objective of this project is to design a hybrid solar bike where the generator and solar panel help to generate electricity, maintains stability of batteries by receiving voltage from solar panels and generators and also to reduce the greenhouse effect caused by heating the atmosphere through the use of sunlight. The hybrid solar bike makes a better lifestyle because peoples can exercise by using the hybrid solar bike and at the same time they also can charge their handphones. These hybrid solar bikes meet the criteria for safe use, providing a healthy environment and save energy. Hybrid solar bike combines kinetic energy from the bike and natural solar power to generate electricity that can be used by a certain electronic device without using a power source. Solar energy will be stored in the battery as additional energy when there is no use of the bike.

This project is a hybrid vehicle because it combines two energies to generate electricity which is from the generator and solar panel. To better understand and use as a source of reference, two examples of the previous project that is quite similar concepts with hybrid solar bike. The first project is referring to [6], where the study was related to a multi-wheeled vehicle and not limited to a bicycle. The preferred arrangement consists of a standard conventional bicycle with multi-speed transmission, plus an electrical generating system and a solar charging arrangement. This preferred arrangement is normally powered by a combination of motor and pedaling, coupled such that either or both may provide power at any instance. The electrical system consists of: a DC Hub motor, lead acid batteries, a hand lever operating a throttle means, a throttle means which is used to control the battery switching circuit. They also studied in the mechanism called regenerative braking arrangement utilizes the braking arrangement to generate energy to charge the battery. When the brakes are applied, they compress the fluid inside a hydraulic cylinder and when the brakes are removed, they release the fluid thus generating energy to charge the battery. The second project is referring to [7]. They studied a bicycle that runs on solar energy consists of solar intensifying collectors. It also consists of a two wheeled moped type vehicle supporting a motor generator and a pedal is driven crank operating arear wheel drive. This vehicle further includes a rear portion consisting of a pair of forwardly open air duct having a wind driven generator. It also includes a pair of rechargeable batteries are further supported within the rear body portion and array of are supported by vertical collar support in generally horizontal panel support. The panels are provided with the energy intensifying lens which intensifies the solar rays received from the sun.

Methodology

The hybrid solar bike consists of the following component – bicycle, solar panel, generator, lead acid battery, inverter, meter, and socket plug. The components used are shown in Figure 1.



Figure 1: Component used in a hybrid solar bike (a) Bicycle, (b) Solar panel (c) Generator, (d) Gear, (e) Inverter and Battery and (f) Meter and socket plug

This system consists of software and hardware design. The software part is only involved during the design of the schematic circuit and the hardware part involves the connection of the circuit and the connection of all the component used as shown in the flowchart in Figure 2.

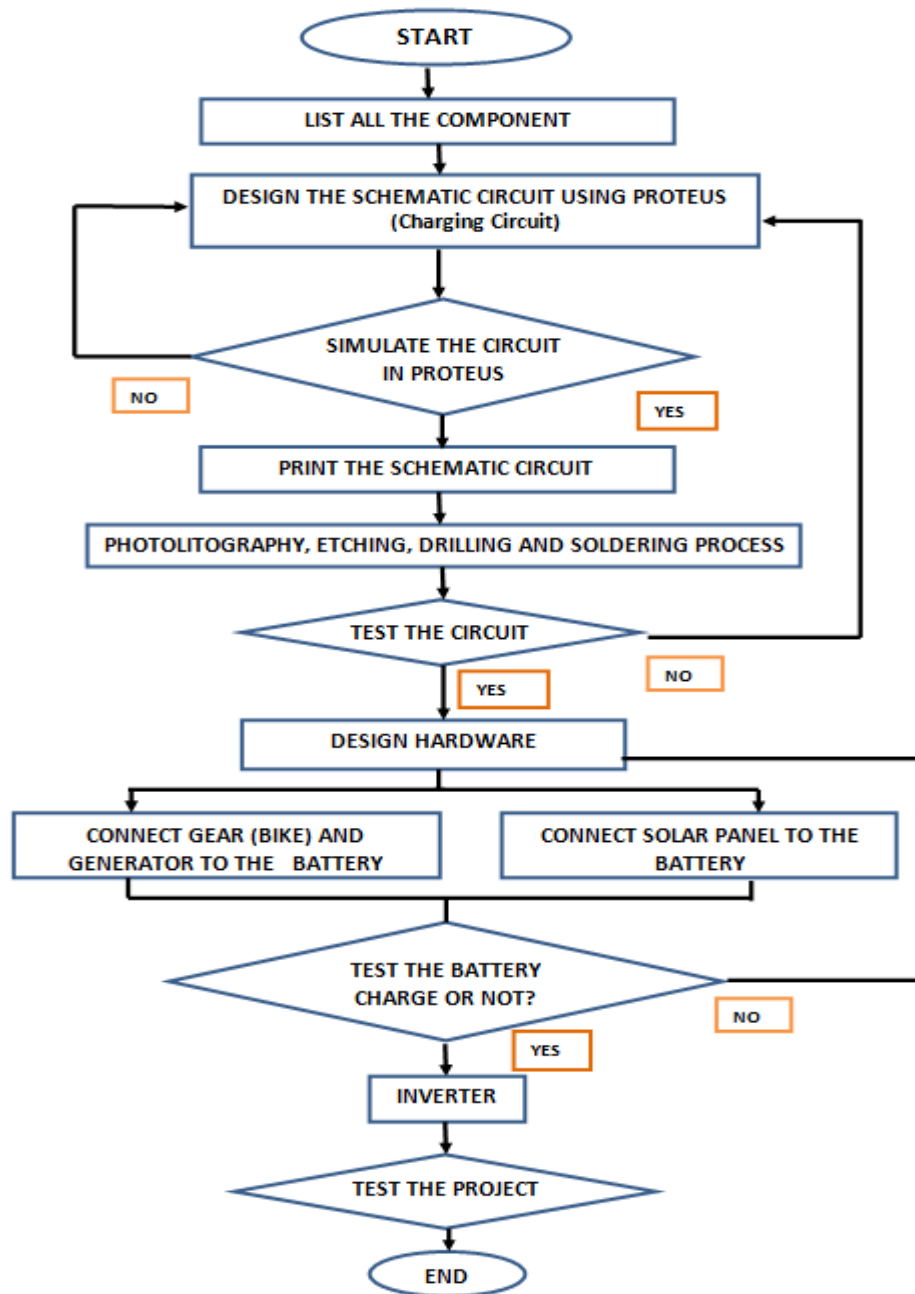


Figure 2: Steps in designing the hybrid solar bike

Block Diagram

Figure 3 illustrates the block diagram for the project. When the battery is fully charged, an inverter converts the DC source to the AC source and produce 230V. Users can charge the electronic device such as handphone or laptop during exercise activities.

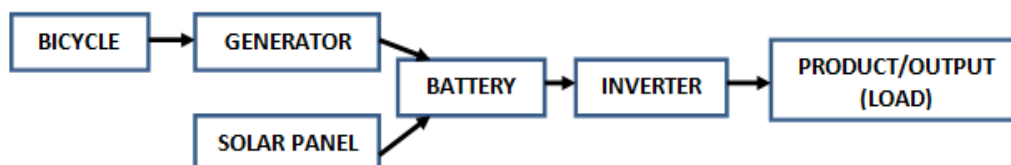


Figure 3: Block Diagram of Hybrid Solar Bike

a) Solar Panel

Solar panels are powered by solar energy. The voltage generated by solar energy is used to charge the lead acid batteries which are charged with the help of photovoltaic cells. Solar cells convert solar energy directly into electricity using photovoltaic effects. Photovoltaic effects involve the conversion of electromagnetic radiation into electrical energy. Solar cells are electrically connected and produced as modules with a piece of glass on top to allow light to pass and protect the semiconductor from the weather. Mathematically, the efficiency of a solar cell can be given by:

$$N = (V \times I \times FF) / P_{in} \quad (1)$$

where,

V: Open circuit voltage

I: Short circuit current

FF: Fill Factor

N: Efficiency

P_{in}: Input power

b) Generator

Generators use the mechanical energy supplied to it to force the movement of electric charges present in the wire of its windings through an external electric circuit. For this hybrid solar bike, gear is used to run the generator. The electrical generator has several important advantages and one of the advantages is it can generate electricity for both long term and short term application.

c) Lead Acid Battery

Lead acid batteries have lower energy density compared to lithium ion batteries. Lead acid battery has several advantages like low cost, easily available, and is also explosion free. Thus it is the most frequently and the most suitable ones to be used battery in hybrid solar bike. The battery is rated in ampere-hours (abbreviated Ah) and this is known as the current rating. This project involves charging and discharging energy within a battery.

d) Inverter

An inverter converts the DC voltage to an AC voltage. The input DC voltage is usually lower while the output AC is equal to the grid supply voltage (240V). This project is used as a power supply from batteries which are charged separately. An inverter provides an AC voltage from dc power sources and is useful in power electronics and electrical equipment rated at the AC mains voltage.

Project Scope

The hybrid solar bike used solar panel which receives the intensity of sunlight to produce direct current (using only 10watt of 40cm x 30cm). Solar panel output is 12V. The generator converts kinetic energy to electricity in the range of 7V to 12V depending on the speed of the riding bike. Lead Acid Battery is used to store 7.2 Ah and electric charge at only 12V, 2.1A. The inverter is also used to convert the current directly to the size of the alternating current (500watt, 500Amp). The output of this inverter is 230V.

Circuit design

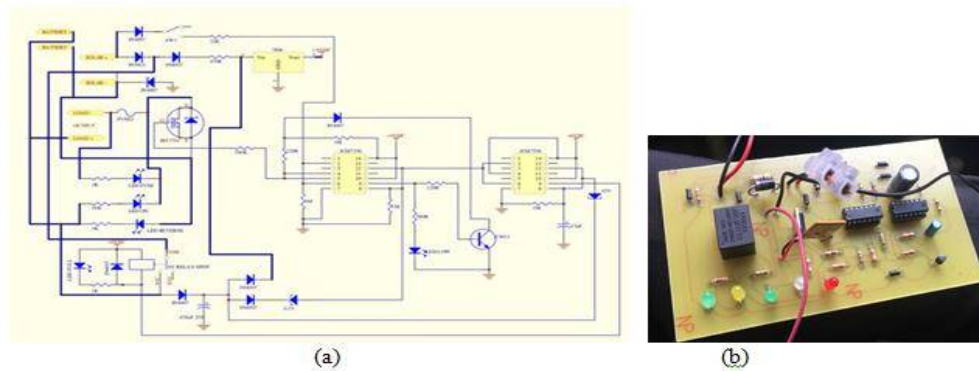


Figure 4: Diagram for (a) schematic charging circuit and (b) charging circuit after the soldering process

Result and Discussions.

In the research work, it relates to energy conversion and storage and also energy management. The project contains three parts, which is the first part is the input part (bicycle, generator, solar, battery), the second part is inverter and last part is output part (meter and socket plug). An inverter is included in this model as a device to convert electric power from DC to AC to supply the load. The hybrid solar bike uses the bicycle as the source of mechanical energy to move the gear and run the generator while the solar panel is used as an additional energy source to generate electricity. The efficiency of a solar photovoltaic depends on the environmental impact such as the surrounding air temperature and the dust contamination of the surface of the solar photovoltaic cells. The reduction of the efficiency of a solar photovoltaic cell is due to high the surrounding which is estimated to 8% for Malaysia surrounding air. The air temperature efficiency due to dust contamination is assumed to be 2% [5]. Electricity produced by the generator depends on the duration and speed of the bike when the user uses during the exercise sessions. The electricity from solar energy and the generator is charged to battery and maximum value for the battery is 12V. The location of the bicycle, solar panel, generator, battery, inverter and output part are shown in Fig 5 below.



Figure5 Hybrid solar bike

Measurement of charging battery (Time vs Voltage)

Time is measured by the stopwatch and voltage is measured by multimeter. When user rides the bike, the recording of time is taken by the use of a stopwatch.

Table 1: Relationship between time and voltage of the battery

Time (Minute)	Voltage (Volts)
5	11.50
10	11.14
15	11.39
20	11.51
25	11.59
30	11.52
35	11.69
40	11.60
45	11.72
50	11.57

Theoretical Calculations

A solar panel of 12V, 10W gives about 70% of the power that is 7W and hence current can be obtained as:

$$\begin{aligned}\text{Current from solar panel} &= \text{Power of module} / \text{Voltage of module} \\ &= 7/12 \\ &= 0.583\text{A}\end{aligned}$$

1 Battery of 7.2Ah is discharged maximum up to 70% which makes it 5.04Ah

Time taken to charge 1 battery completely via solar panel = $5.04\text{Ah} / 0.583\text{A}$

= 8.7 hours approximately

Conclusions.

This project is developed and design the hybrid solar bike to provide a healthy environment and save energy used by the user and support for green technology. This hybrid solar bike has been built to make easier for users to use exercise bikes and at the same time, users can charge electronic devices such as phones, power bank, and laptop especially. Besides, this project also used a solar panel to generate the voltage. The amount of output voltage depends on two conditions. The first condition is the user's cycling speed and cycling duration and the second condition depends on the weather conditions and the duration of the solar panel receives direct sunlight. This project is related to energy conversion and storage and also energy management. The most important merit of this bike is to prevent the environment from the pollution, help conserve the natural resources and also helps to reduce the symptoms of obesity through healthier activities.

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Optimization of Magneto-Rheological Fluids on the Volume Fraction and Viscosity for MR Damper Application

Siti Aishah Wahid^{1,a}, Izwan Ismail^{2,b}

¹Department of Mechanical Engineering, Politeknik Sultan Mizan Zainal Abidin, KM08 Jalan Paka, 23000 Dungun, Terengganu, Malaysia

²Department of Mechanical & Manufacturing Engineering, Universiti Malaysia Pahang 26600 Pekan, Pahang, Malaysia

^asiti.aishah@psmza.edu.my, ^bizwanism@ump.edu.my

Abstract. Magneto-rheological fluid (MR fluid) in squeeze mode able to produce stress resistance up to 80kPa which is exceeded most basic requirement of normal mechanical application. However, to attain the good performance of stress resistance, the composition of MR fluids has to be optimized. The aim of this study is to investigate the optimum volume fraction of carbonyl iron particle (CIP), mineral oil (MO) and fumed silica (FS) for MR damper application. Simultaneously, the appropriate viscosity of MO is also studied. Hence, MR fluid samples with various composition are synthesized and analysed according to combined D-Optimal mixture design (CDMD) design of experiment (DOE). The compression test was conducted to study the compression strength and compression modulus of each samples. The findings indicate that the volume fraction of CIP is the most significant factor to affect the compression stress and compression modulus of MR fluid. Increment of CIP volume fraction from 20vol% to 40vol% increased the compression stress from 0.12MPa to 10.95MPa. Moreover, the compression modulus increased from 0.24MPa to 27.24MPa. This study shows that MR fluid can be produced for MR damper by selecting higher magnetic particles composition. Optimization model produced in this study is crucial for composing aimed squeeze mode MR fluid for MR damper.

Keywords : MR fluid, stress resistance, MR damper

Introduction

MR fluid has become important in automotive technology such as vehicle ride comfort and actuator to stop motion. Extensive researches on the MR fluid preparation have shown that the amendment in one or more constituents will influence the performance of the materials. MR fluids are formerly used in motion damping devices, perhaps the most practical use for MR fluid technology today [1]. Damping mechanisms transfer kinetic energy to thermal energy, dissipating the force exerted on the device. A typical example of a damping mechanism on a car is shown in Figure 1.

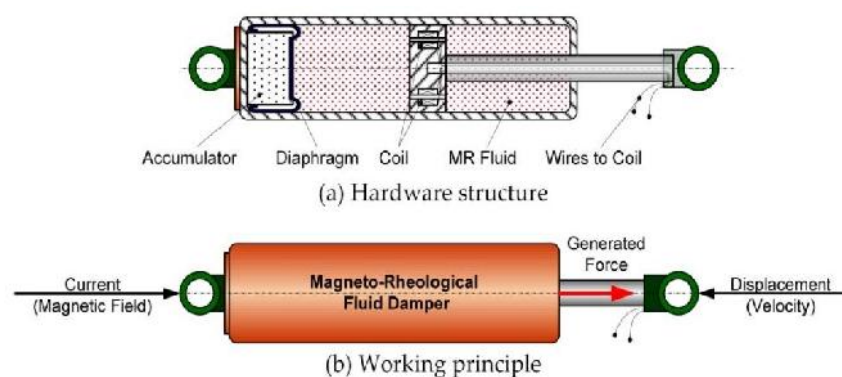


Figure 1: Damping mechanism on a car (a) hardware structure (b) working principle [2]

MR Fluid Preparation and Testing

MR fluid consists of three parts: magnetic particles, carrier fluid and additive. Table 1 lists the materials used to synthesize MR fluid in the laboratory.

Table 1: Constituents of MR fluid

Component	Materials Name	Density(g/cm ³)
Magnetic particles	Carbonyl iron particles (CIP)	7.8
Carrier fluid	Mineral oil (MO)	0.833-0.862
Additive	Fumed Silica (FS)	0.037

Constituents were weighed using microgram balance as per required quantity. FS and CIP were mixed up using a spatula. Small amount of dry mixture was added to the mineral oil. They were stirred at low speed (50 to 100 rpm) until all of the dry mixture being used. The mixture was allowed to mix thoroughly with a mechanical stirrer at 800rpm for 20 to 30 minutes to disperse all the particles uniformly and become homogeneous mixture of MR fluid. Total of 16 samples of MR fluid were prepared based on CDMD.

Table 2: CDMD for MR fluid formulated with CIP, MO and FS in various proportion

SAMPLE	MO Viscosity [cP]	MO [vol%]	CIP [vol%]	FS [vol%]
1	98.1	70	20	10
2	98.1	55	40	5
3	18.5	50	40	10
4	18.5	75	20	5
5	98.1	75	20	5
6	18.5	70	20	10
7	58.3	62.5	30	7.5
8	58.3	75	20	5
9	58.3	50	40	10
10	38.4	56.25	35	8.75
11	18.5	60	30	10
12	98.1	70	20	10
13	98.1	55	40	5
14	18.5	70	20	10
15	18.5	75	20	5
16	98.1	75	20	5

After the preparation of the MR fluid samples in the laboratory, 4 ml for each samples of the fluid were inserted into the support cylinder of the squeeze mode testing rig by using a syringe. The test rig was positioned in the compression test apparatus. Compressions of MR fluid were conducted using a squeeze mode testing rig. The compression tests were assisted by Universal Testing Machine (UTM). The applied magnetic field was achieved by linking the cable of the test rig to a Quantel DC power supply to conduct a 0.8T magnetic field to the test rig. Compression stress and strain data were recorded during compression process.

Effect of Compression Stress on MR Fluid

Figure 2 shows compression stress versus compression strain for MR fluid samples. From the curves plotted, it can be say that the compression stress for all samples increase as the compression strain increase up to 75%. The compressive stress for all samples were increased with increasing the compressive strain, which similar to shear thickening. The shear thickening behavior of compressed MR fluid was in agreement with previous findings [3, 4].

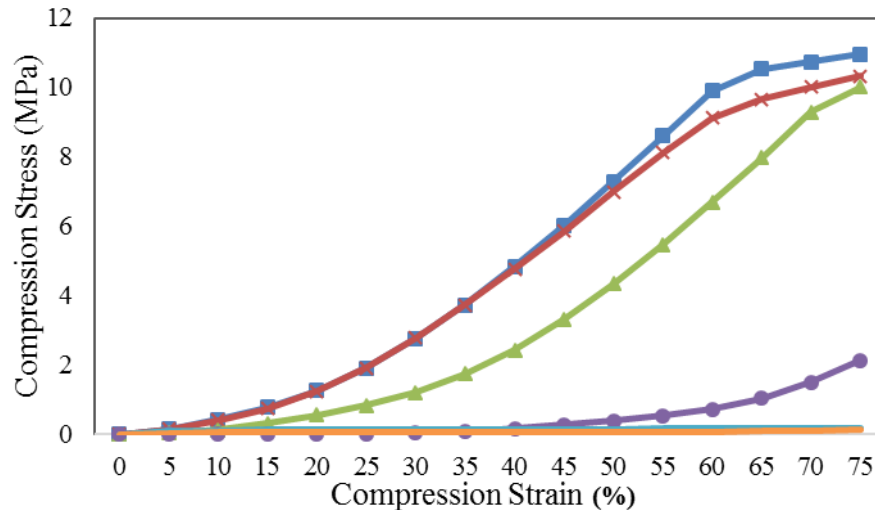


Figure 2: Compression stress versus compression strain of MR fluid samples

Table 2 shows the compressive strength and compression modulus, G , of all MR fluid samples under compression test. The results conclude that higher magnetic particles volume fraction will result in higher compressive strength and higher value of compression modulus, G .

Table 2: Properties of MR Fluid under Compression Test

SAMPLE	Compressive Strength, σ [MPa]	Compression Modulus, G [MPa]
1	0.72	3.45
2	10.62	26.20
3	10.95	27.24
4	2.20	11.67
5	0.59	3.03
6	0.12	0.24
7	0.16	0.30
8	0.12	0.24
9	10.32	24.58
10	2.14	9.35
11	1.56	6.32
12	0.72	0.42
13	10.62	26.20
14	0.86	3.96
15	0.07	0.22
16	0.59	3.03

The highest compressive strength (10.95MPa) and compression modulus (27.24MPa) is for SAMPLE 3 which has 40vol% of magnetic particles. The lowest is SAMPLE 15 with compressive strength of 0.07MPa and compression modulus of 0.22MPa which has 20vol% of magnetic particles. Compression modulus, G indicated stress-resistance performance of the MR fluid. A higher modulus signified their capability to operate in a damper at high stress applications[5]. In the present study, it can be found that compression stress, σ , and compression modulus, G , are affected by the composition of magnetic particles. Higher fraction of magnetic particles in the MR fluid will result in higher compression stress, σ , and compression modulus, G of the MR fluid as depicted in Figure3. SAMPLE 3 with 40% CIP give highest compression modulus, G (27.24MPa) compared to SAMPLE 11 with 30% CIP which give compression modulus, G of 6.32MPa. As expected, SAMPLE 6 with 20% give only 0.24MPa compression modulus, G .

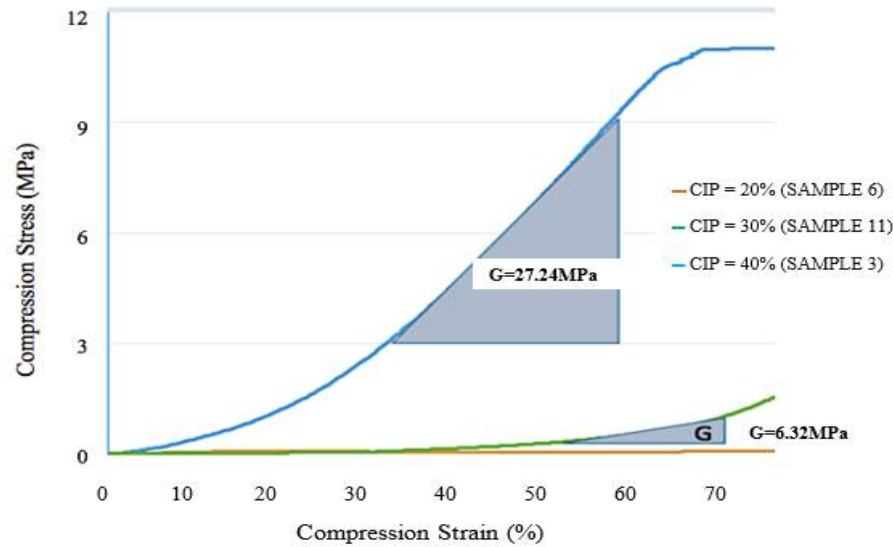


Figure 3: Compression modulus of MR fluid

Experimental result of maximum compression stress of all 16 MR fluid samples were analyzed by using CDMD technique to investigate the effect of each components compositions to the compression. At the same time, the best viscosity of carrier fluid also been investigated. The effect of compression stress for MR fluid samples can be seen from triangular contours plot generated by Design Expert software. This is shown in Figure 4. Figure 4(a) presents the effect of compression stress at MO viscosity is 18.50cP. Figure 4(b) presents the effect of compression stress at MO viscosity is 58.30cP. While Figure 4(c) presents the effect of compression stress at MO viscosity is 98.10cP.

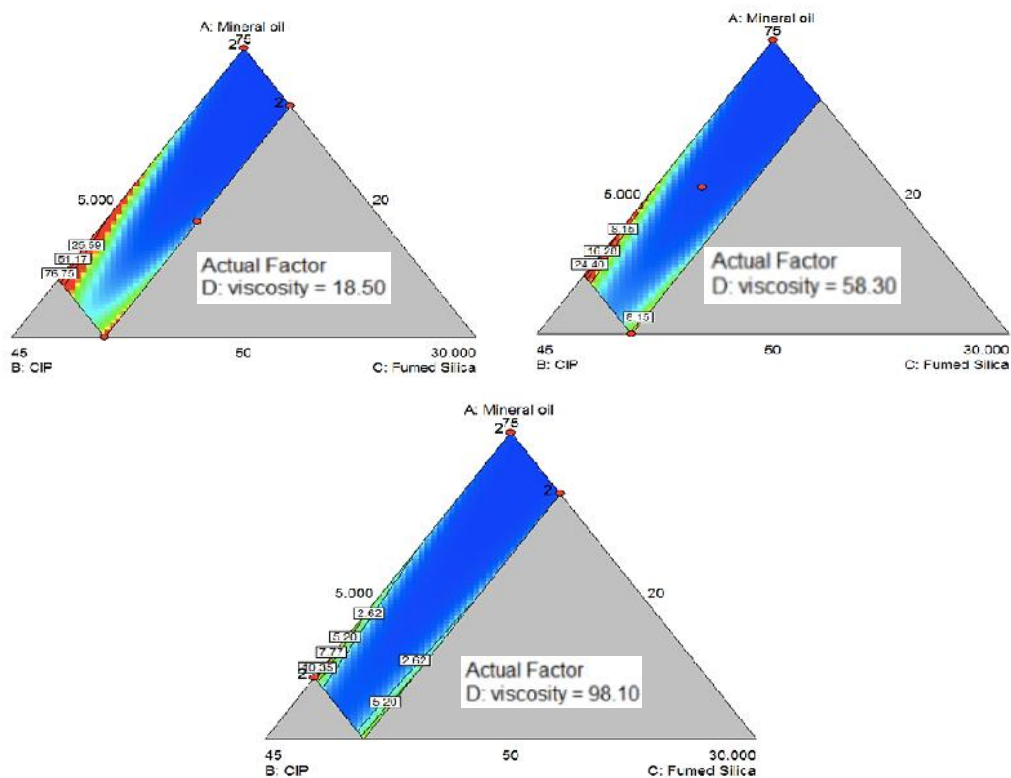


Figure 4: Effect of compression stress at different component compositions and MO viscosity of (a) 18.50cP (b) 58.30cP (c) 98.10cP

Three main components which are MO, CIP and FS as additives were included in the contours plot. There are six main colours in the contours which represents the values of maximum compression stress of the MR fluid samples. Red colour represents the highest maximum compression stress followed by orange, yellow, green, cyan and blue colour. From the triangular plots, it can be seen that blue zones dominant all three plots. Blue, green, cyan, yellow and orange zone are to be avoided. However, the highest desirability of maximum compression stress is at the highest value which is at red zone. It can be also seen that lower carrier fluid viscosity, which is mineral oil, gives an effect to the samples supported by the higher amount of CIP content. The same result was found in 2016 in the study of the effect of the volume fraction and viscosity on the compression and tension behavior of the cobalt-ferrite MR fluids[6].

From Figure 4(a), which is at the lowest carrier fluid viscosity of 18.5cP, the best maximum compression stress is at the highest value of 76.75MPa which is at the composition of CIP 35-40vol%, MO 55-65vol% and FS 5 and 6vol%. This exhibit the best maximum compression stress for the MR fluid sample. As the MO viscosity increase to 58.3cP as depicted in Figure 4(b), the value of maximum compression stress for the MR fluid samples decreases. The red, orange and yellow zones became smaller in the triangular contours plot. Green, cyan and blue zones become larger in the triangular contours plot. The best maximum compression stress at this medium MO viscosity is at 24.40MPa which is at the red zone with the combination of CIP 35-40vol%, MO 50-55vol% and FS 5-6vol%. The yellow, green, cyan and blue zone is to be avoided.

At highest value of MO viscosity, which is 98.1cP as depicted in Figure 4(c), the triangular contours plot produced smallest red zones. There is larger area colored with green, blue and cyan which are to be avoided. Yellow zone is self-eliminated. Therefore, it can be concluded that the best maximum compression stress at highest carrier fluid viscosity of 98.1cP is 10.35MPa at composition amount is CIP 40vol%, MO 50-55vol% and FS 5vol%.

Optimization of MR Fluid volume fraction

From the results obtained, the factors and responses involved with upper and lower limits are presented in Table 3. Samples with maximum compression stress were analysed by using CDMD approach.

Table 3: Optimization of Responses for MR Fluid Mixture Samples

Factors / Responses	Lower	Upper	Criteria	
			Target	Importance
Mineral Oil (vol%)	50	75	in range	3
CIP (vol%)	20	40	in range	3
Fumed Silica (vol%)	5	10	in range	3
MO Viscosity (cP)	18.5	98.1	in range	3
Max Compression Stress (MPa)	1.00	10.95	maximize	5

The mixture optimization and desirability of MR fluid samples are presented in Table 4. From the data presented, solution number 1 possesses desirability value of 1 was selected as the most preferred solution for high stress resistance MR fluid sample. For solution 1, the MR fluid possessed the highest maximum compression stress with value of 19.02MPa. Therefore, the highest desirability requires combination of 61vol% MO at 18.73cP, 34vol% CIP and 5vol% FS.

Table 4 : Mixture Optimization and Desirability of MR Fluid Samples

No	MO(%)	CIP (%)	Factors		Max Comp Stress(MPa)	Response Desirability
			FS (%)	Viscosity(cP)		
1	61	34	5	18.73	19.02	1(selected)
2	50	40	10	38.01	12.08	1
3	50	40	10	44.84	11.45	1
4	56	38	5	83.11	13.31	1
5	50	40	10	22.39	13.63	1

Conclusion

The finding of this study shows that the composition of CIP is the most significant factor to affect the stress resistance of MR fluid for MR damper. Increment of CIP composition from 20 vol% to 40 vol% increased the stress resistance from 0.22MPa to 27.24MPa. Increment of carrier fluid viscosity from 18.5cP to 98.1cP reduced the compression stress resistance from 11.67MPa to 3.03MPa. Though FS composition shows least significant in the changes of stress resistance, it's important to stabilize the suspension. Optimization of materials parameter through CDMD model analysis resulting five resultant compositions at desirability value of 1. The best resultant composition is solution 1 which produced 19.02MPa compression stress. The optimum volume fraction of MR fluid for MR damper application requires combination of 61vol% MO at 18.73cP, 34vol% CIP and 5vol% FS.

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Development of Roselle (*Hibiscus sabdariffa* L.) Calyces Vinegar

Siti Nur Fathiha ^{1,a}

¹Department of Agrotechnology and Bio Industry, Politeknik Jeli Kelantan, Malaysia

^asitinurfathiha@gmail.com

Abstract. Roselle (*Hibiscus sabdariffa* L.) is one of the plants that have many nutrients and uses where the calyces have high anthocyanin and vitamin C content. It also rich in sources of vitamins, minerals, organic acids, polyphenols and antioxidants. However, calyx of roselle has a short-shelf life, and it is not economical to long-distance export. In this study, the calyces of roselle were went through the process of making vinegar to produce roselle calyx vinegar. The sensory acceptability of the roselle calyces were determined in terms of color, aroma, taste, taste after taste, texture and overall acceptance. The parameters analysed were energy, carbohydrate, protein, fat and pH. The roselle calyces vinegar were found to have high scores among all the sensory attributes compared to apple vinegar (control). Meanwhile, in terms of pH, roselle calyces vinegar is more acidic than apple vinegar. However, the nutritional content of roselle calyces vinegar for 100g sample is showed the higher value than apple vinegar. This study revealed that roselle calyx vinegar has the potential to be commercialized because it has a highest acceptability and nutritious.

Keywords: Roselle (*Hibiscus sabdariffa* L.), calyces, vinegar

Introduction

Roselle (*Hibiscus sabdariffa* L.) is one of a plants where its calyces are potentially developed in the food industry to diversify their food sources. In Malaysia, many unexploited food plants have high nutritional potential. The use of roselle as food is still considered new. With this, roselle has been studied as a new food product that can be produced from this plant. Roselle was first introduced in Malaysia in 1990 [1]. It is currently grown commercially in the east coast of Malaysia in Terengganu including Kelantan and is expanding to several areas in Johor and Pahang. Now, it has spread to other countries. Roselle has potential in the food industry because it is nutritious [2]. The red color of the calyces shows the anthocyanins contained. Roselle calyces also contains vitamins A and C as well as minerals. However, roselle calyces are easily damaged and have a limited shelf life. Therefore, one way to solve this problem is to produce a new food product.

Problem Statements

Roselle calyces is a rapid withering flower and easily to damaged. An alternative is applied to it to improve the shelf life. The red edible calyces has a delicate taste which has the potential to be commercialized and is used as a beverage juice in Malaysia [3]. In addition to beverage juices, roselle calyces are also used as lime, jam, halwa, and jelly. Therefore, an unprecedented alternative is roselle calyces vinegar. Vinegar is a vinegar made from organic substances that can be broken down by fermented bacteria into useful ingredients in human life. Roselle calyces are a component of roselle plants that is still lacking and has not been fully studied as vinegar.

Objectives

Until now, most scientific studies have focused on roselle calyces as another food product, and not vinegar. Therefore, a study was conducted to identify sensory acceptability in terms of color, aroma, taste, taste after taste, texture and overall acceptability as well as nutrition (energy, protein, carbohydrate, fat, pH) found in roselle calyces vinegar products.

Methodology

Roselle (*Hibiscus sabdariffa* L.) plants taken around Kelantan were used as a main ingredient. Ingredients for vinegar such as yeast and sugar were bought at nearby stores in Jeli, Kelantan. Then, the tools used are easily available in the home such as kitchens, pots, filters, grinders, and other accessories.

Next, the roselle calyces were harvested, washed to remove dirt then filtered. Then, all the roselle calyces were undergo the process of making vinegar by boiling and grinding and adding yeast and sugar to speed up the fermentation process. The result of the process was put into sterilized containers and kept in a dark room at 25 °C - 30 °C for 2 weeks. After 2 weeks, the vinegar was evaporated and left for a week to complete the fermentation process. Then, roselle calyces vinegar was taken to Kedah Bioresources Corporation Sdn. Bhd. for nutritional analysis in terms of carbohydrate, energy, protein, fat and pH.

Roselle calyces vinegar and apple vinegar (control) were made into beverages and served to a panel of 30 students consisting of students and staff of the Polytechnic Jeli Kelantan randomly for the sensory evaluation test. Sensory evaluation items are in terms of color, aroma, taste, texture, taste after taste and overall acceptance. All panels rated the sample on a scale of 1 - 5 for each rating item meaning that scale 1 was the least liked and scale 5 was the most liked.

All data were statistically analyzed by 1-way ANOVA as determined by Independent T-Test using SPSS version 24.

Result and Discussion

Sensory Evaluation: Based on Table 1, color score results quantitatively showed using 1-way ANOVA that there were significant differences ($p < 0.05$) between roselle calyces and apple cider vinegar (control). Roselle calyces vinegar has a higher score than apple vinegar (control). Roselle calyces contains organic acids that give the role of a beautiful red color [4].

For the aroma, statistics showed no significant difference ($p > 0.05$) between the vinegar samples as the vinegar was acidic and had a sharp, stinky smell. However, roselle calyces vinegar still has a high score of apple vinegar (control) because roselle has a distinctive aroma [5].

Textural analyzes revealed no significant differences ($p > 0.05$) between the samples. The roselle calyces vinegar had a score of 3.40 while the apple vinegar sample (control) was 3.23. It is possible that both samples produced the same final product, which was liquid and refined. Both samples are not too concentrated and are not too liquid.

Based on the number of scores studied on taste, there was no significant difference ($p > 0.05$) between the vinegar samples. Roselle calyces vinegar samples had a high score of 3.30 versus 2.83 for apple vinegar (control) because of roselle has a red color and a unique taste that makes it a valuable food product [6]. As for apple vinegar (control), it is known for its sour taste.

For taste scores after taste showed a significant difference ($p < 0.05$) between roselle calyces and apple cider vinegar (control). The roselle calyces vinegar has the highest score of 3.17 compared to apple vinegar (control) of 2.60. This is probably because roselle has a higher polyphenolic content than apples where phenolic amounts are antioxidants [7], and roselle calyx also is the best source of antioxidants [8]. The after taste may be influenced by the polyphenols and antioxidants contained.

For overall scores, found no significant difference ($p > 0.05$) between the vinegar samples. However, roselle calyces vinegar has the highest score of 3.47 compared to apple vinegar (control) of 3.07. This means that the evaluators will generally like and enjoy this sample of roselle calyces vinegar as a whole because of its red color and unique taste. Apple vinegar (control) is not too far behind as it is already commercialized.

Table 1: Mean scores of sensory evaluations for both samples

	Apple Vinegar (control)	Roselle Calyces Vinegar
Color	3.33 ± 0.84	4.23 ± 0.94
Aroma	3.07 ± 1.05	3.37 ± 1.03
Texture	3.23 ± 0.85	3.40 ± 0.97
Taste	2.83 ± 1.05	3.30 ± 1.09
After taste	2.60 ± 0.97	3.17 ± 0.95
Overall acceptability	3.07 ± 0.87	3.47 ± 1.07

pH Analysis: Based on the pH analysis using the AOAC 945.10 method recorded in Figure 2, the pH value of roselle calyces vinegar is 1.9 and 2.9 is the pH value of apple vinegar (control). The ideal pH value for food acids or the appropriate pH for vinegar is 2.4 and does not exceed 4.0 as this pH value protects the most harmful bacteria. The lower the pH value the acidic the vinegar is. The acidic foods have a sour taste [9]. However, rosellé is already known for its sour taste as a result of the presence of some organic acids [10]. The pH value is an indicator of the presence of anthocyanins, while the lower the pH value the higher the anthocyanin content [10].

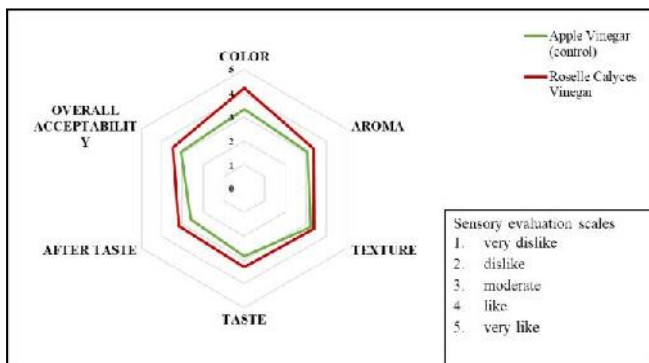


Figure 1: Sensitivity mean score for both samples

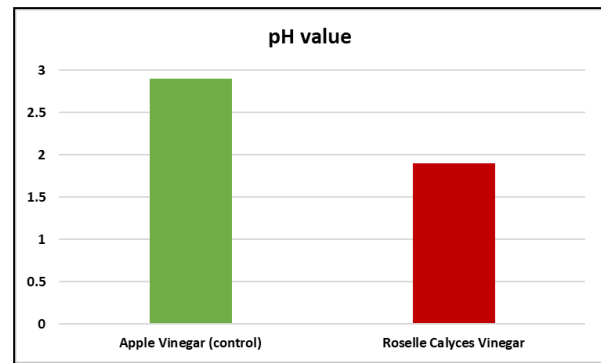


Figure 2: pH analysis of both vinegar samples

Nutrition Content Analysis: Nutrition content analysis showed in Table 2 was conducted to provide more information about the nutritional content of each vinegar sample. The results showed that roselle calyces vinegar contains energy and carbohydrates more than apple vinegar (control). Roselle powders contain high levels of protein, oil and carbohydrate content [11]. Meanwhile, apple vinegar (control) was 0.02g higher in protein parameters than roselle calyces vinegar. However, the protein in apple vinegar is still considered to be very low in content. For fat parameters, both samples contained no fat. This is because apples and roselle contain fiber [12].

Table 2: Differences in nutrient content in 100g (per sample) of rosemary and apple cider vinegar (control)

Parameter	RESULT (Per 100g)	
	Apple Vinegar (control)	Roselle Calyces Vinegar
Energy	2 kcal	6 kcal
Carbohydrates	0.6g	1.6g
Protein	0.02g	0g
Fat	0	0g

Conclusion

Based on the sensory evaluation, it can be concluded that roselle calyces vinegar is the most acceptable compared to apple vinegar (control) as it has the highest score in every sensory evaluation. Roselle has been reported to be a tasty beverage product [7], and has been an attractive source of red since it has become a food coloring [10]. In terms of nutritional content, roselle calyces vinegar also contains more nutritional content than apple vinegar (control). Therefore, roselle calyces vinegar has the potential to be commercially comparable to apple vinegar (control).

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Development of high calcium flour from fish bones of Japanese Scad (*Decapterus maruadsi*) and characterization of nutritional quality

Noor Ain Abd Hamid ^{1,a}

¹Department of Agrotechnology and Bioindustry, Politeknik Jeli Kelantan,
17600 Jeli Kelantan, Malaysia.

^anoorain@pjk.edu.my

Abstract. Japanese Scad is known in east coast Malaysia especially in fish cracker industry. Japanese Scad's bones are obtained from otoshimi factory in Besut Terengganu. Most fish processing industries use only part of the fish. More than 50% of fish tissues including fins, heads, skin and viscera are discarded as they are considered wastes. In most countries, large quantities of fish waste and fish product are dumped to the environment and converted it as a source of pollution. Fish bone waste can produce good quality of products such as food, cosmetics and drinking water filter. In this study, Japanese Scad's bones were went through the process of making flour to produce instant fritter. The process of separating calcium from the fish bone is done by using deproteinize technique. The fish bone powders were extracted by boiling the fish frame with water. The calcium level of fish bone flour and nutrition of instant fritter that is made of Japanese Scad's bones flour were tested through proximal testing and sensory analysis by doing a questionnaire survey. The sensory analysis of the instant fritter was determined in terms of taste, texture, color and overall acceptance. The result of proximal test shows that 100mg of fish bone flour contained 34% of calcium. Through microbial testing, fish bone powder is also safe as it does not contain salmonella, yeast and fungal bacteria. Nutrition analysis of instant fritters also shows a high percentage of calcium of 6076.3mg in 100g of samples. Overall product acceptance showed that the mean level is 3.67. This study is crucial to create new innovative products that can be commercialized through waste from the fishing industry and thus reduce environmental pollution problems.

Keywords: Flour, Bone, Japanese Scad

Introduction

This study is to produce high calcium flour from Japanese Scad's bones. The flour is made by separating the fish content completely from the bones. Japanese Scad is chosen to be a flour mixture because it has a higher calcium content compared to other marine fish. Japanese Scad's bones can be easily got as a result from processing crackers industry. The calcium found in the Japanese Scad's bones can bring many benefits to the consumers. The nutrients contained in the Japanese Scad are essential nutrients needed by the human body such as protein, fat, carbohydrates, phosphorus, vitamin A, iron and calcium. There are five common types of Japanese Scad which are *D.kurroides*, *D.ruselli*, *D.makromosa* dan *D.maruadsi*. Japanese Scad

chosen to be mixed with the flour is a species of *Decapterus maruadsi*. Most fish processing industries use only part of the fish. More than 50% of fish tissues including fins, heads, skin and viscera are discarded as they are considered wastes. Waste from food industry is an important source of environmental pollution. Research has been conducted in Malaysia to develop methods to convert residues into useful products. More than 50 % of possibilities of the remaining from the total catch does not use as food and involves almost 32 million tonnes of wastes. In Malaysia, the average of household produces about 0.5 kg to 0.8 kg waste per day and the remaining food constitutes almost 63.1% of total solid waste [1].

The production of loin tuna that tends to increase each time leaves fish litters such as fish head, fishbone and fish scales which become a huge environmental issue. It has been confirmed that tuna fishbone litters keeps increasing each year, giving negative impact to the environment [2]. The strategy to reduce waste in the industry is to produce products that can be commercialized through the waste of fish. Most of the three common methods for reuse of aquatic waste (either aquatic or wild sources) are fish oil / oil production and organic fertilizer production [3]. Fish bone waste processing can also produce variety of food products, cosmetic products and even drinking water filters. Fish bone waste from the processing crackers industry can be utilized into hydroxyapatite to treat environmental pollution as a result of heavy metal removal. Hydroxyapatite is one of the bioactive products, which can be obtained from fish by-products via hydrolysis and thermal processes [4].

A study conducted by [5], has produced biscuits from catfish bone flour with high calcium and phosphorus minerals. This is further reinforced by the studies from Aly [6], which also produces high calcium biscuits from tilapia fish bones. The awareness of the importance of calcium in society has encouraged the production of high calcium food products. Fish bone flour contains minerals and most of it is calcium. From the point of view of Nabil [7], fish bones are rich in calcium, phosphorus and carbonate that is needed by human body. Calcium fortified products would be helpful in enhancement of the levels of calcium intake [8]. Most of the food products on the market use calcium from dairy products such as milk, cheese and yogurt. Calcium-based products are rarely taken by the society because the price of the milk is higher. Therefore, efforts should be made to find another alternative source of calcium that are cheaper, readily available and absorbed by the body. According to [9], in developing countries, common food products successfully fortified with calcium are including milk products, wheat flour, corn, flour, salt, sugar, fats and oils. These products are enriched by using commercial calcium salts such as calcium carbonate, calcium citrate and tricalcium phosphate whereas the use of natural calcium sources such as fish bones is more acceptable to consumer and is more effective in terms of the presence of calcium phosphate compounds similar to human bone components [10]. Calcium from animal sources such as fish bone wastes has not been fully utilized for human use. Fish bones are one of the processing industry fish waste contains the highest calcium content in the body fish because main of the fish bones are calcium, phosphorus and carbonate.

Previous studies on fish bone flour have been conducted in Indonesia in Palembang. Palembang is known for producing traditional products from the basic ingredients of fish for example meatballs, grilled fish cake and savory fish crackers. The production process uses fish meat (40% of fish weight) while 60% consist of the liver, fins, bones, tails, and heads. The total number of fish bone fragments considered as residues is estimated about 10-15% of the total body weight [11]. According to [2], fishbone has 10% of proportion out of the total fish body and it contains high calcium. Fishbone also contains various minerals especially calcium and phosphor. The fish residue can be further enhanced by producing quality products such as commercial fish flour production as the main ingredient. Researchers have also done research on University of Terengganu researchers on fish waste bones. They carry out a free program of fish waste management to the cracker processing community to utilize fish bone waste into a variety of community needs products under the UMT Center for Socio-Economic Development (CSD) research program [12].

In terms of dietary and nutritional needs, fish bones are rich in calcium that humans need because the main elements of fish bones are calcium, phosphorus and carbonate. According to [11] states that fish bones are a valuable source, as a high quality food or supplement to prevent calcium deficiency and reduce the risk of osteoporosis. Researchers from Universiti Malaysia Terengganu (UMT) have also produced pizza from fish bones. The fish extraction process has been converted into hydroxylate (HA) powder to produce pizza bread. Pizza from leftover fish has six times more calcium than any pizza on the market. In addition, this innovative pizza bun is also more durable. According to [12] fish bones are considered useless, however, they are a low-cost material and rich in calcium phosphate sources. The reuse of fish bones can reduce the cost of disposal into the environment and environmental pollution. Large quantities of fish waste and fish waste products are dumped into the environment and converted into sources of pollution [13]. The objective of this research is to perform extraction to produce japaness scad fishbone flour as an ingredient to produce food product.

Methodology

Production of japaness scad's bone flour

Japanese scad (*Decapterus maruadsi*) fish bone was collected from the otoshimi processing factory in Besut Terengganu. The weight of fish bones used is 10 kg. The research was carried out in two stages which are the process of making bone flour and calcium content analysis and microbial testing. The process of separating calcium from the fish bone is done by using deproteinize technique [14]. The fish bone powders were extracted by boiling the fish frame with water. The process of the production was started by cleansing the bones from dirt such as blood and other dirt, followed by boiling the bones. The bones were boiled for 30 minutes at 100 °C to

facilitate the process of clearing bone from flesh, fat and blood that was attached to the bone, which is the first stage of protein removal. Then the bones were washed using water. The bones were put into the boiler again for 4 hours at 100 °C for a second stage of protein removal to remove the fat present in the bone. The bones were rinsed for a second time and then being autoclaved for 2 hours at 121°C for one hour. This process works to sterilize the bone from the microbes and remove the fat present in the bone. Additionally the protein will be denaturation and clumped. This warming is also intended to gather fish bones to facilitate the next process. The bones being put into an oven at 60°C for 8 hours. The next step was done by grinding the bones using the disc mill, and filtering it within 100 mesh size. Bone flour that was produced is sent to laboratory for a proximal test.

Production process of instant fritter from fish bone flour

Wheat flour (300 g) and fish bone flour (150 g) ratio 2:1 were mixed into bowls and added with sugar, salt, baking powder, vanilla essence, coconut milk and a cup of water. The mixture is mixed thoroughly and dried in a oven at 60 °c for two hours. The dried dough mixture is blended to form instant fritters. Product of instant fritters from fish bone flour is sent to the laboratory for proximal testing. The proximate compositions of fish bone flour were determined according to the AOAC 976.05 method. The In-house Method Based on AOAC 999.11 was used to determine calcium. The survey method was used to obtained data to determine the consumers' acceptance of instant fritters from fish bone flour with the total respondents were 269. Selected respondents were trying the product and answer the questionnaire provided. The sensory attributes selected were tastes, texture, color and overall acceptance. The results from the survey were analyzed using the "ANOVA-single factor" to determine significant differences in sensory quality between fritters samples. Standard deviation was calculated using the same software.

Results and discussions

Proximate analysis

Table 1 shows the results of the proximal and microbial tests that are tested from 100gm of fish bone flour.

Table 1: Proximate and microbial tests

Nutritional Information
Serving size 100g
Calcium 34g
Yeast & Mould 25°C, CFU/gm = NG(<10)
Salmonella = Absent

As a result of this study, the value of calcium in fish bone flour is very high by 34%. Studies from [15], showed that the calcium content of tuna fish bone was 24.56% and that of bone flour was 38.16%. Calcium for mackerel fish bone was 14.3% [16]. According to [17] stated that some differences in the amount of calcium in fish bone is related to the fish species, age, feed nutrition, the amount of the marrow in the different bones, fat and tendons on the surface of the bones and cartilage joined to the bones.

In previous studies, the amount of Ca in fish bone powder for various fish species was in the range of 21–38% [11]. This study is parallel with the previous study. The results of the microbial test showed that fish bone flour was free from salmonella. Therefore, this flour is safe to use in the production of food product. Table 2 and Table 3 shows the comparisons of the proximate test of the instant fritters products made from fish bone flour with commercial fritters product.

Table 2: Proximate Test of Fish Bone Flour

Nutritional Information
Serving size 100g
Nutrients per 100g
Energy 325 kcal
Carbohydrate 51.9
Protein 13.8g
Fat 6.9g
Calcium 6076.3mg

Table 3: Proximate Test of Commercial Fritters

Nutritional Information
Serving size 100g
Nutrients per 100g
Energy 389 kcal
Carbohydrate 77.6
Protein 8.1g
Fat 5.1g

The results of the proximate test showed that the fat content in the fritter fish bone flour was slightly higher than commercial fritters. Protein content is also higher than commercial fritters. This is because the process of making bone flour only uses a boiling method method to get rid of the organic residue in the bone. The results of [18] using alkali treatment showed that protein and fat content in fish bone powder decreased when using NaOH solution. The use of NaOH during bone powder processing will remove organic ingredients from fish bones which is agree with the results of [19]. According to a study from [20], catfish flour contains 67.76% protein and 9.8% fat. However, nutrition studies for Japanese Scad's bones have yet not found. In order to the enrichment of food products by using fish bone flour at a level of about 240 mg of calcium per serving size equal with the one cup of milk, 0.63g of fish bone flour is needed and the amount of the protein and fat in fortified products will be 0.10% and 0.02%, respectively, which is negligible. So, the presence of protein and fat in fish bone flour and fortified products are not a big deal [15].

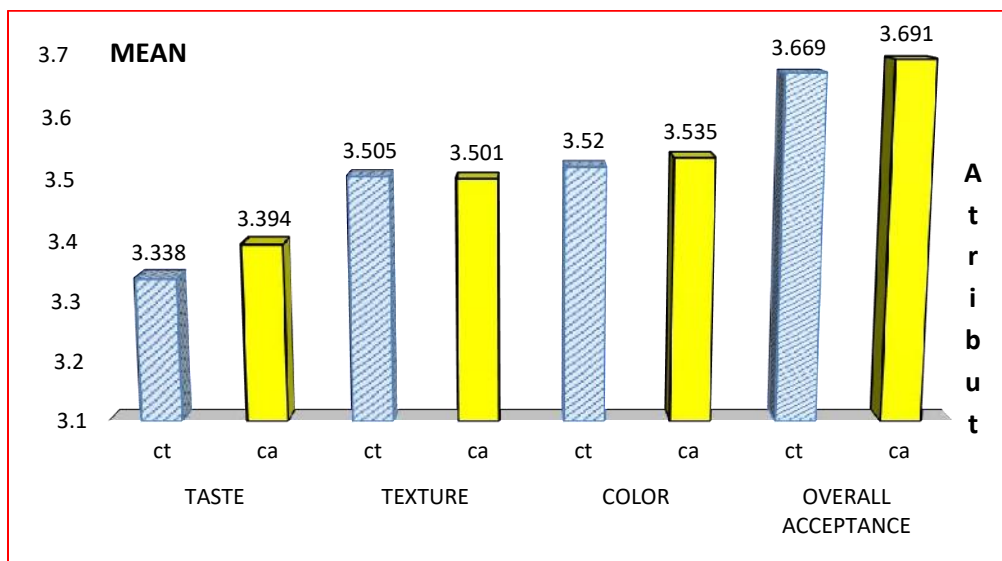
Results of sensory analysis

Figure 1: Mean Value Graph

Table 4: Results of sensory analysis

ATTRIBUTES	FRITTER BONE FLOUR	COMMERCIAL FRITTER
TASTE	3.338 \pm 0.782	3.394 \pm 0.743
TEXTURE	3.505 \pm 0.667	3.501 \pm 0.655
COLOR	3.520 \pm 0.661	3.535 \pm 0.660
OVERALL ACCEPTANCE	3.669 \pm 0.571	3.691 \pm 0.564

The following is a survey of 269 respondents. Table 4 showed there is no significant difference in taste, texture, color and overall acceptability between fritter bone flour and commercial fritter. As for taste attributes, the taste of commercial fritters are better than fritter bone flour, which was 3.394 and 3.38, respectively. The results showed that using a 2: 1 ratio of wheat flour (300 g) and fish bone flour (150 g) makes fritters smell like fish. The results of Kettawan et al., (2002) show that the treatment of alkali with NaOH solution during fish bone flour processing can reduce fish odor. In terms of texture, there is no significance difference between commercial fritters and fritter bone flour, which was 3.505 and 3.501, respectively. Although the texture of the fish bone flour is very delicate, the fritter made from bone flour is a bit hard compared to commercial flour. According to [21], the more use of fish flour the harder the products becomes. This is because fish flour does not contain gluten. As a result, the mixture does not grow well, and will produce a hard texture. The color of the fritter bone flour is slightly darker than the commercial ones. Color is a parameter of the attribute of quality that is visible to

the eye, so that it is very important and determines user acceptance. The results show that fish bone flour is inexpensive and an alternative source of environmentally friendly calcium that can be converted into nutritious value products to increase the amount of calcium in the body and require a combination of processing in terms of product formulation.

Overall product acceptance showed that the mean level is 3.67. Fish bone flour in the form of fine powder, white color and no fish smell, can make it an excellent source of calcium for the purpose of additional calcium supplementation or enrichment of food products. This study indicates that fish bone flour is rich in calcium and may be considered as a potential source of calcium in enriching food products for human consumption. The results of the study were obtained from the sensory analysis parallel with experiment products such as bread enriched with fish bone flour in terms of taste score, odor, color, texture, general appearance and overall product acceptance. Fish bone flour (0.63 g) was added as a source of calcium to the bread product to provide 240 mg of calcium per serving in bread (50 g). This result shows that bakery products enriched with bone flour are acceptable to consumers without any unwanted effects on their sensation [15].

Conclusion

From the results, it was shown that fish bone flour is rich in calcium and it would be suitable to use as excellent calcium source for human utilization either directly as supplement or indirectly as fortificant for enrichment of the food products. The production of fish bone flour is very useful for the management of fish waste organic recycling and its advantages in producing various products in the needs of the community. In the future, researchers plan to continue the research to diversify the use of fish flour for commercialization of domestic and foreign products. Collaboration with agencies such as the Department of Fisheries is also seen as an opportunity to develop products more than fish bone flour.

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Modelling and Simulation of Battery Electric Vehicle with consideration of Propulsion Load and Auxiliary Load

Tengku Azman Tengku Mohd^{1,a}, Mohd Khair Hassan^{2,b}, Ishak Aris² and Azura Che Soh²

¹Politeknik Kuala Terengganu, Jalan Sultan Ismail, 20200 Kuala Terengganu, Terengganu, Malaysia

²Department of Electrical and Electronic Engineering, Faculty of Engineering, Universiti Putra Malaysia, 43400 Serdang, Selangor, Malaysia

^atgazman@pkt.edu.my, ^bkhair@upm.edu.my

Abstract. As electric vehicle becomes a favorable alternative for sustainable and cleaner energy emission in transportation, modeling and simulation of electric vehicle has attracted increasing attentions to the researchers. The preliminary study of electric vehicle is preferably done using simulation software to avoid expensive on the road test and reducing manufacturing time. Therefore, it is important to ensure a comprehensive simulation model of the battery electric vehicle (BEV) considering both propulsion and auxiliary load in order to obtain accurate data analysis. This new and improved BEV simulation model was developed based on mathematical equation using white-box modelling in Matlab-Simulink environment. The model consists of BEV powertrain; HV and LV battery, DC-DC converter, DC-AC inverter/rectifier, transmission gearing, tire, vehicle dynamic, controller (driver), electrical motor (PMAC) as propulsion load and two groups of auxiliary loads. The simulation test in three driving cycles has verified its robustness and effectiveness in achieving the performance objectives.

Keywords: modelling, battery electric vehicle, propulsion load, auxiliary load, Matlab-Simulink.

Introduction

The issues of energy conservation and environment protection have raised an increasing awareness on the importance of heading towards a sustainable alternative transportation. In regard to this, automakers and researchers have essentially spent their time and effort to gradually improve the vehicle drivetrain efficiency and fuel economy; shifting from conventional internal combustion-based high emission vehicle (ICEV) to low or zero emission vehicles. As a result, these days, many sustainable candidates are already made available on the road, for instance; hybrids (HEV), plug-in hybrids (PHEV), fuel cells (FCEV), and battery electric vehicles (BEV). Among all the alternatives, battery electric vehicle (BEV) is the most prominent in term of performance, energy efficiency, noiseless, less maintenance, produces zero tail pipe emission and can be regulated by the power grid regulator as illustrated in Figure 1 [1-8].

However, the major drawback of BEV from being widely adopted is the range limitation due to the constraint of energy storage capacity in batteries which is also the most expensive part of the vehicle [2, 9]. Prospect consumers are aware of BEV advantages, but many are reluctant or unable to pay 20% to 50% more than comparable ICEVs value [9]. Nevertheless, the battery price is continually decreasing due to the research and development in battery technology. Consequently, BEVs and ICEVs parity price is projected to be realized in 2020 [11]. Therefore, in these remaining years, BEVs deserve an enormous attention by the researchers to prepare them for the next upcoming technologies.

At present state, modeling and simulation has becoming an essential step to facilitate system design while reducing the costs and time of actual product development [12]. Since BEV is equipped with various electrical and mechanical components which are expensive and complex to be tested, modeling and simulation can help automakers in minimizing the energy consumption, correctly sizing

the components and choosing the best control strategy. Developing a good and accurate simulation model is imperative in order to avoid incorrect conclusions. The model has to be comprehensive and multidisciplinary accounts for different physic domains; mechanical, electrical, power electronic, control and thermal [13].

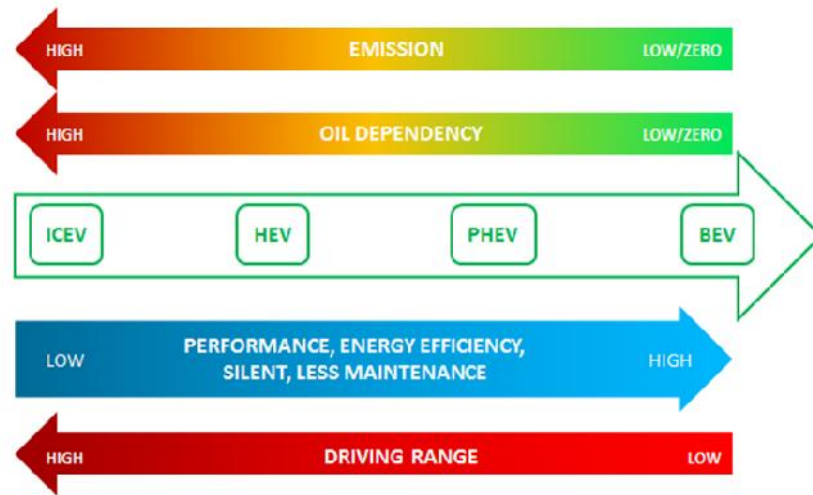


Figure 1. Development in electric vehicle technology.

BEV has become a subject of interest among researchers due to its great potential as sustainable vehicle. Modeling of BEV has been performed by the automakers in various commercial simulation tools such as CarSim, SIMPLEX, MARVEL, V-Elph and ADVISOR [7]. However, most of them possessed their own limitation; focused more on propulsion load, less focus given to auxiliary load, limited option for customization based on local parameter, and concerned more on data reporting instead of modelling. Thus, the modelling of BEV has been proposed which comprises of propulsion and auxiliary loads, adapting Malaysian environment and social requirements.

The BEV simulation model is proposed in order to fill in the following gaps in current situation; the lack of exploration towards BEV due to driving range anxiety, insufficient level of accuracy in simulation model among components may lead to incorrect conclusion, and the need for simple, flexible and comprehensive design (include both propulsion and auxiliary loads). This paper presents the modeling of BEV model where the propulsion load is entirely powered by the high voltage battery, and auxiliary load takes on the low voltage battery. The simulation model is simply configured with separately boost and buck converters between the supply and loads.

Materials and Methods

Model configuration. The performance of BEV model was set according to commercial BEVs performance as shown in Table 1. The listed parameter will become the performance references for BEV model development.

Table 1. Model performance comparison among commercial BEVs.

BEV	Performance parameter			
	Top cruising speed, v_{max}	Acceleration time, t_a (0-100 km/h)	NEDC range (100% DOD)	NEDC range (80% DOD)
1. Nissan Leaf 2010-2013	144 km/h	11.9 s	175 km	140 km
2. Mitsubishi i-MiEV 2010	130 km/h	9.5 s	150 km	120 km
3. Ford Focus Electric 2013	135 km/h	11.4 s	162 km	130 km
4. LG-Proton IRIZ BEV	150 km/h	9.0 s	300 km	240 km
5. BEV model	150 km/h	10.5 s	250 km	200 km

* NEDC is New European urban and extra urban driving cycle, DOD is battery depth of discharge.

The modelling of BEV-001 has been performed in the Matlab-Simulink environment using white-box modelling. The vehicle is configured according to Figure 2 and consists of; high voltage (HV) battery pack, low voltage (LV) battery, power electronic converter and inverter, propulsion load (electric motor), mechanical transmission, HV auxiliary load and LV auxiliary load.

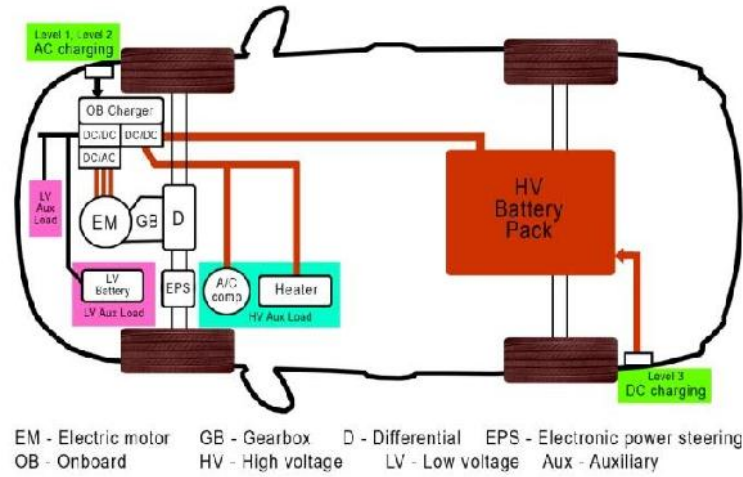


Figure 2. Component configuration of BEV.

Modelling of supply-load topology. Regardless any drivetrain layouts, BEV basically consists of three major subsystems; energy source (supply), propulsion load, and auxiliary load [14, 15]. The supply-load topology for our model is as presented in Figure 3.

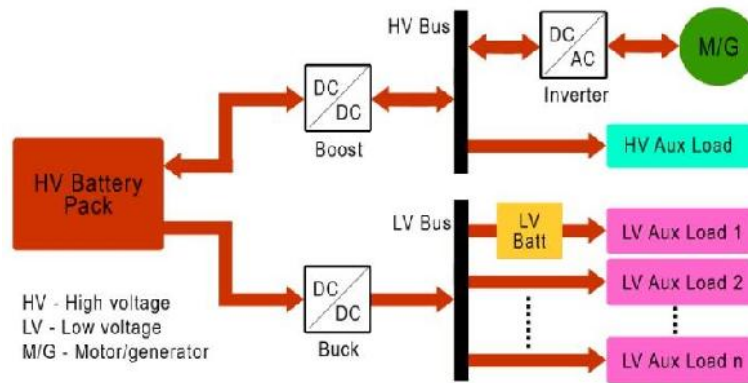


Figure 3. Supply-load topology of BEV.

A. HV Battery Model. The HV battery pack is a lithium-ion battery based on Winston Battery model WB-LYP40AHA [16] as shown in Figure 4. The battery pack comprises of eight modules, where a module consists of two-parallel and 12-serial (2P, 12S) cells connections. These connections will increase the pack Ah capacity from 55 Ah to 110 Ah and nominal voltage from 45 V to 360 V.

The mathematical equations for HV battery state of charge (SOC) is given as follows;

$$SOC(t) = SOC(t_0) - \int_0^t \frac{i_{bat}(t)}{3600 \cdot C_n} dt \quad (1)$$

where $SOC(t_0)$ is the initial SOC level, $i_{bat}(t)$ is the battery current and C_n is battery rated capacity.

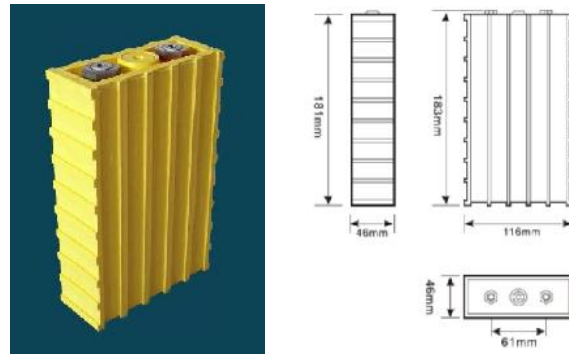


Figure 4. High voltage traction battery WB-LYP40AHA [16].

B. DC-DC Converter. The DC-DC converter is to increase or decrease the voltage from the HV traction battery to suit the voltage requirement of the loads. Two types of DC-DC converters are used; boost converter, and buck converter. Both are assumed operating in continuous mode. The voltage ratio and current ratio of boost converter are based on the following equations;

$$\frac{V_o}{V_i} = \frac{1}{1-D} \quad (2)$$

$$\frac{I_o}{I_i} = (1-D) \cdot \eta_{DCDC} \quad (3)$$

where V_o is the output voltage (bus voltage), V_i is the input voltage (battery voltage), I_o is the output current, I_i is the battery current, and D is duty cycle.

C. Propulsion Load. Propulsion load, typically an electrical motor is the most important load to EV as it serves for vehicle traction and usually the most energy consuming load. One advantage of using electric motor is its capability to recuperate energy during regenerative braking which helps to increase the traction battery energy level during driving. Propulsion load could be any type of AC or DC motor, however the most popular candidates for EV are induction motor (IM), brushless dc (BLDC), brushless ac (BLAC or PMAC), and switch reluctance motor (SRM). The BEV model are PMAC motor based on YASA-400 from YASA Motors [17]. This motor possesses a high torque and power density capability that suitable for EV applications.



Figure 5. YASA-400 electric motor from YASA Motors [17].

The electromagnetic torque for permanent magnet AC motor (PMAC) is given by the following equation;

$$T_{em} = k_e \left[f(\theta_e) i_a + f\left(\theta_e - \frac{2\pi}{3}\right) i_b + f\left(\theta_e - \frac{4\pi}{3}\right) i_c \right] \quad (4)$$

where k_e is motor torque constant, θ_e is rotor angle and i_a, i_b, i_c is phase currents from inverter.

D. Vehicle Dynamic Model. It is necessary to identify each of the acting forces in a vehicle direction to determine its movement behaviour. The dynamic model for BEV is based on [14] as illustrated in Figure 8 and represented by the equations (5) – (8).

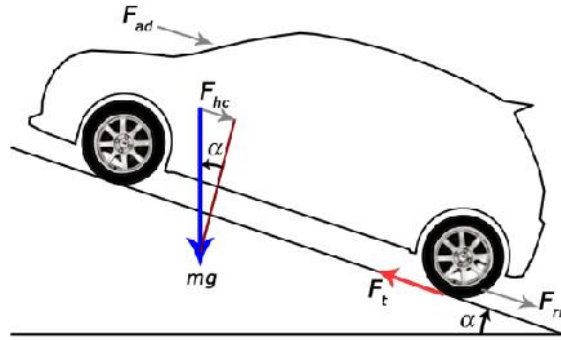


Figure 6. Forces acting on a vehicle moving uphill.

$$M \frac{dV}{dt} = F_t - (F_{rr} + F_{ad} + F_{hc}) \quad (5)$$

$$F_{rr} = MgC_r \cos \alpha \quad (6)$$

$$F_{ad} = \frac{1}{2} \rho A_f C_d V^2 \quad (7)$$

$$F_{hc} = Mg \sin \alpha \quad (8)$$

where M is vehicle curb weight, $\frac{dV}{dt}$ is vehicle linear acceleration along longitudinal direction, F_t is traction force, F_{rr} is rolling resistance force, F_{ad} is aerodynamic drag force, F_{hc} is hill climbing force, C_r is tire rolling resistance coefficient, g is gravitational acceleration, α is slope angle of the road, ρ is air density, A_f is vehicle frontal area, C_d is aerodynamic drag coefficient, and V = vehicle speed.

D. Auxiliary Loads. The auxiliary loads are loads that accomplish either necessary or desired aspects of vehicle operation [14]. These loads are clustered into four groups; initial load, comfort load, safety load and luxury load, based on their performed functions [15] as in Fig. 9. All auxiliary loads are supplied by the HV battery pack through power buses (HV and LV) except for the safety load, which is fed by the LV battery for safety purposes.

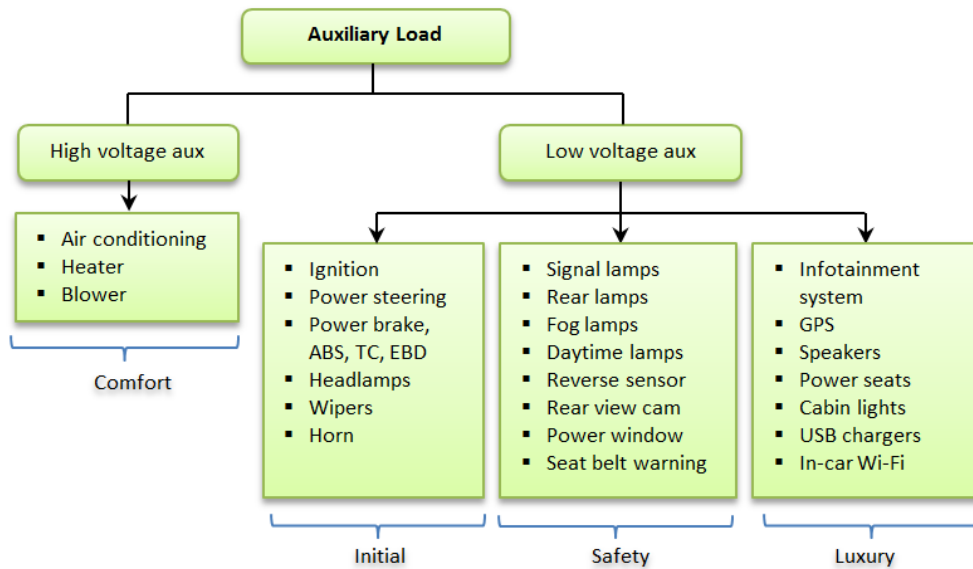


Figure 7. Auxiliary loads categorization [15].

E. Comfort Load Model. Comfort load (a.k.a. HVAC) consists of three loads; (1) air conditioner (A/C), (2) heater and (3) fan/blower. This load is the second highest energy consumption load (after electrical motor). The consumed power is proportional to the difference between outside temperature and cabin temperature. The cabin temperature is control by the user, typically set at 25°C as comfort temperature (based on Malaysia weather) [18].

Air conditioner is modelled based on equation $y = ax + b$ and 3 parameters; (1) $T_{comfort} = 25^{\circ}\text{C}$, (2) $T_{max} = 40^{\circ}\text{C}$ and (3) $P_{max} = 4.5\text{kW}$ as follows;

$$P_{AC} = \frac{P_{max}}{(T_{max} - T_{comf})} T_{out} - \frac{P_{max}}{(T_{max} - T_{comf})} T_{comf} \quad (9)$$

$$P_{AC} = \frac{P_{max}}{(T_{max} - T_{comf})} T_{out} - \frac{P_{max}}{(T_{max} - T_{comf})} T_{comf} \quad (10)$$

Heater is modelled in reverse to A/C by using equation $y = ax + b$ and 3 parameters; (1) $T_{comfort} = 25^{\circ}\text{C}$, (2) $T_{min} = 5^{\circ}\text{C}$ and (3) $P_{max} = 5\text{kW}$ as follows;

$$P_{heat} = \frac{P_{max}}{(T_{min} - T_{comf})} T_{out} - \frac{P_{max}}{(T_{min} - T_{comf})} T_{comf} \quad (11)$$

$$P_{heat} = \frac{P_{max}}{(T_{min} - T_{comf})} T_{out} - \frac{P_{max}}{(T_{min} - T_{comf})} T_{comf} \quad (12)$$

Fan/blower is modelled based on its maximum power rating, $P_{max_blower} = 80\text{W}$.

Results and Discussion

The complete Simulink model of BEV is presented in following Figure 8. In order to validate the model performance, performance simulation test has been employed to the model under two speed conditions; (1) constant speed input of 120 km/h (Figure 9) and (2) driving cycle speed input (Figure 10).

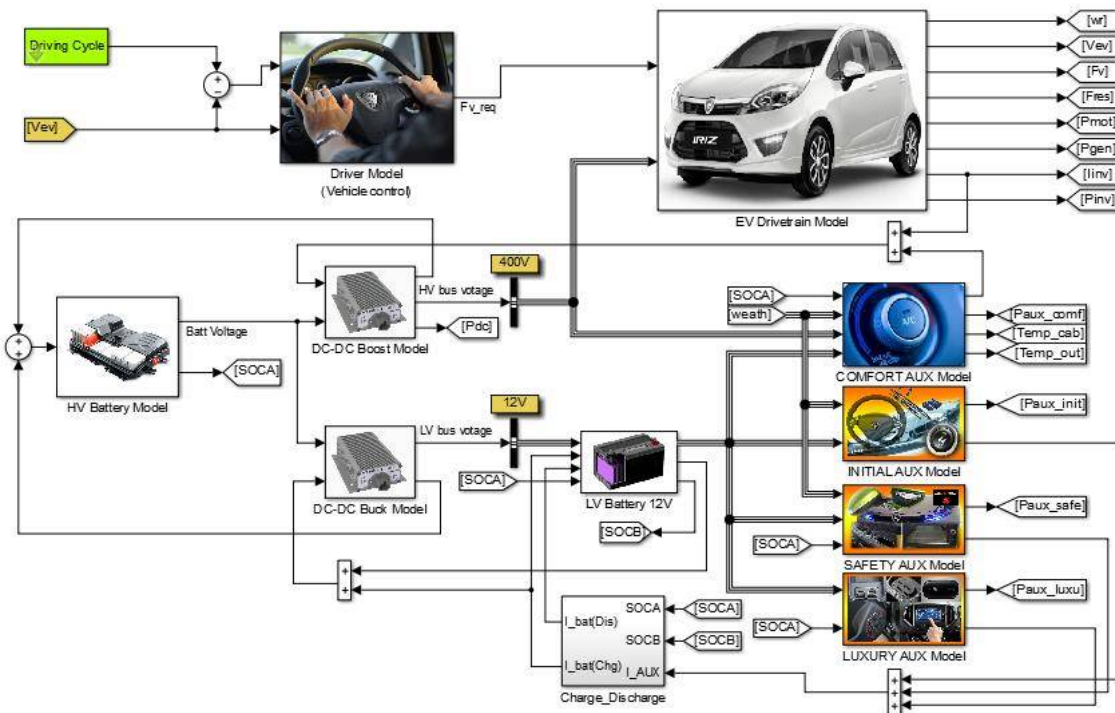


Figure 8. Simulink model of BEV.

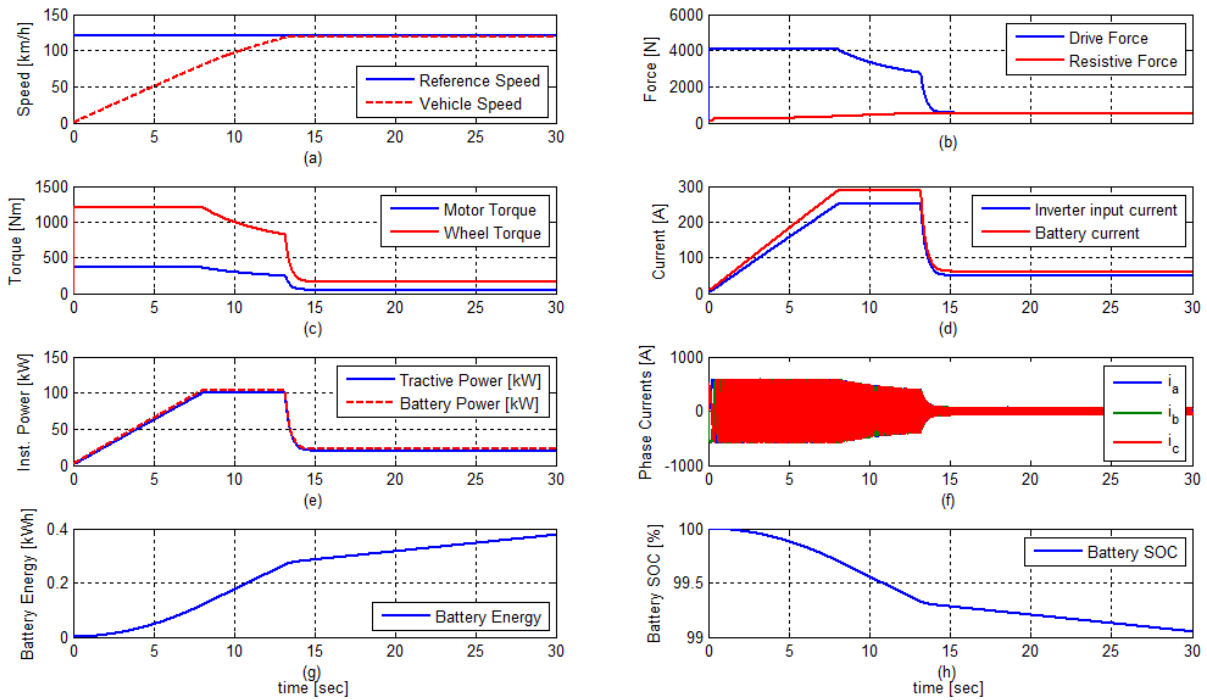


Figure 9. BEV basic model responses against 120 km/h speed input; (a) reference and vehicle speeds (b) drive and resistive forces (c) motor and wheel torques (d) inverter and battery currents (e) tractive and battery power (f) phase currents (g) battery energy, and (h) battery SOC.

According to Figure 9 (a), the BEV model achieved its base speed of 80 km/h in 8.1 s, reached 100 km/h in 10.5 s (acceleration time = 10.5 s) and took 13.2 s to settled. Both torque and force are maximum during beginning, however gradually reduced once the based speed is achieved and finally decreased to its minimum after the reference speed is obtained. There is some considerable resistive force in 9(b) to accumulate for net force command to the vehicle plant. In 9(c) motor torque was converter into wheel torque by the gearing ratio. In 9(d) and 9(e), the current and power shapes are similar which represent the multiple region of constant torque, constant power (flux weakening) and constant voltage. The different between tractive power and battery power is due to the power consumption of auxiliary load. Balanced and healthy condition of the drive currents is illustrated in 9(f). Finally, in 9(g), the consumption of battery energy increased slowly after achieving the targeted speed, oppositely shown by the battery SOC in 9(h).

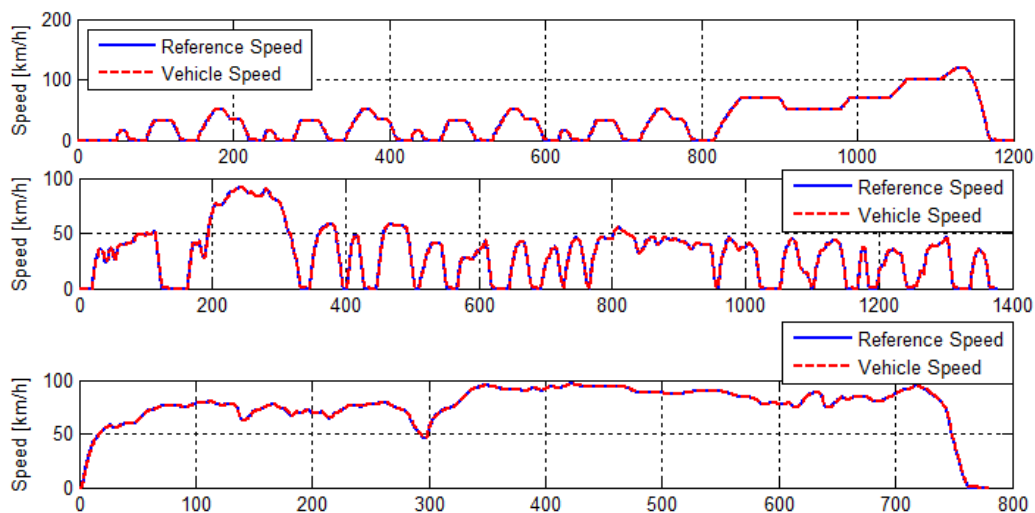


Figure 10. BEV model responses against NEDC, FTP-75 and HWFET speed input.

Based on Figure 10, the model simulation tests in three driving cycles of NEDC (New European urban and extra urban driving), FTP-75 (US urban driving) and HWFET (US highway driving) have shown the performance ability of the BEV model to track the driving cycle speed input. The trip details are as shown in Table 3.

Table 3. Trip parameter comparison between BEV basic model and model with auxiliary loads during NEDC, FTP-75 and HWFET simulation testing.

Parameter	Driving Cycle					
	NEDC		FTP-75		HWFET	
	Basic	With aux	Basic	With aux	Basic	With aux
1. Time travelled (minutes)	20.00	20.00	23.00	23.00	12.75	12.75
2. Range travelled (km)	10.93	10.93	11.97	11.97	16.50	16.50
3. Residual range (km)	239.60	189.60	236.20	186.90	255.50	225.20
4. Total range (km)	250.53	200.53	248.17	198.87	272.00	241.70
5. Battery output energy (kWh)	1.7270	1.9730	1.9100	2.0900	2.4030	2.6080
6. Traction energy (kWh)	1.6920	1.6920	1.8710	1.8710	2.3550	2.3550
7. Regenerative energy (kWh)	0.2582	0.2582	0.4010	0.4010	0.1223	0.1223
8. HVAC energy (kWh)	-	0.4244	-	0.4881	-	0.2759
9. Auxiliary loads energy (kWh)	-	0.0674	-	0.0775	-	0.0438
10. Battery SOC (%)	95.64	94.55	95.18	93.98	93.93	93.17
11. Per km consump. (kWh/km)	0.158	0.198	0.160	0.199	0.146	0.164

From Table 3, during NEDC it can be noted that the total range for BEV is 250.53 km without auxiliary load, and only 200.53 km with auxiliary load. The regenerative energy of 0.2582 kWh was recovered into the battery during braking and costing to be used during the trip. The highest regenerative energy is during urban driving (FTP-75) due to the highest frequency of braking, while the lowest is during highway driving (HWFET). The energy distribution profile during NEDC is illustrated in Figure 11.

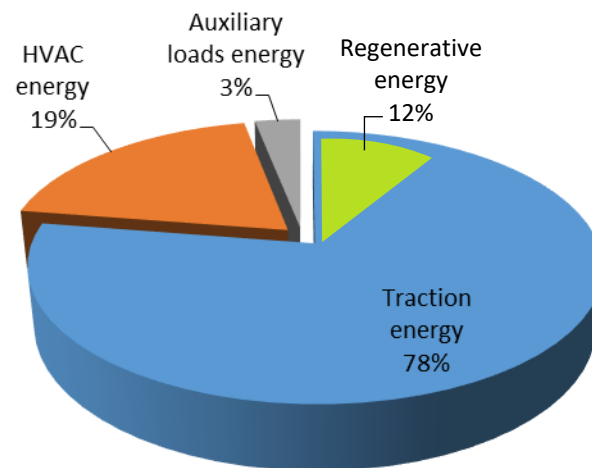


Figure 11. BEV energy distribution profile relative to battery output (kWh) during NEDC

According to Figure 11, energy distributes the highest for traction purpose in propulsion load (PMAC) as much as 78%. The second highest is HVAC (comfort load) with 19% while low voltage auxiliary load only consumed 3% of the battery energy. On the other hand, the regenerative braking feature in BEV has contributed for additional 12% to the battery energy.

Conclusion

In this study, the model of battery electric vehicle and auxiliary loads have been developed using mathematical equations via white-box modelling in Matlab-Simulink environment. The model comprises a multi-disciplinary study of control, electrical, electrochemical, mechanical, electromechanical, and power electronic systems. The model has been tested in constant speed input and three driving cycles speed input (NEDC, FTP-75 and HWFET). The results have demonstrated the model control robustness in speed tracking and achieving the targeted performances. In addition, the model also can be used to illustrate energy distribution profile between loads for the proposed driving cycle.

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Recycling Aluminium Chips (AA6061) Using Hot Extrusion Process for Sustainability Environment and Green Technology

Syaiful Nizam Ab Rahim^{1, a}, Mohd Zaniel Mahadzir^{1, b}, Nik Ahmad Faris Nik Abdullah^{1, c} and Mohd Amri Lajis^{2, d}

¹Department of Mechanical Engineering, Politeknik Sultan Abdul Halim Mu'adzam Shah (POLIMAS), Bandar Darulaman, 06000 Jitra, Kedah, Malaysia

² Sustainable Manufacturing and Recycling Technology, Advanced Manufacturing and Materials Center (SMART-AMMC), Universiti Tun Hussein Onn Malaysia, 86400 Pt Raja, Batu Pahat, Johor, Malaysia

^aSyaiful5599@gmail.com, ^bmohdzaniel@yahoo.com, ^cnikfaris71@gmail.com ^damri@uthm.edu.my

Abstract. This study introduces the direct technique for recycling aluminum chips instead of conventional method which will be carried out without melting phase. The hot extrusion technique is characterized by the low number of steps and gives benefit on low energy consumption and operating cost. It could elaborate technical process details and a systematic characterization of hot extruded profile's properties of the recycled of AA-6061 aluminum alloy chip of different geometries and will show the technique potential regarding yield behavior and microstructure. By following the research task, it is reveal the performance of recycled aluminum chip on their mechanical properties and microstructure by comparing them with the original aluminum-base composite. It is ensure to review the possibility of this recycled aluminum chip as a secondary resources as an alternative to overcome the shortage of primary resources in which it utilizes the metal optimally and able to lower the usage of raw metal.

Keywords: Recycling aluminium, AA6061 Aluminium, Mechanical Properties, Microstructure

Introduction

A global reduction of carbon dioxide emissions is becoming more and more important to prevent global warming caused by greenhouse production. Due to this, the need for decrease in energy consumption of industrial processes as well as transportation and production engineering is a major factor in today's industrial world [1]. This research will introduces the new direct techniques of recycling with low energy consumption and cost without intervening the metallurgical processes. It provides very low air pollution emission and high metal saving as compared with conventional methods [2]. Even for recycling culture among the country's government intensify campaign 3R (Reuse, Reduce, Recycle) to provide bins, garbage variety of colors so that litter easily separated by categories such as plastic, glass, and paper. Metals have always been the most recycled material in the world [3]. Conventional recycling method involves melting scrap aluminium in a secondary aluminium production process. It uses 10-20 times less energy than primary aluminium production. Somehow, by having a melting point at 660°C still define aluminium recycling as an energy intensive process. The waste of aluminium usually comes in the form of chip resulted from the machining of semi-finished products [4,5]. Therefore, this will be an initiative to support our government programs and respected policies in particularly Green Technology and Solid Waste Management in such a way to promote in preventing global warming, reduce the landfill of solid waste production and also decrease the energy consumption. This effort can be described as sustainable manufacturing, which is to create the manufactured products using the process that minimize negative environmental impact, conserve energy and natural resources, safe for communities and economies.

Experiment Procedures

The chip will be prepared using milling Mazak high-speed machining. The mill cutting produces a constant 1100 m/min cutting speed, 1.00 mm depth of cut and 0.05 mm/tooth feed. By applying acetone on the Ultrasonic bath the chip was cleaned and dried at a temperature of 60°C in a hot oven. The characteristics of the output of high-speed milling machining shall be explained in two ways, which is by quantitative measures. The aluminium alloy (AA6061) chips were prepared by machining an ingot using high-speed machining in a milling. Machined chips were kept clean after the turning process. Finally, hot extrusion was carried out at an extrusion ratio of 6:1 to produce a 6mm x 10mm square bar. For comparison, extrusions were processed from as-received 6061 aluminium alloy ingot under the same conditions as the extrusions from the machined chips, as shown in Figure 1(a). Cold compacting phase was performed on a hydraulic press with a maximum pressure of 50 tonnes. In order to create 11 billets (11 set equal 11 billets) in accordance to the experimental plan, chips were compacted with forces of 350 kN. The compacting was carried out by utilizing a die with the inside diameter of 30 mm and a punch of the same diameter. In order to get as far as possible, higher length of the extrudate billets with a minimal height of 60 mm was desired. Preliminary researches showed that compacting force should be at least 200 kN if metallic bonding of the individual aluminum chips was wanted. With the first compaction, initial volume was obtained and new chips were added followed by compaction and so on until the length of at least 60 mm was achieved. The extrudate temperature is the most important because it determines the quality of the product and indicates the possibility of increasing extrusion speed. The achieved tensile strength and elongation of aluminum chips 6061 produced by forward hot extrusion is at least approximately the same then as-received 6061 [6,7,8].

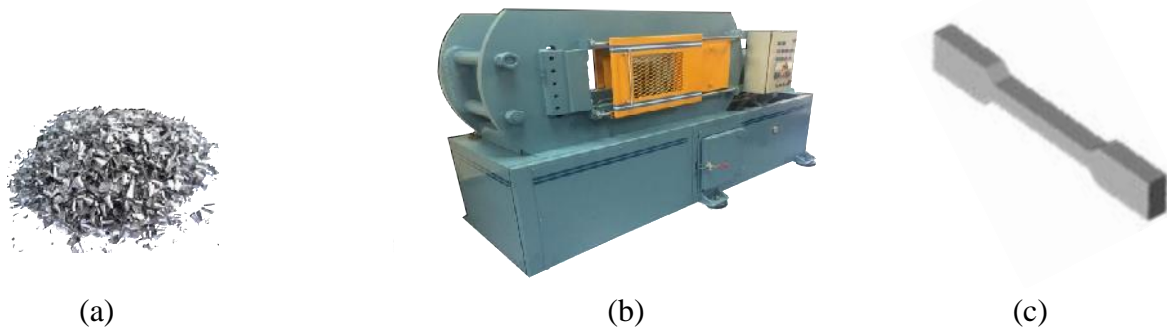


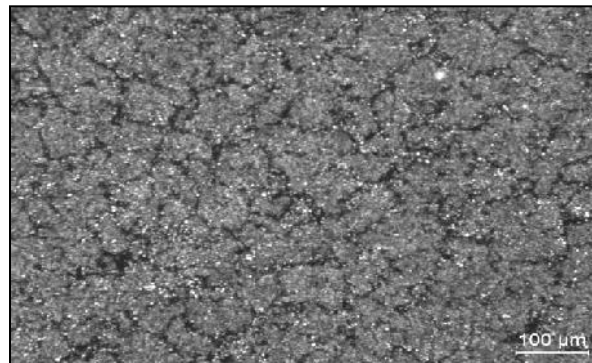
Figure 1. Illustrated (a) chip, (b) hot extrusion machine and (c) dog bone specimen

Table 1. Mechanical properties of producing sections of ER6

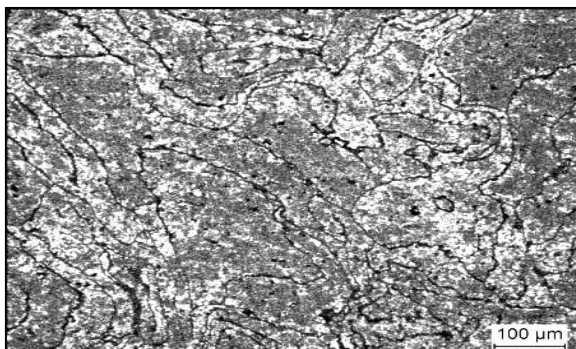
Sample	Preheat Temp. (T) (°C)	Preheat Time, (t)(h)	Ultimate Tensile Strength (UTS) (MPa)	Elongation to failure (Etf) (%)
1	450	1	138.67	11.36
2	500	1	141.16	14.49
3	550	1	160.51	9.07
4	450	2	159.87	19.57
5	500	2	136.51	11.51
6	550	2	165.51	11.97
7	450	3	162.09	20.63
8	500	3	167.82	17.39
9	550	3	170.85	9.07

Result And Discussion

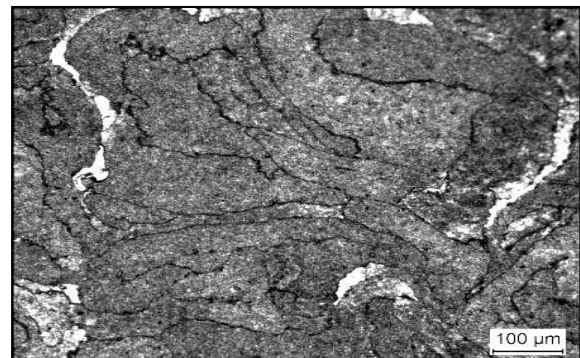
The aluminum chips of medium type were compacted to billets inside a thick-walled steel tube with an inner diameter of 30 mm. Table 1 shows the result of tensile. The relationship between maximum stresses in relation to temperature for both tested materials is shown it. It can be seen that increasing maximum stress leads to the enhancement of preheat temperature, which is a typical behavior of the direct extrusion process [9,10]. Consequently, the higher preheat temperature is applied the higher deformation is induced, which in turn results in increasing maximum stress. It has been shown that the maximum ultimate tensile strength of recycled chip contributes 59.53 % compared with ASM Theory AA6061-T4, 240 MPa and as-received AA6061, 328 MPa tensile tests. The minimum result occurring at preheat time of 2 hours at a temperature of 500°C with a low extrusion ratio of 6, ultimate tensile strength is 136.51 MPa respectively. At the preheat temperature of 450°C, the value of UTS is marginally raised (138.67 MPa) with the rise of preheat time of an hour (159.87MPa) to two hours (162.09MPa). Whereas, at the maximum preheat temperature of 550°C, the value of UTS slightly increased from 165.51 MPa at an hour to 170.85 MPa to two hours. [3,6] stated that the quality of the chip-based finish parts strongly depends on the bonding quality between the individual chips. The results on the effect of preheat time and preheat temperature clearly gave a significant impact to the hot extrusion process when used for the ER6, value of UTS is slightly lower compared with high extrusion ratio (ER). The lower extrusion ratio did not produce a good consolidation when cold pressed chips were employed. Using higher extrusion ratio seems to produce a good consolidation for both kinds of pressed chips [4,5,9,10].



(a) As-received AA6061



(b) Minimum UTS ($T=500^{\circ}\text{C}$, $t=2$ hrs)
[Grain size = 52.04 μm]



(c) Maximum UTS ($T=550^{\circ}\text{C}$, $t=3$ hrs)
[Grain size = 56.43 μm]

Figure 2. Microstructure and grain size for minimum and maximum UTS and as-received (ER6)

Figure 2 shows the microstructure and grain size for minimum and maximum UTS and as-received (ER6). Tensile tests were conducted to determine the mechanical properties of the weld region. Relevant samples were polished, etched with 50% hydrofluoric acid aqueous solution, and observed using an optical microscope. Tensile fractured surfaces were examined through a scanning electron microscope (SEM). The average grain size diameter at minimum UTS with a temperature 500°C and 2 hours of preheating as shown that in Figure 2 (b) revealed to be smaller (52.04µm) as compared to the maximum UTS with a temperature 550°C and 3 hours of preheating (56.43µm) in Figure 2 (c). As shown in Figure 2 (b) and (c), the fractured surfaces of the tensile test specimens cut from the extruded rods had a high density of cavities and dimples. A summary of different extrusion parameters on the samples versus zooming view is referred in Figure 2, which presents microstructure in the horizontal section to an extrusion direction of the recycled specimen observed by Optical Microscope. It is found that the precipitations were dispersed parallel to the extrusion direction in the as-received specimen. This value indicates that the grains were refined by dynamic recrystallisation during hot extrusion. Severe plastic strain and high dislocation density promote recrystallisation. Hot extrusion with the extrusion ratio of 6 : 1 could produce a fine consolidation of the recycled scraps. By using the difference temperatures, [11] showed that recrystallisation grain size is smaller than that of the original grains when the deformation degree is lower. The mechanisms of dynamic recrystallization depend on the plastic deformation process and change with the deformation temperature. Extrusion processed samples, showed large dimple size in the tensile fracture surfaces with clear brittle fracture mode comparable to as-received. The machined chips were not consolidated after compaction at room temperature. The surface of the chips exhibited some breaking and bonding [3,5,9]. The boundaries between chips are distinguished from each other indicating that sound bonding of the chips is not yet complete, and there is a need for an additional consolidation process. Furthermore, voids can be observed between the boundaries of the chips.

These observations are in a non good agreement with the low relative density of the compacted sample. The maximum result occurred at preheat time of 3 hours and temperature of 550°C as illustrated in Figure 2 (b), ultimate tensile strength is 170.85 MPa, respectively. The combination of high heat and low extrusion speed enables the matrix material to flow plastically into the pores and voids, and thus allows longer inter-particle diffusions. The high deformation temperature promotes particle precipitation and realizes interfacial bonding between chips. Chips from alloy exhibit excellent tensile strength when consolidated at a significantly higher temperature and at the same time contribute to poor grain refinement ability. At high temperatures, the chip bonding was improved through the inter-particle diffusion under the high strain in the extrusion process, where the diffusivity between virgin chips also increases [8,12]. The good diffusion bonds and very low porosity of the extruded composite are obtained at high extrusion temperature. According to [13] good inter-chip bonding and improved mechanical properties can be achieved in the recycled 6060 aluminium alloy produced by hot extrusion of chips by both increasing extrusion ratio and using a porthole die instead of a flat die. Recently, [3,5] found that fine equiaxed grains and improved inter chip bonding can be achieved in the recycled AA6060 aluminium alloy produced by hot extrusion of machining chips by using integrated die, which imposes a high pressure and strain during extrusion. In order to void cracks in microstructure analysis, further investigation with higher combination between extrusion temperature and extrusion ration (ER) should be done [14,15].

Conclusion

Tensile test results showed that material extruded at temperature 550°C exhibit higher mechanical properties with comparison to temperature at 450°C. The extrudate temperature is the most important because it determines the quality of the product and indicates the possibility of increasing extrusion speed. The achieved tensile strength and elongation of aluminum chips 6061 produced by forward hot extrusion is at least approximately the same then as-received 6061. At high temperature the chip

bonding improves through the inter-particle diffusion under the high strain in an extrusion process, the diffusivity between virgin chips also increases. Preheating duration times were influenced a better homogeneity of the billet structure made a better consolidation during extrusion processes. At high extrusion temperature, good diffusion bonds and very low porosity of extruded composites can be obtained.

Acknowledgement

The authors would like to express the deepest appreciation to the Department of Mechanical Engineering, Politeknik Sultan Abdul Halim Mu'adzam Shah (POLIMAS) Jitra Kedah, Ministry of Education (MOE), Malaysia, for funding this project through the Fundamental Research Grant Schemes (FRGS - vot numbers 1426, 1463, and 1496). Additional support in terms of facilities was also provided by Sustainable Manufacturing and Recycling Technology, Advanced Manufacturing and Materials Center (SMART-AMMC), Universiti Tun Hussein Onn Malaysia (UTHM).

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Flood Detection and Warning System using Arduino

Mohd Daud Isa^{1, a}, Tengku Azman Tengku Mohd^{1, b}

¹Politeknik Kuala Terengganu, Jalan Sultan Ismail, 20200 Kuala Terengganu,
Terengganu, Malaysia

^amdaudisa@pkt.edu.my, ^btgazman@pkt.edu.my

Abstract. The purpose of this prototype is to simulate the situation of real flood area as a system to detect and monitor the flood event. This prototype system uses Arduino Uno as a main controller, LCD display to show the output of the water level as an indicator for flood level. The water level detection is done by ultrasonic sensors. In addition, the GSM mobile communication system has been used to send warning signal in term of text messages to the villagers/peoples in the affected areas, or sharing them with the authorities. From the testing performed, the result shown the purpose of the prototype developed was successfully achieved, where all circuits and algorithms were completely functioning. Finally, for the future improvement and betterment, the system can be upgraded by installing the prototype in real flood area for testing.

Keywords: Flood detection, warning system, microcontroller, sensor, Arduino, GSM

Introduction

Flood is one of the most destructive phenomena and one of the major disasters occurs all over the world, including Malaysia. It has becomes the most common natural hazard which causes a lot of damages including human life losses, property damages, crops destruction as well as health deteriorations. Flood most commonly occurs from heavy rainfall when natural watercourses or rivers do not have the capacity to convey excess water. As a result, water will flow from river banks to downstream, then to the adjacent low-lying areas and causes floods [1, 2].

In Malaysia, more than 200,000 people were affected by flood while 21 were killed in 2014. This flood has been described as the worst in a decade. Three worst affected states were Kelantan, Terengganu and Pahang. Around 6,700 victims have been evacuated in Kelantan, 4,600 in Terengganu and 825 in Pahang. This happen because of no early flood detection system was installed at the affected area to provide information or signal to warn people in the area. As a consequence, most people were trapped in flood area after water level has increased. Losses due to flood can be reduced by means of measures such as monitoring, forecasting, simulation, evaluation, and analysis [3]. As a result, it is a crucial challenge to the flood management committee, local authorities and experts to provide a vital infrastructure system that able to provide flood-related information and warning system against flood events.

A prototype called Flood Detecting and Warning System has been designed and developed using Arduino. This prototype objective is to simulate the situation at the real flood area to detect and monitor the flood situation as well as to send information/signal via text or short message services (SMS) to flood management committee and local authorities in the case of danger or rapid water level increase as a warning signal. In addition, warning signal to local people/villager through LCD Display, Light/LED color indicator, and alarm system (speaker) have been included.

Literature Review

Several literature studies been conducted for gaining the understanding and the knowledge. L. Siew Khuan et al. invented a system to detect the depth of water. This project was placed in the lowland or the location that a flood always occurs. The system is completed with the warning light, to tell the user road about the flood and will tell the control center the information via the microcontroller Atmel 89S51. This project used the LED Display as output signal to the user road. The other components that been used in the system is encoder, decoder and opto-coupler. As a result, the user will know the flood is occurred when they saw the warning light that been placed at the road side of the flood area. This warning light acted as a sign of the flood, where it is divided into three colors, every color is represented each level of water lever. In the same time, the information of the flood will be sent to the control center to make sure the further action will be taken by the authorities [4]. There are many lacks that been seen in this system, where the user have to be neared to the flood area to get the information, so the information will late to be known by the user. Another problem that occurred, not all user maybe alert with the warning light sign that been placed in the flood area.

D. Hughes et al described a wireless sensor network for flood warning system. Which is not only capable of integrating with remote fixed-network grids for computationally-intensive flood modelling purposes, but is also capable of performing on-site flood modelling by organizing itself as a "local grid" [5]. The combination of these two modes of grid computation to local and remote to yields significant benefits. For example, local computation can be used to provide timely warnings to local stakeholders, and a combination of local and remote computation can inform adaptation of the sensor network to maintain optimal performance in changing environmental conditions.

Jirapon Sunkpho and Chaiwat Ootamakorn develop the system for real-time monitoring of water conditions with water level and flow detection. They develop the precipitation level which is used to be employed in monitoring flood in Nakhon Si Thammarat, a southern province in Thailand. The two main objectives of the developed system is to serve as information channel for flooding between the involved authorities and experts to enhance their responsibilities and collaboration and also as a web based information source for the public, responding to their need for information on water condition and flooding [6].

From these literature study, the current prototype developed is a look likely similar with first and third literature review but the component and algorithm that been used for this project is different. This prototype uses Arduino Uno as a controller, the LCD display to show the output of the water level as well as indicator level of flood such as normal, warning and danger. These water levels are detected by device installed in the system called ultrasonic Sensors. In addition, the GSM Mobile communication was used to warn the villagers/peoples in the particular area as well as sharing the data with the related parties. Therefore, related party especially flood management committee, local authority department such as Jabatan Bomba dan Penyelamat Malaysia, police, Jawatankuasa kampung and etc. will react faster to evacuate the people into safe area. As a result, in real situation people are able to save their life and family, corps, properties etc.

Design and Development of Prototype System

Prototype System Block Diagram. The project design includes the hardware and software system development. The detail of the workflow of the project will be discussed below, This Include device or hardware design and program flow process or algorithm development. Fig. 1 shows the block diagram of the system that has been developed. It includes of Arduino Uno as the main controller, Ultrasonic sensor and temperature sensor as the inputs. The output of the system is GSM module, LCD display, LED indicator, buzzer and water pump.

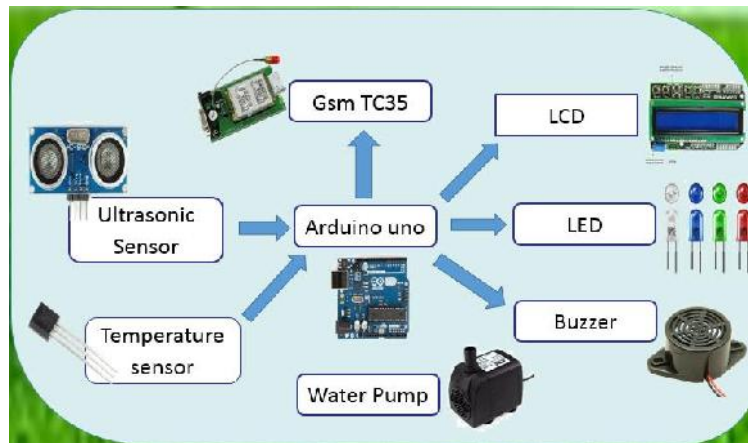


Figure 1. Block diagram of prototype system.

The flood detection system concerns on detection, monitoring and early warning of the floods. The presence of ultrasonic sensor and Global System for Mobile Communication (GSM) into this project, differ it against other floods detection system.

The operation of water level detection started with the detection of current water level by ultrasonic sensor. The LED colour will change according to the water level. Initially, the LED green colour will turn ON which indicates the normal condition of water level. The red colour will turn ON when the water level reached the critical stage or danger. Consequently, the GSM module will send the SMS data to the related party. This prototype model has been provided with water pump to control the water lever during testing.

Arduino UNO Microcontroller. The Arduino Uno is a microcontroller board based on the ATmega328P. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz quartz crystal, a USB connection, a power jack, an ICSP header and a reset button. These systems can be interfaced to various expansion boards ("shields") and other circuits. In addition, it contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with an AC-to-DC adapter or battery to get started [7]. Fig. 2 shows the Arduino microcontroller board used in the system.



Figure 2. Arduino microcontroller board.

For microcontrollers programming, the Arduino project provides an integrated development environment (IDE) based on the processing project, which includes support for the C and C++ programming languages.

Ultrasonic sensor and water level detection. Water level will be identified through water level detection done by ultrasonic sensor. Figure 3 shows the ultrasonic sensors, it can be used to solve even the most complex tasks involving object detection or level measurement with millimeter precision, because their measuring method works reliably under almost all conditions. The sensor surface cleans itself through vibration; make it insensitive to dirt [8].



Figure 3. Ultrasonic Sensor.

Table 1 shows the range of water level and temperature setting used in the prototype system. Instead of water lever, temperature also the second parameter included in the control algorithm for identifying the situation or level (normal/warning/danger) of flood event in the system design. It used to simulate the situation of flood in flooding area. Although this setting uses the same value temperature for algorithm, but for the future it can be changed into the practical situation depending on the value of the temperature for every situations or levels of flood in that particular area.

Table 1. Range of water level and temperature setting.

LEVEL	WATER LEVEL (CM)	TEMPERATURE(°C)
NORMAL	0 - 2.9	27
WARNING	3 - 4.4	27
DANGER	4.5- 7	27

SIM900 GSM GPRS Shield. SIM900 GSM GPRS Shield provides a straightforward way to let Arduino connect to the cell phone via GSM/GPRS network. It can be used with Arduino to dial a phone number or send a text to others easily via AT commands. This latest version features a quad-band low power consumption GSM/GPRS module SIM900 as well as a compact PCB antenna. The SIM900 GPS GPRS Shield comes with SIM900 GPS GPRS Shield Board, Antenna and Antenna Extension Cable as shown in Fig. 4.

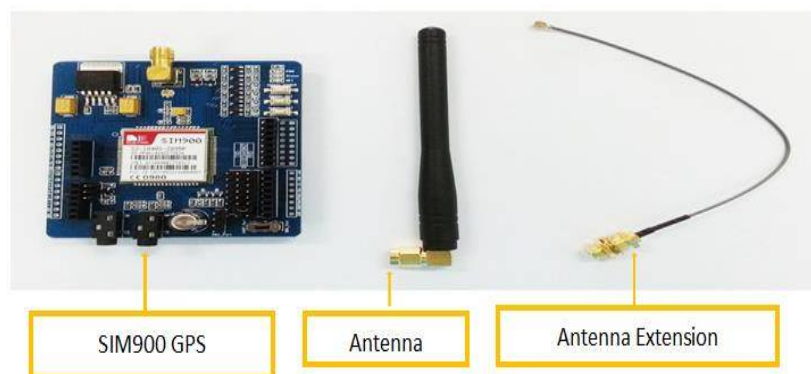


Figure 4. SIM900 GPS GPRS Shield comes with SIM900 GPS GPRS Shield Board, Antenna and Antenna Extension Cable.

Electronic Circuit Diagram. Fig. 5 show the prototype flood detecting and warning system electronic circuit that have been designed using Proteus software.

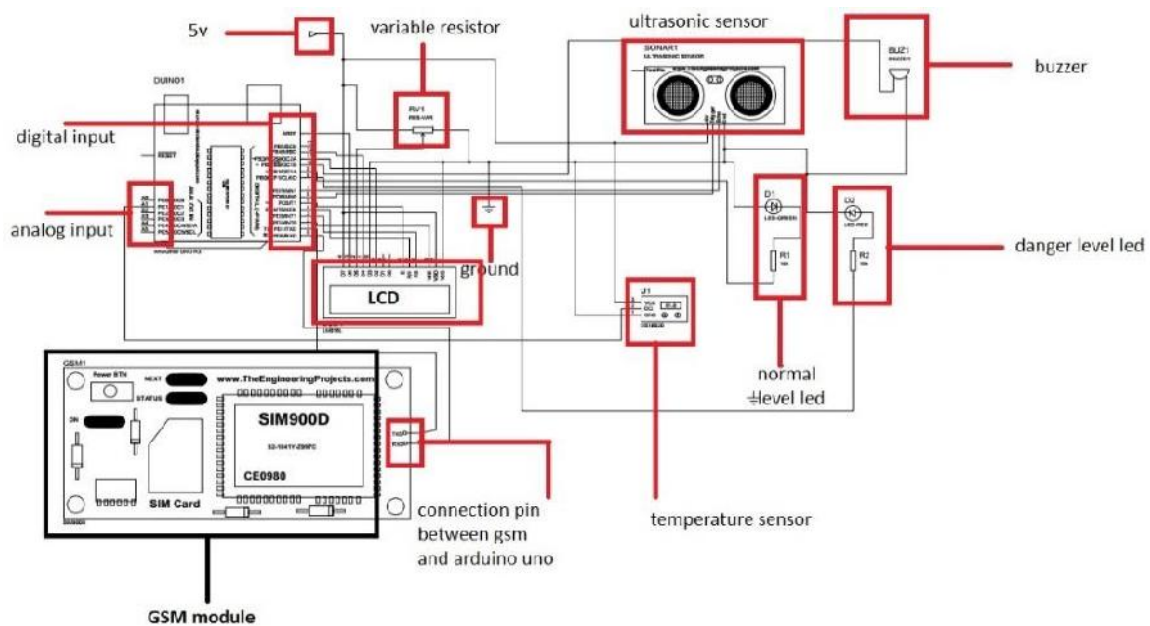


Figure 5. Prototype flood detecting and warning system electronic circuit.

Ultrasonic Sensors connected with Arduino through pin 6 for trigger pin and pin 7 for echo pin. The ultrasonic sensor will be used as water level detector and the signal will be sent to the Arduino circuit in certain period of time as an analog signal. On the other hand, temperature sensor will send a signal to the Arduino circuit in certain period of time through pin A0. The operations of the system will start with the ultrasonic sensor detect the current water level situation such as normal, warning or danger level. Arduino UNO will process the input water level and temperature with the knowledge store in the data base being used as control algorithm system of flow process. Other devices such as LCD display, LED/Light colour indicator and buzzer are connected to Arduino UNO as shows in Figure 5. These devices are used to provide support warning indication of flood to the people around the flood area. The most important device is GSM device which is making alarm signal through the SMS message to the related parties that responsible to the evacuation process if the flood becomes danger or worst. Figure 6 shows the flow diagram of the system upon the power switch is activated.

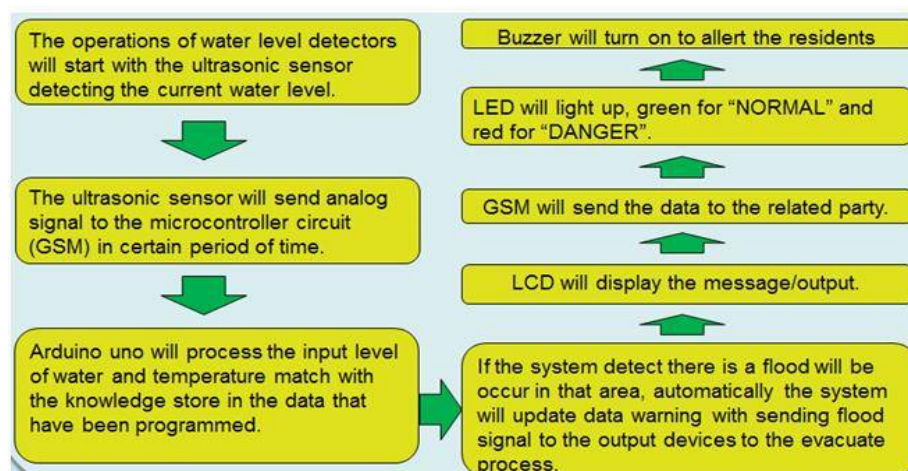
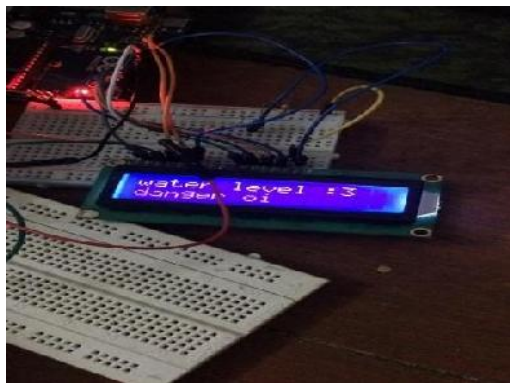


Figure 6. Flow diagram of the system after the switch power on system is activated.

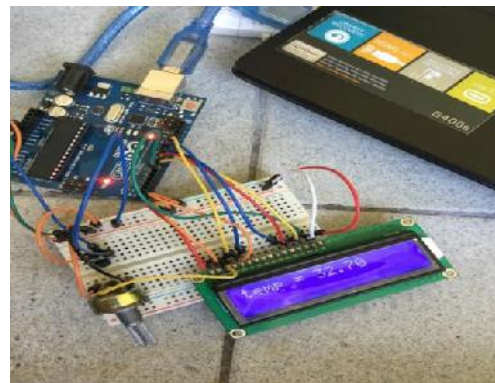
Results and Discussion

In this section, the hardware testing will be explained as well as software testing. Figure 7(a) shows the Ultrasonic Sensor and LCD display testing. Instead of showing the water level 1, 2 or 3 of the flood on the LCD display, it also shows the status of the flood such as normal, warning or danger respectively. This testing is based on programming code that has been written using C programming language and uploaded into the Arduino UNO. Moreover, this program is not only to test the hardware interface between ultrasonic sensor and LCD display with Arduino UNO but also to validate the right way of the system flow process as shows in Figure 6.

Figure 7(b) show the LCD display with the temperature sensor testing. The testing indicates that the hardware interface between temperature sensor, LCD display and Arduino UNO as well as the software are successfully running.



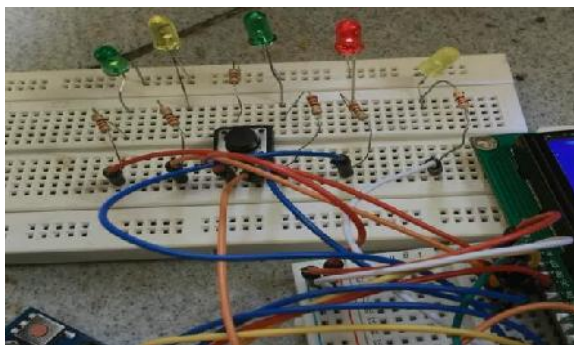
(a)



(b)

Figure 7(a). Ultrasonic sensor with LCD display testing. (b) Temperature sensor with LCD display testing.

Figure 8(a) shows the LED/Light indicator circuit testing and Figure 8(b) shows LED/Light indicator installed on the prototype system. The results indicate that the hardware interface between LED/light indicator and Arduino UNO as well as program code upload into system is correctly and smoothly running.



(a)



(b)

Figure 8(a). LED/Light indicator testing. (b) LED/Light indicator testing capture from video.

Figure 9 shows the results of GSM signal (SMS) shield testing for alert of water level in the prototype. This result is based on modification of program code that has been based on flow diagram in Fig. 6. The testing shows that the mobile phone received the SMS message from the GSM/GPRS Shield as a message 'ALERT! RIVER WATER LEVEL IS AT DANGER LEVEL'. This indicated that the alert signal or alert message from Prototype Flood Detecting and Warning System to a mobile phone is

communicated successfully as well as an alert signal to the third party. It means that as soon as the water level reached “DANGER” level, GSM signal will automatically sent information via SMS to the number that have been registered in the system.



Figure 9. GSM signal (SMS) testing using mobile phone.

Prototype System Model. Figure 10(a) and (b) show flood area and model map of the flood area respectively. This flood area has been simulated using the prototype system developed. This involved the flood area at Kuala Krai District in Kelantan, Malaysia which is the worst affected area in 2014. Figure 11 (a) and (b) show the complete model of Prototype that have been developed.



(a)



(b)

Figure 10(a). Kuala Krai district flood area. (b) Model map of flood area for prototype system.



(a)



(b)

Figure 11(a). Model SFDS from side. (b) Model SFDS 45 degree view.

This model has two tanks of water; one containing full water and the other is empty (river). Water pump is used to suck the water from full tank to empty tank (river). The water level will increase in the empty tank (river). This process will continue until the level of water reach warning and then danger level (flood simulation) in the prototype model. When water level reached to the danger level, the devices in system such as LED/light, alarm, LCD display and SMS message will be activated. These signals will be used by the villager/people around the food area as a warning signal to prepared their families, property and crops as well as for flood management and local authorities to prepare for evacuation process of villager/people from flood area to the rehabilitation centre.

Conclusion

The prototype of flood detecting and warning system was developed with purpose to simulate the situation at the real flood area as a system to detect and monitor the flood situation as well as to send information/signal (SMS) to flood management and local authorities in case of danger or water lever increase rapidly as a warning signal. From the testing and finding that has been done, the objectives of the project development are successfully achieved, where the circuit and algorithm are completely tested and functioned. However, this model can be improved to more advanced and betterment of application in the next stage of project. For future improvement, the system can be upgraded by adding component that allowed the data shared with entire world or changing the components or devices for the project successful installed to the real flood area. By doing so, the prototype can be applied for real application in the future.

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Fish Processing Device

Muhammad Azam Ngah^{1,a}, Haswa-Sofilah Ab. Wahab^{1,b}, Abdul Razak A. Aziz^{1,c}

¹Politeknik Sultan Mizan Zainal Abidin, Terengganu, Malaysia

^aazam@psmza.edu.my, ^bsofilah@psmza.edu.my, ^crazak.aziz@psmza.edu.my

Abstract. Malaysia is a maritime nation and its fishing industry is a source of income for 134,000 fishermen. The fisheries sector is an important sub-sector in Malaysia and plays a significant role in the national economy. Apart from contributing to the national Gross Domestic Product (GDP), it is also a source of employment, foreign exchange and a source of the national animal protein intake, with per caput consumption of 47.8 kg per year. It is recorded that in 2012, the fisheries sector produced 1.7 million tons of fish valued at RM 10.8 billion and generated trade worth RM 6 billion. Fish Processing Device (FBD) can be characterized by a platform, a cutting board comprising a railing assembly mounted on the platform configured for receiving the fish, wherein the fish is arranged in a predetermined fashion, a rotatable symmetrical slicer configured for contacting the fish to removing a portion of the fish arranged on the cutting board, wherein the rotatable symmetrical slicer rotatable cuts the fish as the cutting board slides along an axis of the platform, and an electrical motor configured for driving the rotatable symmetrical slicer to rotate at a pace to remove a portion of the fish. It is, therefore, an advantage of the present invention that the device for providing a beheading and gutting fish has the ability to process fish at a higher speed and increasing productivity. Further, the device is economical to manufacture, durable in used, simple to operate and as well as safe.

Keywords: Fish, platform, cutting board, , electrical motor, rotatable symmetrical slicer, invention, beheading, gutting.

Introduction

Fish landed in Malaysia mainly comes from the sea. Freshwater fish at the moment comprises only less than 5 percent of the total landed volume (DoF,2012) while catch from the sea in 2012 contributed about 1.6 to 1.8 million metric ton annually. The pattern will not improve further as most of the catch are from coastal zone which indicated declining trend. At this stage, the government encourages and provides incentives for deep-sea fishing venture and emphasizes the need to expand aquaculture activities [1].

The Strategic Plan of the Department of Fisheries (2011-2020) provides the framework and roadmap in transforming the fisheries sub-sector as outlined in the Government Transformation Program and the National Agri-Food Policy 2011-2020 (NAP). One of the six strategic thrust of the department that is related to fisheries resource management is to manage the fisheries resources efficiently, innovatively and in an environmentally friendly manner [2].

Fishery products and method of processing is considered important. The status of existing technology is also assessed, through this is difficult due to the rapid expansion and development of certain sectors of the industry. The growth of the processing and utilization industry has increased the need to improved technology and consequently research and development is needed to support the growth of the industry [3].

Problem Statement

The entrepreneur of fish cracker in Terengganu having a problem to gutting 100 kg fish every day. They also need to take many worker to gutting 100 kg of fish. The worker also having a problem because their hand having water sores. This happened because they did not use gloves while gutting the fish.

Objective of the Project

The objective of making this device is to reduce the time of gutting fish and to avoid the workers having water sores on their hand. This device can help the entrepreneurs of fish cracker from using a lot of worker and it's also can reduce the cost.

Scope of the Project

The scope is a limitation or the limitations on the features, specifications or capabilities of a predetermined construction project. This intended as a guideline for determining the direction of the project. The prescribed for this FPD is:

- i) The size of the machine is 11cm x 19cm
- ii) Limited to medium size of fish such as *Selayang* fish and *Selar* fish
- iii) Capable to produce a machine that can gutting 100 kg or more fish a day
- iv) Produce a machine that can cut the head of fish and at the same time can remove the fish belly

Methodology

The fish processing device comprises an electric motor for converting electrical energy to mechanical energy, an electric motor electric motor stand and cover for holding and covering the electric motor on the table, a cutting blade for separating the fish head and gutting the fish, wherein the cutting blade is attached to the electric motor, a cutting board made of durable material, a railing system for the mobility of the cutting board; and a table stand for placing the component in place, wherein the component is the electric motor, the electric motor stand and cover, the cutting blade, the cutting board, and the railing system, whereby the fish will be cut on the cutting board and by the cutting blade

Work Steps and Installation

Step 1

Placed the cutting board on bench wise and cut the cutting board into a rectangle using a hacksaw.



Figure 1: Cutting the cutting board

Step 2

Drill the hole on cutting board by using bench drill.



Figure 2: Drilling

Step 3

Grinder machine is use to cut the tools



Figure 3: Cutting process

Step 4

After using the grinder machine, the cutting board was profiling by profile to make the surface smooth



Figure 4: Profiling the cutting board

Step 5

Rectangle playwood is cutting by portable hacksaw cutting machine. Playwood is use to make a desk



Figure 5: Cutting the plywood

Step 6

Put a screw on each edge to make sure the cutting board not deprived



Figure 6: Putting screw at cutting board

Step 7

Sharpen the blade by using grinder machine



Figure 7: Sharpen the blade

Step 8

Wrapping the plywood with aluminum and screw it



Figure 8: Screw the aluminum on plywood

Step 9

The cutting board and ac motor is placed on the desk.



Figure 9: Placed the motor and cutting board

Step 10

The rail sliding is screw on the desk



Figure 10: Screw the rail sliding

Step 11

Testing the cutting blade is function or not.



Figure 11: Testing the blade

Results and Discussion

Table 1: Time comparison between Fish Processing Device and manual for gutting the fish

Method	Fish mass	Manual Device	Fish Processing Device
	1 kg	2 minutes 30 second	1 minute 40 second
	10 kg	25 minutes	16 minute 40 second
	50 kg	2 hour 5 minutes	1 hour 53 minutes 20 second
	100 kg	4 hours 10 minutes	3 hours 46 minutes 40 second

The results of the experiment that shown in Table 1 are based on the time comparison between Fish Processing Device and manual device for 1kg to 100kg of fish mass. FPD capable to produce a device that can gutting 100kg or more fish per day and can beheading of fish and at the same time can remove the fish belly. The analysis of gutting fish using FPD only takes 1 minute 40 second (1kg) and takes 3 hours 46 minutes 40 second (100kg) compare with manual method takes 2 minutes 30 second (1kg) and 4 hours 10 minutes (100kg).

Conclusion

Generally, FPD can help industry to solve problem Gutting Fish for their production *Keropok Keping*. The more specific objective of this project is to save the time of gutting the fish and to avoid the worker from having water sores on hand. Besides that, FPD also can give profit to industry and to reduce worker energy when gutting the fish. Furthermore, this machine also can reduce time. It does also can be handling by anybody and no need high skill to handle this machine. By using FPD so the process of beheading and gutting fish can do easily.

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Development of Smart Trolley

Norazlinawati Mat Yaacob^{1,a}, Safira Din^{1,b}, Norsuriani Che Musa^{1,c}

¹ Department of Electrical Engineering, Politeknik Sultan Mizan Zainal Abidin,
Dungun, Terengganu, Malaysia

^aazlinawati@psmza.edu.my, ^bsafira@psmza.edu.my, ^cnorsuriani@psmza.edu.my

Abstract. Nowadays with the fast-growing country, supermarkets are also increasingly. Often we see shopping malls becoming a common focus for additional shopping as well as exciting discounts on offer. Users will buy a variety of items and put them inside trolley. Several of users who hold the items they buy because the trolley is limited. Often, we also see consumers especially when they have to push the trolley while holding baby or control the stroller. This makes it difficult to push or control the trolley with one hand, so Smart Trolley is designed to help consumers reduce human consumption in the matter of lifting or transporting goods. The trolley helps consumers who want to buy things in the market more comfortably. Other than that, the other factor in using this Smart Trolley is to replace plastic use. Beside this it's easier to bring the item to the car by using this smart trolley. By using this Smart trolley, the user simply uses the smartphone to control the movement of the trolley. Smart Trolley can make shopping with kids becomes fun and enjoy.

Keywords: trolley, consumers, shopping

Introduction

A supermarket or a hypermarket is a form where wide variety of product items is available. These product items such as food, beverages, clothing or any household product [1]. A shopping trolley is a large metal basket on wheels which is provided by shops such as supermarkets for customers to use while they are in the shop.

A trolley is an object with wheels that you use to transport heavy things such as shopping [2]. Trolley is widely used all around the world. There are many uses of trolley in our daily life such as carrying things but the trolley used manually [3]. Customers who need to purchase different products in supermarkets needs lots of time and patience in coordinating among them self for successful shopping [4].

There are still plenty of spaces for improvement in terms of providing quality shopping experience to the consumers. Consumers often face problems and inconvenience when shopping. Every time customer has to pull the trolley from rack to rack for collecting items . It needs a lot of power to be done when shopping. So that ,trolleys in supermarkets were needed. A lot of goods in the shopping cart would be to push or pull, the customers will limit the activity of the hand. Smart Trolley is created to improve this system. Smart Trolley will help the user to have a convenience shopping time and help to reduce their time wasted. Therefore, if a customer carries a baby while doing shopping it is a real burden to the customer to push the trolley or to a disabled person with one hand is almost impossible to push the trolley

The main objective in this study are to provide a convenience to user to buy necessities at supermarket and to design and produce a versatile trolley that is user friendly for human and makes their life more productive.

Methodology

Smart Trolley consists of two part which is hardware and software. Smart trolley works automatically without the use of manpower, but use NodeMcu applications that have been set up on smart phones and communicate with the hardware to move the smart trolley.

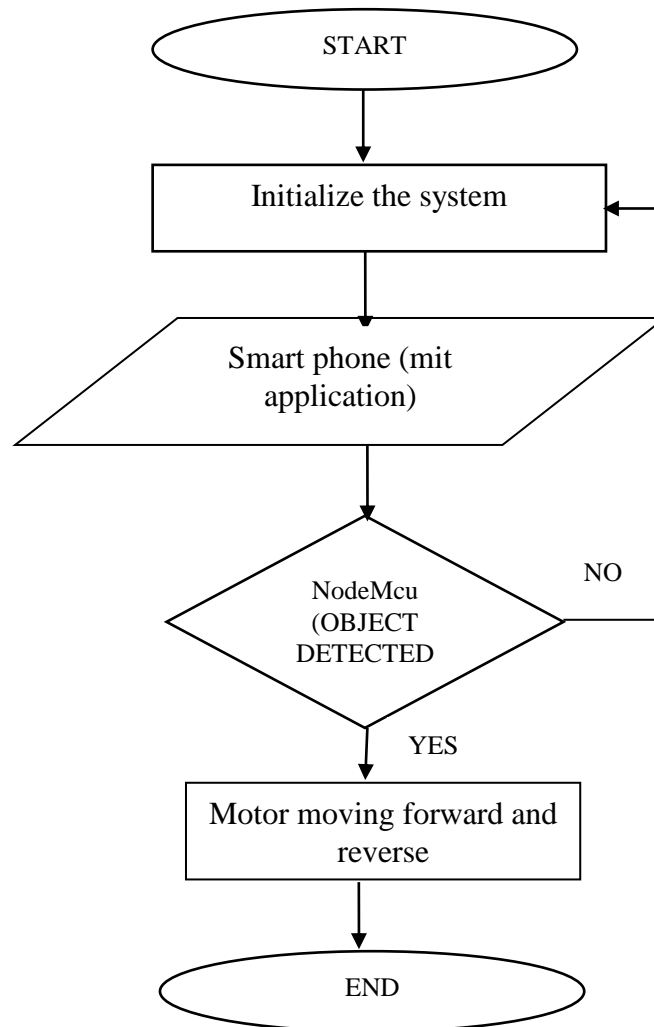


Figure 1: Flowchart of project

Block Diagram

Figure 2 illustrate the block diagram for the project. Power supply is connected to the NodeMcu and drivers. In this project also use dc motor that installed on the left and right of the trolley.

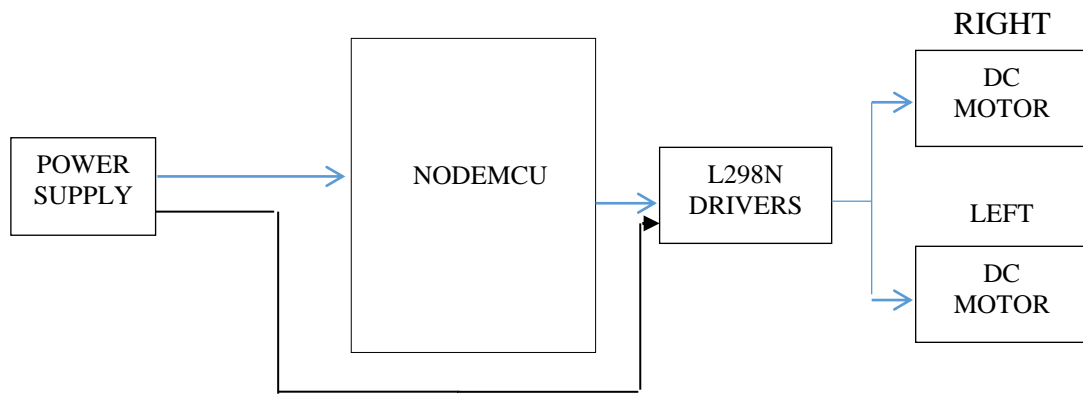


Figure 2: Block diagram of smart trolley

The NodeMCU system will control the movement of smart trolley. NodeMCU is programmed directly using Arduino IDE.

Circuit Design

Based on the simulation in Figure 3 shows the schematic diagram that used for this project.

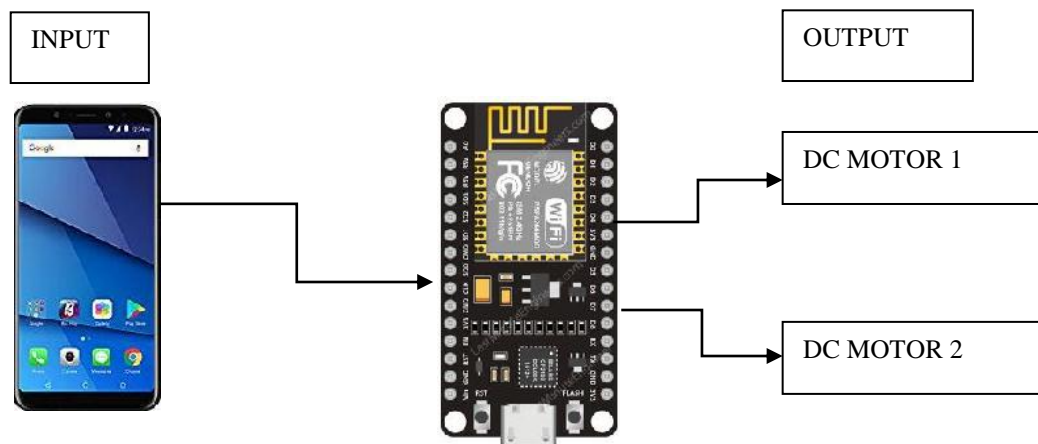


Figure 3: Schematic diagram

Result and Discussion

In this study work, it contains hardware and software which is used NodeMcu with two motor to move the trolley. Smart trolley will follow the customer to pick the items and it maintains the safe distance between customer and the trolley.

For the future, we can upgrade this smart trolley with details of the product items and quantity of the item appear on the screen. This system provides on spot scanning of the product and shows its price details on lcd screen. It allows customers to compare the total price with the budget in the pocket before billing.

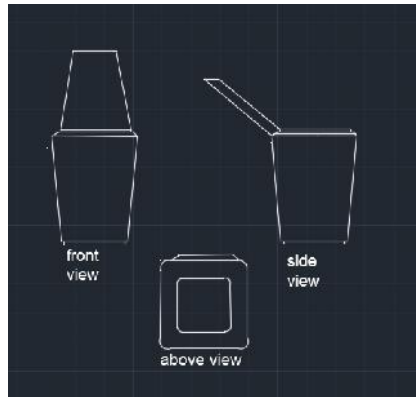


Figure 4: Outline view of smart trolley



Figure 5: The proposed of smart trolley

NO	MIT APPLICATION	EXPLANATION
1	BUTTON DEPAN ON	MOVE FORWARD
2	BUTTON DEPAN OFF	MOTOR STOP
3	BUTTON BELAKANG ON	MOVE REVERSE
4	BUTTON BELAKANG OFF	MOTOR STOP
5	BUTTON KIRI ON	MOVE TO THE LEFT
6	BUTTON KANAN ON	MOVE TO THE RIGHT
7	BUTTON BERHENTI ON	MOTOR STOP

Table 1: Configuration of Button

Conclusion

This project is to develop and design smart trolley that suitable used in supermarket in Malaysia. The movement and motor at the smart trolley controlled by coding program in NodeMcu. So the smart trolley will move follow to the customer who hold the smartphone. Smart Trolley able to move alone without pulling or pushing the trolley, with using the application over the mobile phone. Smart Trolley can save time and energy for consumers to make choices and buy goods.

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Development of Arduino Door Lock System Using GSM

Nor Hafizah Che Hassan^{1,a}, Wan Rizegillah Hj Abdul Wahid^{1,b}

¹Jabatan Kejuruteraan Elektrik, Politeknik Sultan Mizan Zainal Abidin, Km 8 Jalan Paka, 23000 Dungun, Terengganu, Malaysia

^ahafizah.hassan@psmza.edu.my , ^brizegillah@psmza.edu.my

Abstract. All security systems work on the same basic principle of securing entry points, like doors and windows, as well as interior space containing valuables like art, computers and any priceless things. However, many people cannot afford to buy such security system since its price is quite high in the market. Therefore, the development of Arduino door lock system using GSM is a security system with cheap component but practically effective. With the design and implementations of an electronic door lock system using the Arduino platform, this security system enables users to lock/unlock the door by using Short Message System (SMS) and Global System for Mobile (GSM) module, where the door will be unlocked without using keys. This module operates on a password or code as programmed. This system were created to provide higher level of security due to the increment of thief and robbery crimes. With this system, we can lock or unlock the door by sending the password or code message to GSM simcard number. The operation of the door lock only operate when the correct code that has been programmed entered by sending the message.

Keywords: Arduino, Door Lock System, GSM

Introduction

Smart home system is very popular in modern days and provides many kinds of applications that make everything simple and easy to control. According to the work presented by [1], the smart home system can increase the comforts and offer greater safety and security, as well as reduce the use of energy and other resources, and allow for significant savings. Security is an important aspect of future in the smart home applications[2]. The new and emerging concept of smart homes offers a comfortable, convenient, and safe environment for occupants. Conventional security systems keep home owners and their property, safe from intruders by giving the indication in terms of alarm. However, a smart home security system offers many more benefits[3].

As overall, security describes protection of life and property. There are doors to keep people out, key locks and chains reinforce the mode of security. The doors are being made of metals not just wood anymore. Influential person in our society have bullet proof doors to ensure a good measure of security of self and family. The security sector is experiencing diversification as it has never seen before. This has brought about the need to review the reliability of already existing system and look into the possibility of creating better systems that are smarter and more secure.

GSM is a cellular digital system standard phones which are widely used in advanced technology industries. First named after the frequency band around 900 MHz, GSM -900 provide the basis for several other networks using GSM technology, usually GSM networks operating at frequencies band around 1800 MHz and 1900 MHz GSM network technology it has become a largest source of industrial technology for and the communication protocol that allows the transmission of text messages between phone devices and sending short message[4]. The SMS-based door lock presented here is an access control system that allows only authorized persons to access a restricted area, this system is best suitable for home security and corporate offices. It comprises of a small electronic unit which is in fixed at the entry door to control a solenoid operated lock with the help of a stepper motor, when an authorized person enters predetermined user password or code via the Global System for Mobile Communication (GSM), the stepper is operated for a limited time to unlatch the

solenoid-operated lock so the door can be open. At the end of preset delay time, the stepper motor is operated in reverse direction and the doors get locked again.

The project intends to interface the Arduino with the GSM modem and start/stop engine by sending the predefined messages from the mobile phone to controlling unit. The software application and the hardware implementation help the Arduino read the messages sent by the user from a mobile phone or send messages to the mobile phone through the modem and accordingly change the status of the engine motor required.

The main objectives in this project is to facilitate users to lock the door wherever they are and to avoid any key losses. In this paper, the first part brief about the introduction and literature from previous findings. Second part explains about the methodology of the project. Next, results and discussion and then followed by the conclusions.

Methodology

This system consists of two parts which is hardware and software implementations. We use IC Arduino Uno as the core of the project, Global System for Mobile Communication (GSM) as an input and solenoid as an output. While for interfacing the hardware and software, the programming is written in Arduino C language and being compiled in Arduino software. The open-source Arduino software (IDE) makes it easy to write code and upload it to the board. The environment is written in Java and based on processing and other open-source software. This software can be used with any Arduino board. Figure 1 below show the flowchart of the project.

The system compromises of a small electronic unit which is in fixed at the entry door to control a solenoid operated lock with the help of a stepper motor, when an authorized person enters predetermined user password or code via the Global System for Mobile Communication (GSM), the stepper is operated for a limited time to unlatch the solenoid-operated lock so the door can be open. At the end of preset delay time, the stepper motor is operated in reverse direction and the doors gets locked again.

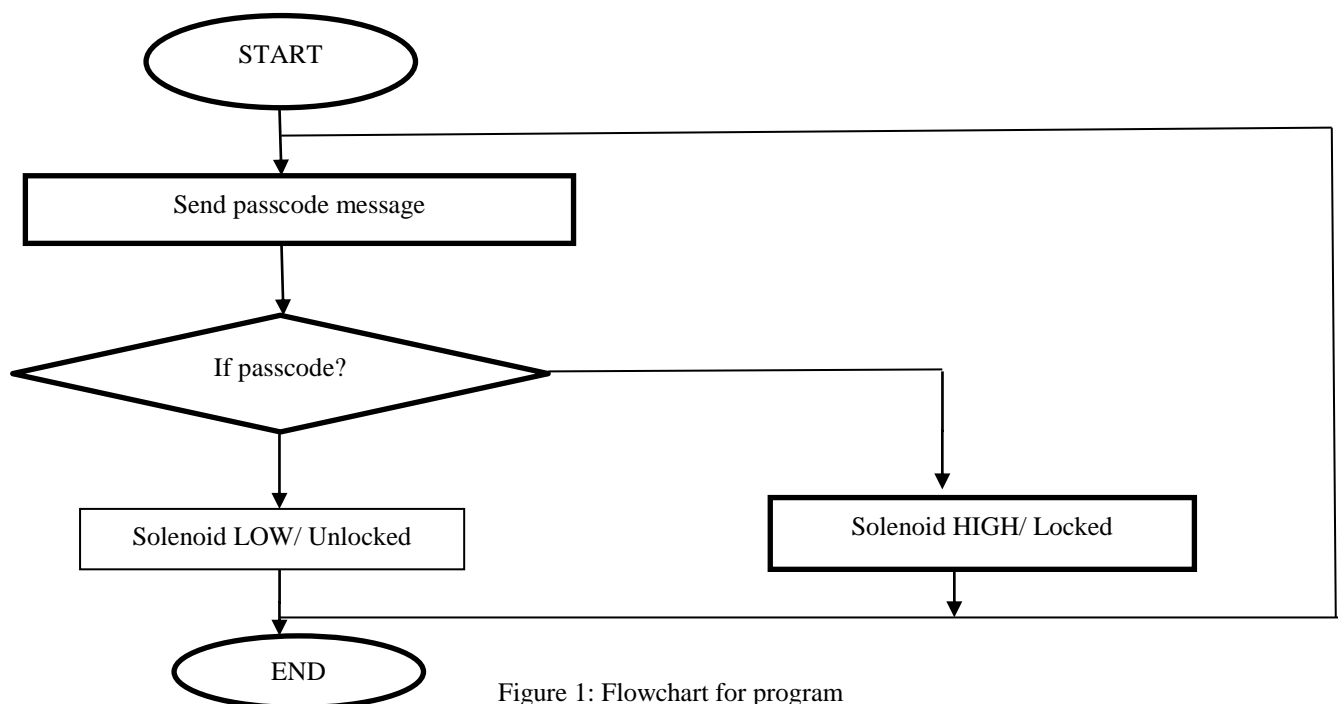


Figure 1: Flowchart for program

Block Diagram

Figure 2 illustrates the block diagram for the project. This project contains gsm modem as an input, process by arduino uno and the output will be shown by the solenoid at the door whether it will be lock or unlocked.

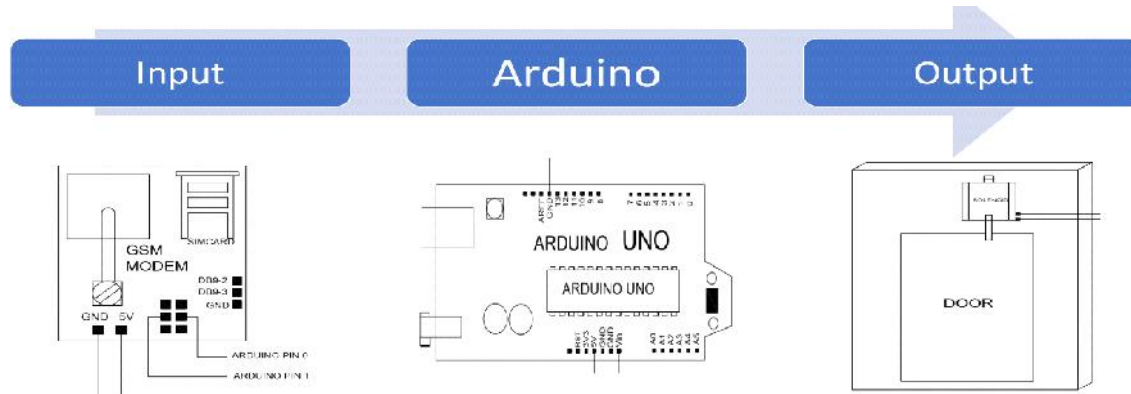


Figure 2: Block diagram of Door Lock System with SMS

Circuit design

The overall circuit is design with arduino circuit, the relay circuit will function as switch to activate the solenoid and the GSM circuit is used to communicate with arduino.

a) ARDUINO CIRCUIT

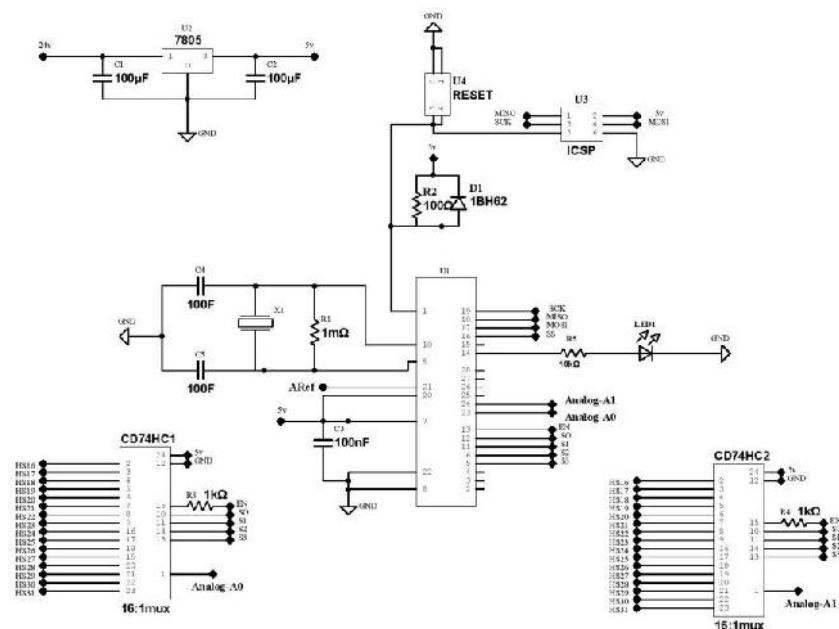


Figure 3: Schematic diagram for Arduino circuit

Based on the simulation in Figure 3, the overall operation of this circuit is centralised by IC Arduino Uno. Arduino Uno has 14pins digital input/output(6 are used as output source PWM), 6 analog input, 16MHz crystal oscillator, USB connection, Vcc and reset button. Arduino Uno is used to support microcontroller, it is easy to connect from computer to USB cable or supply AC to DC. The digital 14 pins of Arduino Uno can be use as input and output using the function of pinMode(),

digitalWrite(), and digitalRead(). It will be function at 5Volts. Each pin will supply or receive maximum current of 40mA and the pull-up resistor(default cut-off) at 20-50Kohm.

The phone number of the users is declared in the coding of the programming which is written in Arduino C language and being compiled in Arduino software (IDE). When output is set LOW, so it will detect as POWER OFF, so the door will unlocked. When the output is set HIGH, then it will detect as POWER ON, so the door will lock.

b) RELAY CIRCUIT

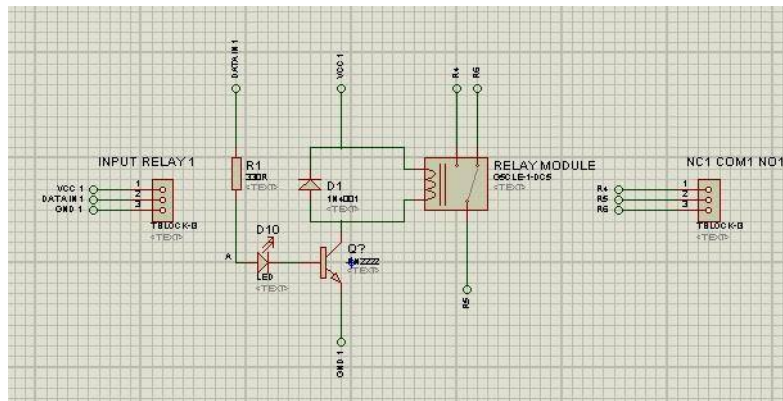


Figure 4 : Schematic diagram for Relay circuit

According to Figure 4, the function of relay are as switches which is open and close circuits electromechanically. The usage of this relay is operated for a limited time to unlatch the solenoid-operated lock so the door can be open. At the end of preset delay time, the stepper motor is operated in reverse direction and the doors gets locked again.

c) GSM CIRCUIT

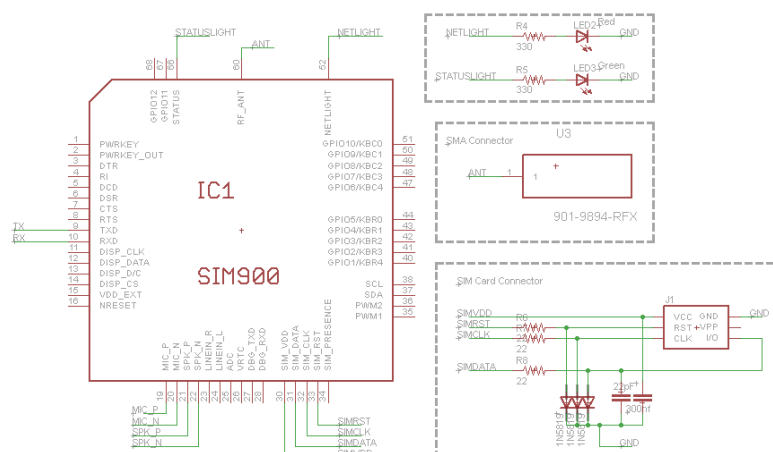


Figure 5 : Schematic diagram for GSM Module

A GSM modem is used to make a computer or any other processor communicate over a network. For this project, we use it to interface with arduino to be operated by sending the sms to lock or unlocked the door. It is only operated when the correct password on the identified number of mobile phone is detected. GSM is selected due to its wide range of applications in interfacing, security applications, weather stations and GPRS mode remote data logging.

Project Design

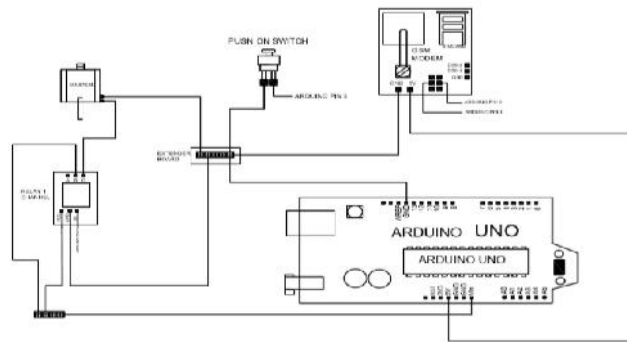


Figure 6: circuit design of door lock system with SMS

The circuit in Figure 6 depicts the connection of the components used in this project, which include IC Arduino Uno, Global System For Mobile Communication (GSM), and solenoid. The voltage regulator will regulate the voltage supply from 9V to 5V that suited for IC for this system. This circuit used GSM as an input module communicate with arduino. This circuit needs 5V relay to run the stepper motor in reverse or forward.

Results and Discussion

In this research work, it contains the Arduino circuit, GSM, solenoid and relay. The GSM is used to send sms when an authorized person enters predetermined user password or code, the stepper is operated for a limited time to unlatch the solenoid-operated lock so the door can be open. At the end of preset delay time, the stepper motor is operated in reverse direction and the doors gets locked again.

Figure 8 shows the complete hardware of project. It contains of woods represent as the door, in a square shape of the box represents the room. The connection of the Arduino circuit, GSM, solenoid and relay are located at the door as depicted in Figure 7.

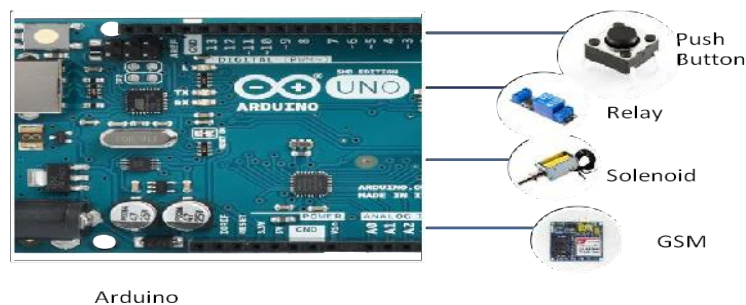


Figure 7: Overall of the hardware in the project



Figure 8: Complete hardware of project

Table 1: Configuration of two cases

case	Passcode message	solenoid	explanation
1	POWER OFF	LOW	unlocked
2	POWER ON	HIGH	locked

In order for door lock system very well with Arduino, the 2 cases are identified as shown in Table 1. First case, when the passcode (POWER OFF) is sent and detected the solenoid (LOW), the door will unlocked. Second case, when the passcode (POWER ON) is sent and detected the solenoid (HIGH), the door will locked.

Conclusions

This project will facilitate users to lock the door wherever they are and to avoid any key losses. Users can only use the system that has been designed effectively by sending the password code to lock or unlocked the door by using Short Message System (SMS) and Global System for Mobile (GSM) module, where the door will be lock or unlocked without using keys.

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Introduction to QR Code Technology for The Validation of Student Seat Position Before Sitting for an Exam

Saupi Mohamed Noor^{1,a}, Nik Muhammad Azif Arifin^{1,b}, and
Samsiah Samsudin^{1,c}

¹Politeknik Sultan Mizan Zainal Abidin, Km 8, Jalan Paka, 23000 Dungun, Terengganu.

^asaupi@psmza.edu.my, ^bahammar4@gmail.com, ^csamsiah@psmza.edu.my

Abstract. Information technology development has opened a new chapter in human relations and brought about changes within organizations. In line with this rapid development, various mediums can be used to provide information on subject matter. However, in this country, this technology is still unpopular and is not widely-used in education e.g., admission to examination halls in institutions of higher learning, such as Polytechnics. This causes delays in exam travel; especially with the use of large halls, as it takes a long time for students who do not know their seating position to be seated. This innovation study discusses the use and benefits of QR (Quick Response) code technology as a validation for student seating position before sitting for an exam. An Android application uses QR codes when students enter the exam hall. This innovation will speed-up the verification process and makes it easier for students to identify their seats, as well as for exam officer monitoring purposes for the number of students attending.

Keywords: Technology, Seating position, QR code.

Introduction

The changes brought about by new technologies have had a significant effect on the lives of people living in every corner of the globe. Information technology has brought about radical changes to human life, but not all these changes have necessarily been positive. Some have been negative and have had a detrimental effect on individuals and communities. For example, traffickers are using the Internet to offer and promote their products for sale.

There are many types of technologies, including those that serve science, education and the economy. There is a close relationship between science and technology. It has been noted that the basis of technology is to study science and to employ inventions in different areas of life in order to meet the needs of individuals and societies. Therefore, technology connects governments and societies in the development of strategies to enhance the quality of life of the citizens

Institutions of higher education in Malaysia are facing many challenges at the beginning of the twenty-first century in their efforts to remain intellectually and culturally viable in a rapidly changing world while preparing students to compete globally. In Malaysia, the education system still emphasizes the importance of examinations and is subject-oriented [1]. In the current educational process in Malaysia, individuals are driven by assessments and examinations to continue their struggle with learning. Examinations not only determine the future of students, but also assess the extent to which students have acquired knowledge. Examinations also help to measure how well a person has learned something.

However, examinations have several effects on students. For instance, examinations will create fear in students, categorize them and undermine their self-confidence [2]. Fear of sitting for an exam can cause students to be depressed and pressured into getting the best results, which may tend to lead to dishonesty when answering the exam questions. Overall, the final examination, which takes

approximately 3 hours, is considered to be a stressful period for students in Malaysian polytechnics. Therefore, it is necessary to make preparations in advance to ensure that students know the exam instructions that need to be complied with and their seating positions before they enter the examination hall so as to reduce the risk of them being pressured during the examination. These requirements can be easily and quickly met using the latest information technology resources.

QR Code

Information technology has made the education process more effective and productive, and has increased the well-being of students. Educational methods have been developed to make this process easier, such as the replacement of paper with tablets. One well-known technology is the QR code (Figure 1).

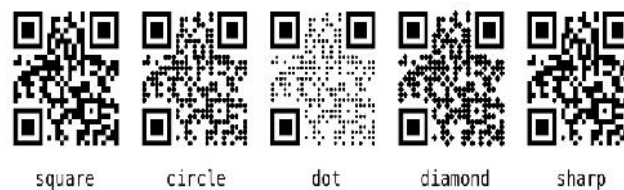


Figure 1: Examples of QR codes

Today, the use of the QR code is familiar in activities around the world, but this technology is still unpopular and is not widely-used in education. The QR code is being used to facilitate activities, such as managing inventories, as these barcodes store specific data such as production codes, identification numbers and more, so that computer systems can easily identify the information encoded in barcodes. The QR code is a two-dimensional image of a data, especially text-shaped data, and it has evolved from a one-dimensional to a two-dimensional barcode, whereby it is able to store much larger data.

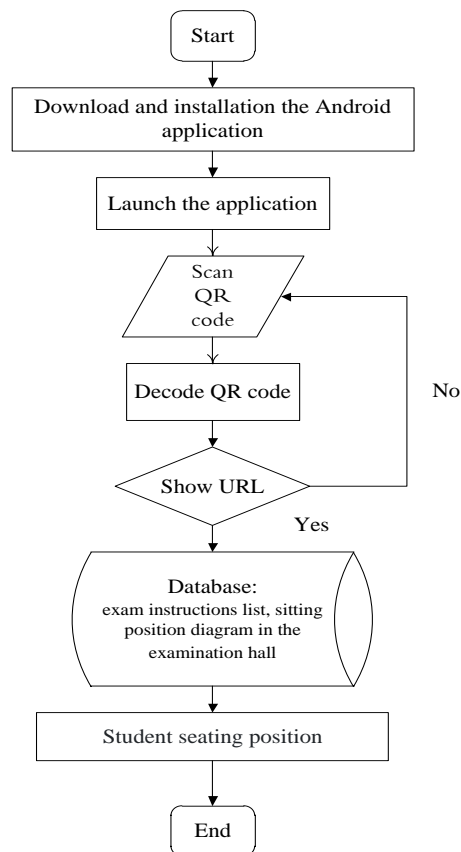
QR codes carry several hundred times more information than regular barcodes as they allow information to be stored both horizontally and vertically in a 2D barcode format. These codes can be read by dedicated readers or by using smartphones as long as they have a camera and an autofocus feature. Also, the advantage of QR codes is that they can be easily created and printed using a regular printer, thus making the process of physical distribution inexpensive. In fact, this process may be integrated in the workflow of existing schedules.

Result and discussion

The basic concept of a positioning system involves the use of QR codes (Figure 2) for an online solution. In this case, the students must install the application and scan the QR code at the entrance to the exam hall prior to entering it by connecting to the local network of the information system of the QR code. The advantage of having an online solution is that an Internet connection is required only for installing the app, after which, all the data needed to locate the information (exam instructions list, sitting position diagram in the examination hall, etc.) are displayed and automatically downloaded. The over- all process flow of the procedures is listed in Figure 3.



Figure 2: QR codes

Figure 3: Flowchart of the *QR Code* application

The following sections of this paper describe the process of designing a positioning system that runs on an Android operating system, which is currently being used by most software developers for smartphones. It is user-friendly, simple and very intuitive. The advantage of the OS Android is not only that it has many free apps, but also that anyone can program the apps using freeware compilers. [3].

Figure 4 shows an overview of the system design of the QR code-based data system. The system has three components: A data server, which stores the diagram of the sitting positions in the examination hall and the network information; an information display so that students can accept their data from the server; and a QR code of an inner space. Students can scan the QR code in any position, and the code will be decoded so that they can obtain their locations.

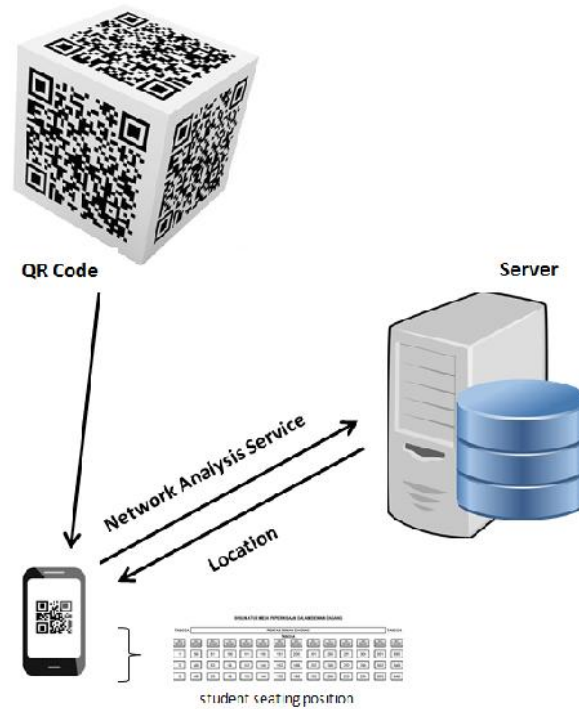


Figure 4: QR code-based data system

Students feedback

The main feedback from the students was that fear of sitting for an exam can cause students to be depressed, if don't make preparations in advance admission before to examination hall and is not familiar with QR codes or the ways to utilize them. In our study we found that QR codes can support in different contexts. We also found that QR codes can support both independent and collaborative learning and that QR codes can motivate and engage learners. The 90 students feedback from Politeknik Sultan Mizan Zainal Abidin (PSMZA) Dungun Terengganu, was very positive. 45.6% of it was easy to use QR code and 45.6% QR codes should be used more in education. 40% of I learned new things with QR code and 43.3% QR code can provide more information (Figure 5), Therefore, in our study we found that QR codes can support learning in different contexts.

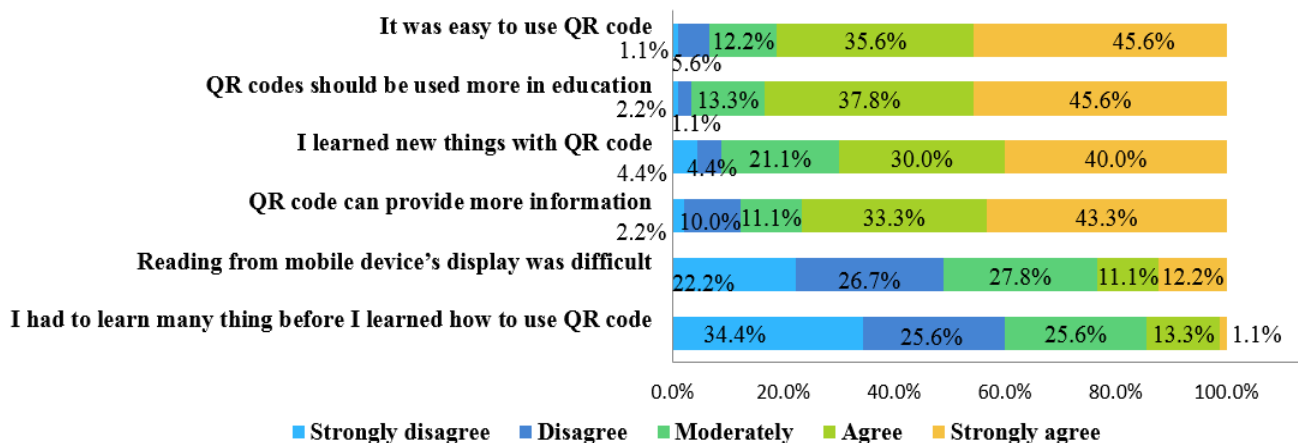


Figure 5: Students feedback on using QR code

Conclusion

Information Technology is a basic requirement in today's world. Technological progress is entering all fields. Education is a big and important part of development and progress. The results led to the conclusion that QR codes can be easily applied to overcome the causes of delays in examinations, especially with regard to the use of large halls, as it takes a long time for students to be seated when they do not know their seating positions.

The combination of education and technology is regarded as the main key to human progress. Education feeds technology, which in turn forms the basis of education. Therefore, it is evident that information technology has brought about changes to the methods, purpose and perceived potential of education.

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The Implementation of Online Electronic Filing Monitoring System

Zainolrin Saari^{1, a}, Suhana Ismail^{1, b}, Muhammad Noor Hazim Mohamed Esa^{1, c}

¹Politeknik Mersing, Malaysia

^azainolrin@pmj.edu.my, ^bsuhana@pmj.edu.my, ^chazim.sap@gmail.com

Abstract. The electronic filing monitoring system as known as eFMs are developed using PHP programming language and MySQL database in open source. The development of this application aims to facilitate the recording of file movements in the administrative unit. This application is very efficient to assist staff in handling file movements to identify the status of the borrowed files. Through conventional methods, file movement cards are used to record file movements. Using this method makes it difficult for users to know the status of a file and can not detect it immediately if there are borrowed files exceeding the due date. So, using this application, the system admin just scanning the borrowed files barcode and employee identity cards. To facilitate the user, the main interface displays the 3 statuses (all borrowing, under borrowing period and exceeding due date). This system can be customized according to customer's request as needed. The privilege of this system, users can check file status before retrieving it in the file room online. The built-in website is installed with website security which will protect the system from any attack on the application level. Overall, the system has a user-friendly and systematic design. It also saves cost and time in file status searches. Hence, these eFMs are very easy, fast, efficient and eco-friendly applications.

Keywords: Implementation, Online, Filing Monitoring.

Introduction

The efficient management of an organization reflects the productivity of an organization. This productivity can be measured in terms of efficiency using labor to the optimum. If employees are unable to perform their tasks efficiently or effectively, this indicates weakness in organizational management. Productive organizations are able to compete nationally and internationally. For example, an organization that uses the latest technology can improve productivity because it can produce products and provide more competitive services. Whether an organization is a public or private sector organization, service or industry output, productivity and quality are important factors that can drive an organization's competitiveness and viability. Thus, in line with current trends and modernization, the implementation of computer-based information systems can improve work productivity. Nur Sakinah and Mohd Nihar [1], suggested that the use of this computer system can replace human roles in information extraction and decision making to enhance efficiency in the management of an organization. Technology is important because technology causes the emergence of electronic records but not all government departments have electronic records management policies [2]. As a result, the revolution in the creation, processing, management and storage of information has been driven by advances in computer technology, telecommunications and software. Even ICT applications have successfully set the record as a strategic asset that has the value and power to increase productivity, operational efficiency and improve service quality despite the many challenges [3]. Manually managing documents is less effective. Having large numbers of documents can cause problems in the search for documents. Implementation of technologies such as electronic document management systems can help make the work more systematic [4].

Problem Statement

The Government of Malaysia through the Service Circular No. 5 of 2007 [5] has issued an Office Management Guide to replace the current Service Directive. This Service Circular is expected to help public agencies perform more efficient, organized and effective office administration tasks. In Part VII, this circular has touched on the importance of file management including file management procedures. The files must be systematically managed in accordance with the records management standards and procedures set by the National Archives. According to the Public Sector Management Handbook [6], issued by the National Archives of Malaysia, officers should return the files to the file storage room as soon as they have been referred. An officer may only keep a file for not more than fourteen (14) days. In order to keep the file management organized while reducing the risk of file loss, the movement of a file must be controlled. Therefore, a file movement card is created to ensure that every borrowing and return is recorded. Details such as the name of the officer, date and time taken and returned are recorded on the file movement card. Each of these file movement cards will be stored together with the files in the file storage room. If this file is being taken out, this file's movement card needs to be stored in the file room for easy monitoring of file movement. If there is a requirement that the file borrowing period should be extended or given to another officer for further action, the file should be forwarded to the officer in charge of the file storage room to record the movement for easy detection. However, there are some weaknesses when using this file movement cards. This is because the card is manually recorded. The officer in charge should take time to identify the current status of the file in the storage room and unable to immediately locate files that have been borrowed exceeding due date. Therefore, a computer system needs to be developed to facilitate the process of borrowing, monitoring and users to know the current status of a document (file). This system has been developed to solve the problem

Methodology

The methodology of the software development process is using the waterfall model. This waterfall model was introduced by Royce in the 1970s. This model supports inter-phase interactions that allow developers to return to the previous phase in case of errors in each phase. This waterfall model covers five key phases.

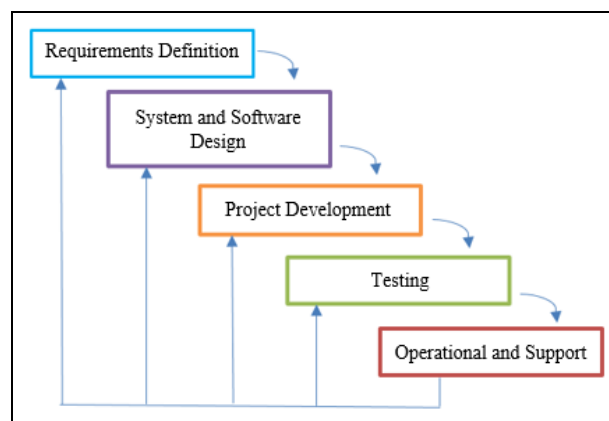


Figure 1 : Waterfall Model

- i. **Requirements Defining Phase**
Identifying the application needs to be developed, software and the elements such as system interface, hardware, database and so on.
- ii. **System Design and Software Phase**

Focuses on how it will operate in terms of hardware, software, interfaces, databases and forms and reports and what will be used in the system. This phase will also assess the needs of the users to ensure that the system being built will facilitate future users.

iii. Project Development Phase

Focus on system application development, using open source PHP programming language and MySQL database.

iv. Testing phase

Testing by system administrators and user to ensure the overall functionality of application that has been built can operate as required by the user.

v. Operation and Support Phase

For these eFMs applications, some interface design, error, layout and other things are done according to customer's request. This is because the system can be customized according to the customer's needs and requirements.

System Analysis and Testing

System analysis and testing has been carried out to test the effectiveness of the developed system. It aims to detect errors in a system and to track the errors of the program that has been developed. It also ensures that the modules has been developed are free of any problems and that the system can deliver good and effective results. Among the tests conducted are unit testing, module testing, integration testing, system testing and user testing.

System Interface

The main page of the eFMs will display the current state of the file's movement. This page has three (3) optional buttons that will connect users to the main page, file search and login. If the file are being borrowed, the name of the officer, the file code and the details of the borrowed will be displayed on the main page. All users can enter the main page and search the file without having to use the user id and password except the login view. The login view is dedicated to the system administrator or the officer responsible for managing the file movement and the officer must have a user id and password.

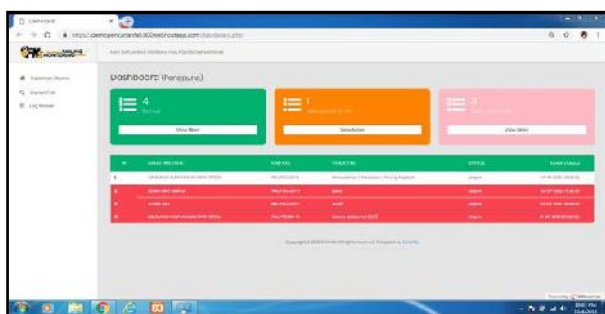


Figure 2 : eFMs main page

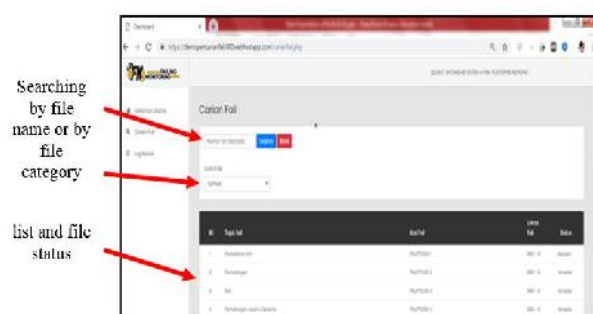


Figure 3 : File searching page

Figure 3 show the file searching page. Users can get the current status of the file by file name or file category. If the file is in a storage room, the system will display the location of the file. If the searching file is being borrowed by another officer, the system will notify the status of the file being borrowed. In the admin view there are several other functions such as file borrowing, file return, records, list of officers, list of administrators, admin updates, admin list and new admin list. The current status of the file is also displayed at the top of the display giving the total number of files being borrowed, the total number of files being borrowed in less than fourteen (14) days and the total number of files being borrowed in excess of fourteen (14) days. Admins can also find

out the name of the borrower for each status category by clicking on the status. Officers who want to borrowing a file simply need to scan the barcode on the file and then scan the barcode on the staff card for recording in the system (refer to Figure 5 for borrowing process). The borrowed file can only be returned to the officer on duty for managing the file movement. The officer on duty will scan the received files and staff cards for recording in the system (refer to Figure 6 for return process)

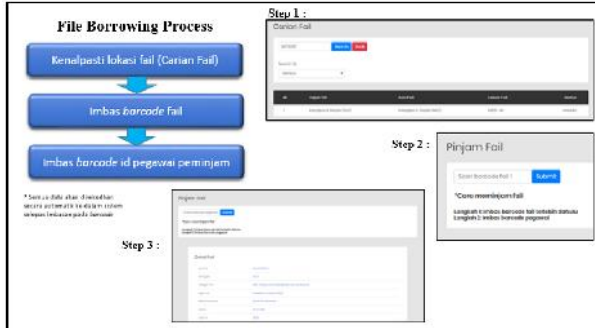


Figure 4 : File borrowing process



Figure 5 : File return process

Officers who want to borrowing a file simply need to scan the barcode on the file and then scan the barcode on the staff card for recording in the system (refer to Figure 5 for borrowing process). The borrowed file can only be returned to the officer on duty for managing the file movement. The officer on duty will scan the received files and staff cards for recording in the system (refer to Figure 6 for return process)

Penetration Testing

Penetration testing, also called pen testing or ethical hacking, is the practice of testing a computer system, network or web application to discover vulnerabilities that can be exploited by an attacker. Penetration testing can be automated with software applications or done manually. The process involves gathering information about the target before the test, identifying possible points of entry, trying to sign in - either virtual or real - and re-reporting the findings. The eFMs application on the website has been done for penetration testing. It aims to identify security weaknesses. Penetration testing can also be used to test an organization's security policies, its compliance with compliance requirements, its employees' safety awareness, and its ability to identify and respond to security incidents. Pen testing is also sometimes called white hat attack because in pen test, good hackers are trying to break into the system. Figure 7 to Figure 8 are show the pen testing result :

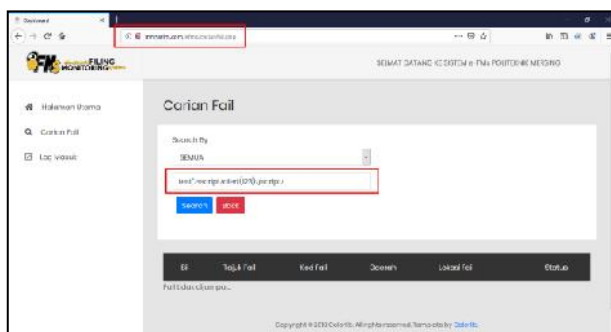


Figure 6 : Cross-Site Scripting cannot reflected

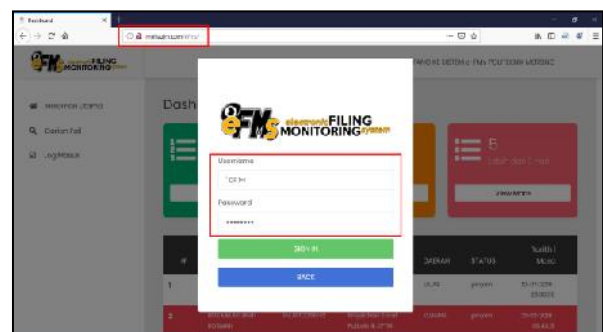


Figure 7 : The attacker cannot bypass the login page because the broken authentication was hardening

User feedback

Finally, user testing is conducted to see how users respond to the system being developed. The use of these eFMs applications has been tested and adopted at the Pusat Koreksional Jasin, Melaka. It aims to make it easier for the administration to identify the status of the files in the file storage room and to track down the individuals who have borrowing their files quickly and easily. The system was introduced during the EKSA audit conducted by the MAMPU auditors at the Pusat Koreksional Jasin, Melaka in June 2018. The use of the system has been recognized by the MAMPU auditors. The following is a response from the Pusat Koreksional Jasin, Melaka.

"Thank God, the system has been shown to MAMPU. Auditors can recommend to other agencies"
Administrative Assistant, Pusat Koreksional Jasin, Melaka

"This file search system has been in operation since June 4, 2018 and was also introduced during the EKSA audit conducted by the MAMPU audit. The MAMPU auditors have given due credit to the implementation of this system and have successfully helped the institution obtain the certification of the CEMERLANG category"

Director of Pusat Koreksional Jasin, Melaka

The application of these eFMs has also received attention from the Johor state MARA headquarters and is currently in the process of testing its use. However, the usage at the Johor State Mara headquarters is different because the Johor State Mara office has more than 15,000 files to monitor.

Discussion

In developing this system, the process of system analysis and testing plays an important role in ensuring that system applications work properly. Unit testing was first conducted. It is a test of each component of a program module that is tested separately in the application module. In unit testing, each file in the same module interacts with each other. To begin with, testing is performed on the system administrator module. All functions in this module such as file borrowing, file retrieval, records, staff registers, staff lists, administrator updates, admin lists and new administrators list are tested with each other. Some of the tests performed include logging, registering records, deleting records, updating records, filing process, file recovery process, password conversion and report generation. Subsequent unit testing processes for file search modules, main display modules and dashboard modules. Through module testing, each procedure and function in the system interface will be tested separately to ensure that it works correctly. Data were first introduced and manipulated to test the speed and reliability of the system and to facilitate testing of system integration. Next, integration testing is performed on a complete system in which the individual components of each module are integrated into one master file. This will give you an overview of the actual system in the event of system failure. The development of these eFMs applications has adopted a sandwich integration technique approach. Technique is a testing pattern that combines top-down and bottom-up testing methods. This technique is chosen because it has many advantages over other techniques. The technique allows testing to be carried out at an early stage and the module can be tested alone or mixed with other modules. In addition, it reduces error and makes each module safer and the system flow smoother. Before the system was installed on the user, a system test was performed. This test aims to ensure that the application of this system meets the needs of the user. There are two types of tests performed, namely functional testing and performance testing. Functional testing is based on the system's functional requirements and focuses more on display application functions such as the total number of files being borrowed, the number of files borrowed in less than 14 days and the the number of files being borrowed over 14 days. The achievement testing is more focused on the needs of the system it runs smoothly while ensuring that the system meets its objectives and operates properly. The development of this system has helped the administration of the office to be more systematic, efficient, organized and effective.

Conclusion

Overall the development of these eFMs applications has achieved its objective of assisting systematic file management and control. This system enables users to obtain the required file information with quick and accurate access when needed. With this eFMs application, any officer wishing to file a loan can make an online status check before going to the file storage room. If the file you want to borrow is not in the file room, the officer can get information on moving the file to the main view of the eFMs application. The method of file lending is also easier and faster with the user simply having to scan the barcode on the file and the identity card of the officer. All borrower data will be automatically recorded and stored in the database. Officers responsible for file lending management can monitor file lending records through eFMs application simply by referencing the main view of eFMs. Thus, the development of these eFMs applications has had a huge positive impact on the users. It has made it easy for the lending process, monitoring and users to easily know the current state of a file. This application has leveraged the latest technological capabilities as well as enhancing the efficiency and effectiveness of service delivery as well as cost and resource savings.

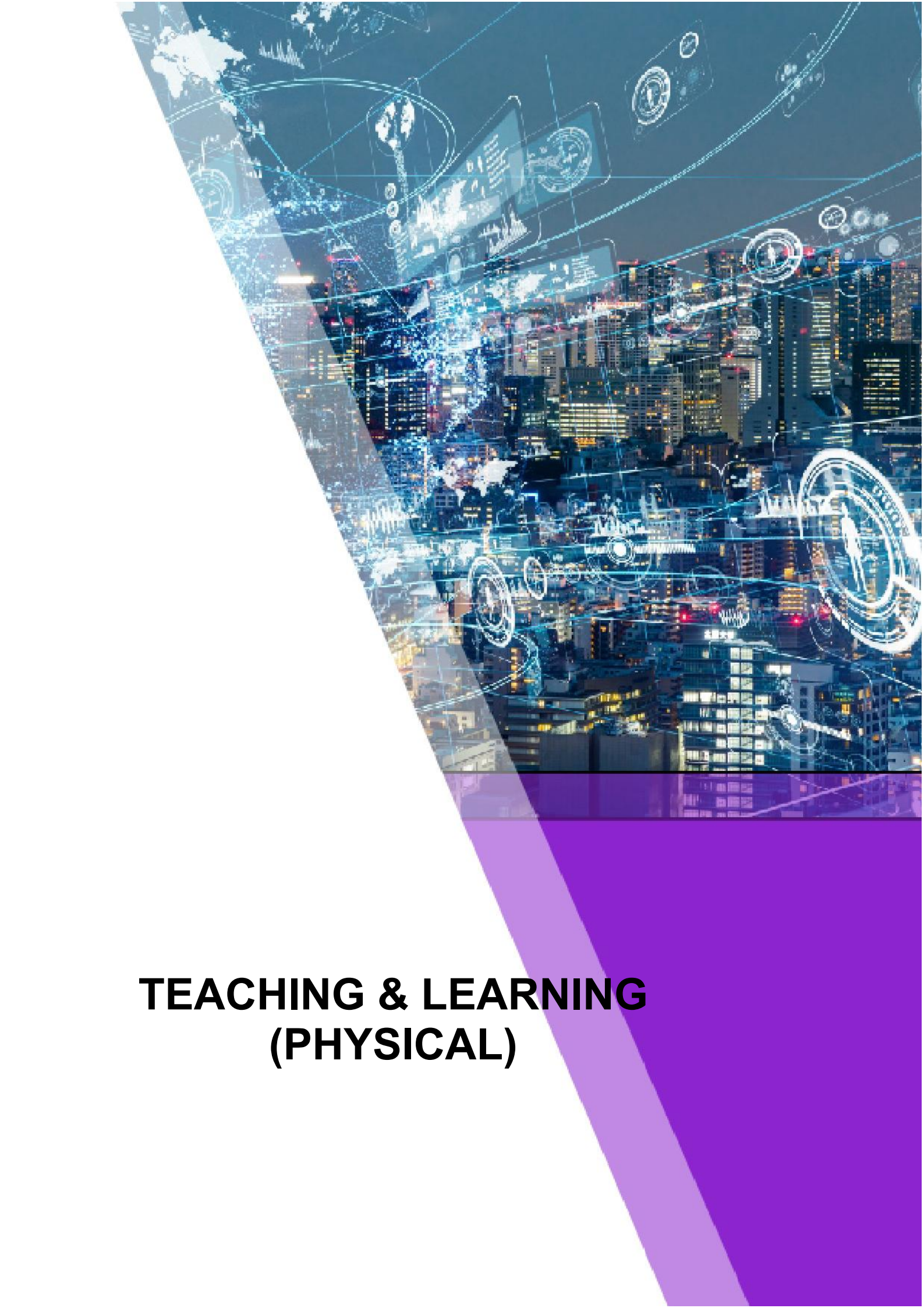
Award and Recognition

Special thanks to the management and administration of the Pusat Koreksional Jasin, Melaka and Ibu Pejabat Mara Negeri Johor who have given us full confidence to develop this system. This eFM system has also been awarded gold in several competitions such as the PMJB National Innovation & Creation Competition 2018 (PMJB), eREKA : Industry Networking & Business Pitching 2018 (Unimap), Creative Innovative Poster Competition 2019 (PIS) and first place in the National Startup Pitch Boothcamp & Competition 2019 (PMJB).

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TEACHING & LEARNING (PHYSICAL)

Development of Teaching And Learning Kits For DEE10013

Nur Fadzillah Hussin^{1a}

¹Electrical Engineering Department, Politeknik Sultan Mizan Zainal Abidin, Terengganu, Malaysia

^afadzillah@psmza.edu.my

Abstract. It is a teaching and learning kit that contains analog multimeter model used in DEE10013 (Measurement Devices). An analog multimeter model has been developed to facilitate teaching sessions in the classroom, where in previous methods used, lecturers were difficult to demonstrate how to read the resistance, dc voltage and current using analog multimeter. This developed kit has been tested for the DEE10013 course, and the test result shows that the students more understood the correct way to take the reading using analog multimeter. This kit has been proven effective to facilitate the process of teaching and learning for DEE10013 at the Electrical Engineering Department, PSMZA.

Keywords: teaching and learning kit, multimeter model

Introduction

DEE10013 (Measurement Devices) is a discipline core course for all electrical engineering students in Polytechnics. One of the devices the students will learn and use in this course is an analog multimeter. It is a common piece of test equipment, in which different kinds of meters are combined into a single unit [1]. The volt-ohm-milliammeter (VOM) is the most often used. As its name implies, it combines voltage, resistance and current measuring capabilities.

Before the kit was developed, the lecturers had problems showing students how to properly read the multimeter. This is because the multimeter scale is so small and the lecturers need to show each student individually or in small groups. This will take times to explain to each student. In this course, students will need to use analog multimeter to complete the Practical 1 until Practical 3. In addition, some other courses also require students to be skilled in using analog multimeter, such as Electrical Wiring, Electrical Technology and so on. Therefore, it is very important for every student to master the usage of analog multimeter.

Innovation Focus

The focus of this kit is to help lecturers teach the students on how to read the analog multimeter. When teachers using model and explicit examples, they reduce student confusion and enhance understanding [2].

About the Innovation

This innovative model is made of 5mm thick plastic sheets. It is 100cm high and 60cm wide, lightweight and easy to carry.



Figure 1 : Dimension of the Project

Methodology

Figure 2 below shows the use of this multimeter model in the classroom. All students can clearly see the position of the indicator needle on the multimeter scale as well as the change in range selection.



Figure 2 : Application of the Project

Result and Discussion

This kit was tested in DET10013 course by 39 students of DTK1S2 session June 2019 in Politeknik Sultan Mizan Zainal Abidin. The students take the pre-test and post-test consisting with 10 questions related to the topic in measuring the resistance, dc voltage and current. They must answer the pre-test first then the whole class were taught using this kit. After that, they may answer the post-test. Results are summarised in Table 1.

Based on results, all questions show positive change where the number of incorrect turns decreased after the lecturer used this kit. To evaluate the kit usability, students need to answer the simple question consists of four questions. There has five-point scale from strongly disagree to strongly agree. Results are summarised in Table 2.

Table 1: Comparison between pre-test and post-test.

Question	Subtopic	Result				Change
		Pre	Post	Pre	Post	
		Correct		Incorrect		
1	Resistance reading	28	39	11	0	+
2	Resistance reading	28	38	11	1	+
3	Resistance reading	29	39	10	0	+
4	Resistance reading	30	39	9	0	+
5	Voltage reading	26	36	13	3	+
6	Voltage reading	25	37	14	2	+
7	Voltage reading	27	36	12	3	+
8	Current reading	22	34	17	5	+
9	Current reading	23	35	16	4	+
10	Current reading	24	33	15	6	+

Table 2: Kit Usability

Question	Strongly Disagree (%)	Disagree (%)	Neutral (%)	Agree (%)	Strongly Agree (%)
The skills of using a multimeter are very important to me.	0.0	0.0	2.6	5.1	92.3
The skills of using a multimeter helped me in courses other than DEE10013.	0.0	0.0	10.3	7.7	79.5
I am better off reading multimeters after my lecturer using this kit.	0.0	2.6	5.1	10.3	82.1
This innovation kit is ideal as a teaching tool for the DEE10013 course.	0.0	0.0	7.7	12.8	79.5

Based on the summary, by percentage, we know that most probably students choose to strongly agreed with the questions given.

Summary

The analysis results clearly show that the developed kit has a positive impact on student learning in DEE10013 and help improve students' ability to use analog multimeters.

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Development of Mechatronic Training Kit for Embedded System

Norlaili binti Abdul Rahman @ Abdul Rahim^{1, a}

¹Jabatan Kejuruteraan Mekanikal, Politeknik Tuanku Sultanah Bahiyah, 09000 Kulim, Kedah, Malaysia

^anorlaili@ptsb.edu.my

Abstract. Mechatronic engineering is a combination of technologies such as robotics, electronics, computer, telecommunications and control systems. One of the main skills for mechatronics undergraduates in polytechnics is computer programming skill such as in universal computer language of C programming in controlling microcontrollers. Embedded system is a subject where the students are exposed to the use of microcontroller and programming language. There exists a need to promote better mechatronics oriented practical applications in class of C programming for mechatronics students. In order to satisfy this need, a portable educational trainer that contain various electronic components with real-world applications were developed. This trainer provides combination of common and advance practical applications ranging from a simple light emitting diode to the various sensor with display such as DHT11. This trainer is known as Mechatronic Training Kit for Embedded System (MTKES). To keep students up to date with latest trend of technology, MTKES also included application of internet of things (IoT) in a form of its lab sheet where an application named as MTKES can be installed into user's smart phone. In order to install the MTKES lab sheet application a QR code is provided stick on the MTKES board. The MTKES lab sheet application is provided with nine practical labs. Furthermore, the trainer is portable and light in weight making it suitable for undergraduate's lab use and interested parties such as school students. This trainer offers an interdisciplinary, hands-on approach to teaching C programming that will help students to grab C coding skills along with knowledge of mechatronic systems. Together the trainer and provided experiments manual familiarize key concepts in C programming whilst giving users hands-on experience with microcontrollers and various electronic components and sensors. The trainer uses the Arduino Mega open-source Microprocessor and software as the primary control unit.

Keywords: Arduino, educational trainer, C programming, mechatronics systems, Internet of Things (IoT), Embedded System

Introduction

Nowadays, training kit is widely used especially in educational field in order to encourage certain study among students. With the use of training kit, the study of certain topic can be done and clearly shown in practicing certain part of the topic study. It helps both learners and educators. For educators the training kit really useful especially when it comes to do the practical task for certain topic study. In order to enhance the understanding of certain knowledge educators need to do some practical activities with the students [1]. For examples, in mechatronic field there are a lot of knowledge that is need of practical to encourage the understanding among learners or students.

Mechatronic also called mechatronic engineering, is a multidisciplinary branch of engineering that focuses on the engineering of both electrical and mechanical systems, and also includes a combination of robotics, electronics, computer, telecommunications, systems, control, and product engineering as shown in Fig. 1. Every branch of mechatronic multidisciplinary really exposed to the practical tasks such as wiring, interfacing, programming and designing [2].

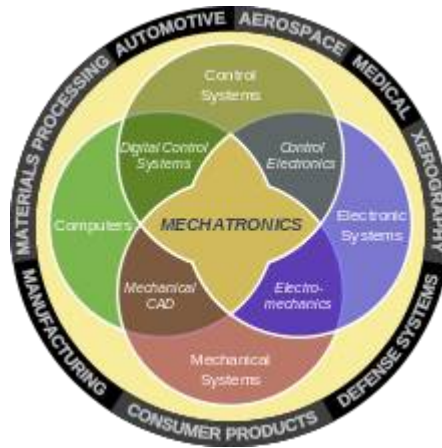


Figure 1: Multidisciplinary Branch of Mechatronic Engineering

Embedded system is one of the study which need lots of application in mechatronic engineering. An embedded system is a controller with a function within a larger mechanical or electrical system, often with real-time computing constraints [3]. It is embedded as part of a complete device often including hardware and mechanical parts. Embedded systems control many devices in common use today. It is a combination of computer hardware and software, either fixed in capability or programmable, designed for a specific function or functions within a larger system. Industrial machines, agricultural and process industry devices, automobiles, medical equipment, cameras, household appliances, airplanes, vending machines and toys, as well as mobile devices, are possible locations for an embedded system.

In higher institution, especially polytechnic embedded system is a compulsory course for mechatronic students. In this course, students are exposed to the knowledge of microcontroller theory, applications and programming. In Fig.2 below show the example of Embedded System study which include the study of microcontroller as the CPU, interfacing with computers then driver motor and sensors as the input and output [4].

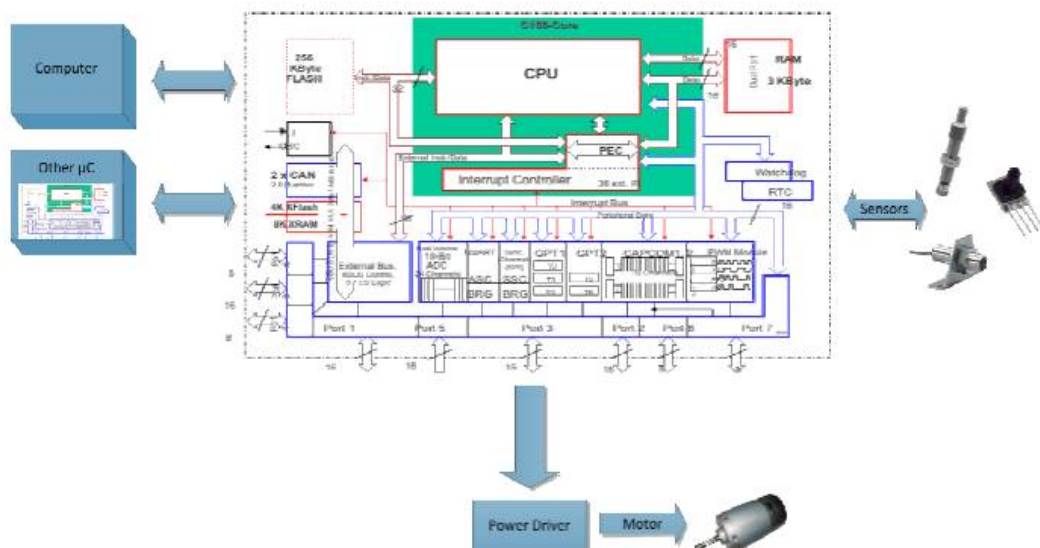


Figure2 : Example of Embedded System Study

Thus, in order to help lecturer and students in doing practical task of the course, a trainer is built which named as Mechatronic Training Kit for Embedded System (MTKES). The objective of this MTKES are:

- i. MTKES is built to help students experience the real practice of embedded system study which include programming and circuit connection.
- ii. MTKES is built with light weight and easy to carry.
- iii. MTKES is built with the smart MTKES MIT smartphone apps for the lab sheets.

While, the scope of the MTKES are specifically mention as follows:

- i. MTKES using Arduino Mega as the main controller which needed students to write and compile the programming using Arduino Ide software.
- ii. MTKES is designed with the ability to do nine practical task from a simple LED application to the data collection using DHT11 sensor with LCD display.
- iii. MTKES is user friendly since it is easy to carry with the handles both side, light and portable.

Methodology

In mechanical part, the process begins with the designing the training kit. It is designed using inventor software. In the design, it is clearly present all the components and how the MTKES looks like. Fig. 3 show the design of MTKES.

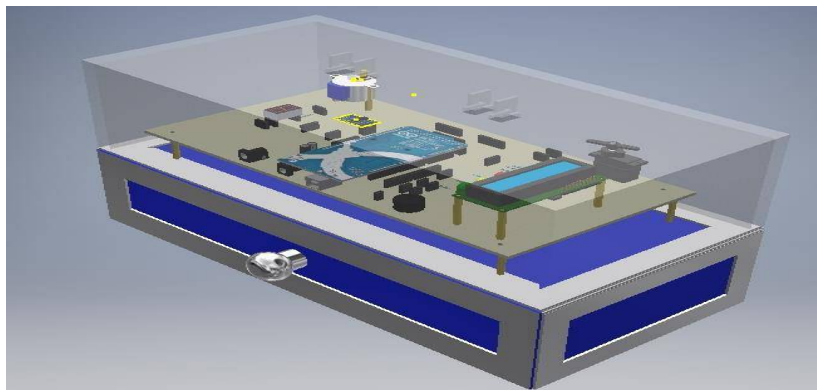


Figure 3: Design of Mechatronic Training Kit for Embedded System

The design of this MTKES use Perspex material for its full body, cover and lockers. It is designed with the upper cover to avoid the main printed circuit board (PCB) and all the components soldered on PCB from any obstacles which can lead to any damage. This MTKES also designed with a drawer to store all the unplug sensors, RS232 interfacing cable, jumper wires and adapter.

For electrical part, it includes the process of designing, printing and etching the Printed Circuit Board (PCB). The PCB is designed using Proteus Design Suite software. In Fig.4 shows the PCB layout for MTKES.

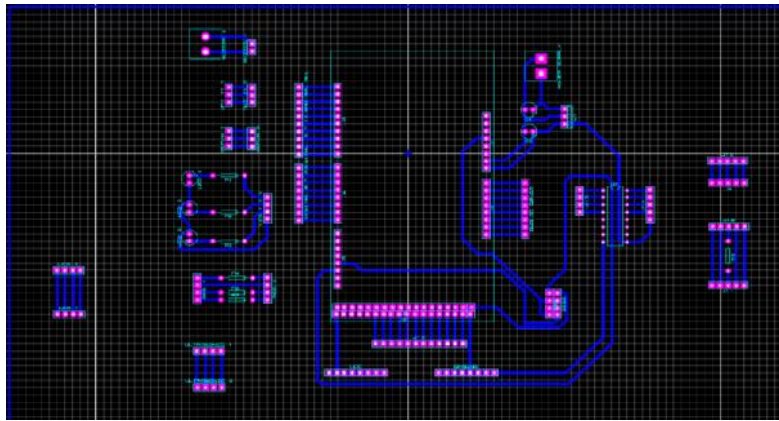


Figure 4: Complete MTKES PCB layout

Once completing the printed circuit board, all the components used are soldered onto it. The components used are Arduino Mega as the main controller, LCD display, sensors, buzzer, light emitting diode, seven segment display, servo motor, stepper motor and ultrasonic sensor.

MTKES is completed with QR code which student can install the MTKES mobile apps into the smartphone in order to get the lab sheet for each practical. The mobile apps is prepared using MIT APP INVENTOR 2 software. Fig. 5 shows the QR code of MTKES labsheet and the front page of the MTKES mobile apps.

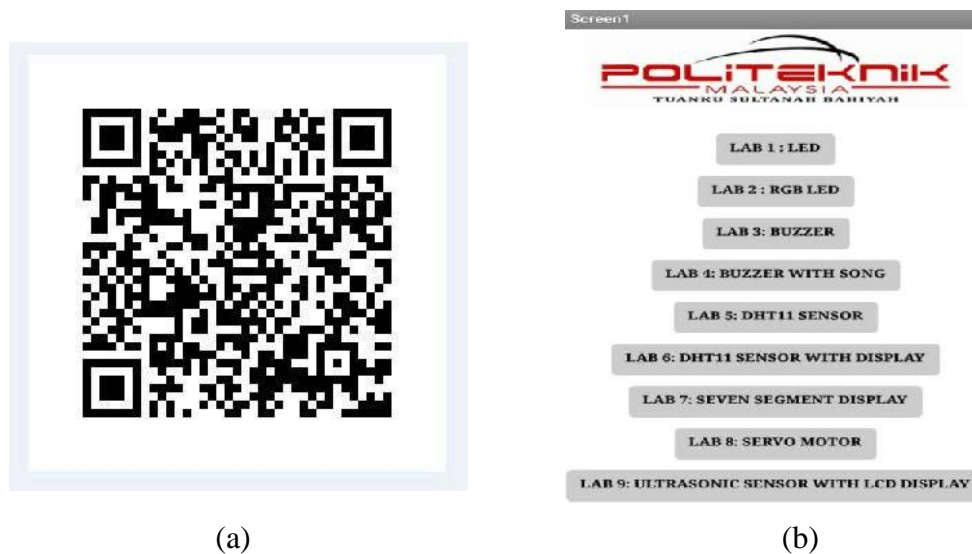


Figure 5 (a) QR Code of MTKES Labsheet; (b) MTKES Mobile Apps

MTKES is built with nine practical task which tested the wire connection and programming for LED application, RGB LED, buzzer, buzzer with song, DHT11 sensor, DHT11 sensor with display, seven segment display, servo motor and application of ultrasonic sensor with LCD display.

Result and Discussion

The practical task is to expose the student to do some circuit connection and programming for controlling the Arduino Mega. There are nine practical task should be completed by the students which need of nine different connection and programming. From the nine task given, students able to understand deeply in writing a programming for Arduino. For example, in lab 5 students are tested to do practical in connecting sensor DHT11 as a weather sensor. Thus, from a lab sheet as shown in Fig.6, students easily make the circuit connection and write the programming using Arduino Ide software.

LAB5		LAB5	
		MTKES (MECHATRONIC TRAINING KIT FOR EMBEDDED SYSTEM)	
EXPERIMENT	1	5	
TITLE	1	DHT 11 SENSOR	
DURATION	1	1 Hour	
1.0 Experiment outcome		5.0 Programming	
At the end of the lab session students should be able:		dht DHT;	
i) To learn the programming using Arduino IDE for DHT11 sensor.		#define DHT11_PIN 7	
2.0 Apparatus required		void setup(){	
i. Mechatronic Training Kit for Embedded System (MTKES)		Serial.begin(9600);	
ii. Wire jumper.		}	
iii. Arduino IDE software.		void loop{	
iv. Arduino adapter		{	
3.0 Safety Precautions		int chk = DHT.read11(DHT11_PIN);	
Before beginning, it is important to mention some safety and measuring rules. First of all, do not hook up any power to your circuit until you have finished assembling it and the laboratory instructor has checked it out. When measuring the current or voltage of a system that you are not familiar with, always set your Ammeter or Voltmeter to maximum scale and work your way down so that you do not overload the meter. Also, always make sure your polarities are correct, and always turn the power off when changing the configuration of the circuits.		Serial.print("Temperature = ");	
4.0 Procedures :		Serial.print(DHT temperature);	
Step 1: Connect Ground pin for DHT11 sensor to ground channel using jumper wire.		Serial.print("Humidity = ");	
Step 2: Connect positive pin to Vcc channel.		Serial.print(DHT hum dty);	
Step 3: Connect input buzzer pin to pin 7 at Arduino Mega port.		delay(2000);	
Step 4: Write programming into Arduino IDE software		}	
Step 5: Plug in the Arduino adapter to the laptop and upload the coding as given below using Arduino IDE software.		6.0 Discussion and conclusion	
Step 6: Observe the result.			




Figure 6: Labsheet for Lab 5 DHT11 Sensor in MTKES Apps

Circuit connection for the lab is done with taking the minimum time which is less than ten minutes for each lab. As shown in Fig.7 is the complete connection for Lab 5 DHT11 Sensor. The result of the sensor reading can be shown in Blynk apps as shown in Table 1. From the all practical task, student surely can use the basic knowledge into their own final project or any application. Since in polytechnic, embedded system study only carries out the marks for continuous assessment. Hence, the marks are 100% focus on the student's ability and capability in doing practical whether in circuit connection or programming.



Fig.7: Cicut Connection of Lab 5 DHT11 Sensor

Table 1: Result for DHT11 Sensor

Graph	Description
	In the initial of the DHT 11 sensor of the data pick up from the graph, we can see in the starting of the sensor is not stable. The temperature is up and down around 28°C to 30°C and the humidity is reading high at 85%.
	From the graph, we can see the temperature is increasing because we taking the sensor to the outdoor for warming up. From 29°C to 32°C and humidity from 85% to 95%.
	After the warming up, the DHT11 sensor become more stable and remain the temperature around 30°C to 31°C and the humidity around 79% to 80%.

Conclusion

In conclusion, training kit is one of the useful device in enhancing the potential of students in teaching and learning process. As for MTKES, this device completely fulfills all the objective which are to help students experience the real practice of embedded system study which include programming and circuit connection, portable kit and easy to access with its lab sheet. Besides in teaching and learning process, MTKES can be exposed to others who have interest in mechatronic system. For examples, lots of hobbyist outside apply the use of Arduino in doing their interest. Thus, this MTKES can give them the first idea how to work with Arduino.

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Design and Development of Smart Whiteboard Cleaner in Classroom Application

Suzilawati binti Alias^{1,a}, Sullyfaizura binti Mohd Rawi^{1,b}, Marlina binti Mohamad^{1,c}

¹Department of Mechanical Engineering, Politeknik Sultan Mizan Zainal Abidin, Km 08 Jalan Paka, 23000 Dungun, Terengganu, Malaysia.

^asuzilawati@psmza.edu.my, ^bsullyfaizura@psmza.edu.my, ^cmarlina@psmza.edu.my

Abstract. Nowadays, whiteboards are used widely in higher educational centre over the world. The whiteboards usually are cleaned manually using manpower. This study offers a solution to clean the whiteboard automatically called Smart Whiteboard Cleaner. The idea gained after viewing the manual process of whiteboard cleaning in polytechnics in ways to provide some comfort for teachers while cleaning the whiteboard. Smart Whiteboard Cleaner is a tool which can move up and down to clean the whiteboards by pressing the button called Double Pole Double Throw (DPDT) button and powered with the help of DC Motor 12V. Smart Whiteboard Cleaner will be implement to facilitate the process of the classroom housekeeping. The result is compared between manual duster cleaning and Smart Whiteboard Cleaner. Finding shows that manual duster cleaning completed after 6.53 seconds while Smart Whiteboard Cleaner only takes 4.01 seconds. This makes Smart Whiteboard Cleaner worth to use as it can save time. In conclusion, Smart Whiteboard Cleaner is a good option used to facilitate the process of the whiteboard cleaning as it can be cleaned in an easy and can provide convenient ways of use.

Keywords: whiteboard cleaner, board cleaning, board cleaning system, automatic whiteboard cleaner.

Introduction

Whiteboards are the basic things in classroom and used widely in schools and higher educational centres for teaching and learning purpose. Whiteboards also support face to face meetings by facilitating the sharing of ideas, focusing attention, and summarizing [1].

Development of Smart Whiteboard Cleaner in Classroom Application is a system that is generally used to facilitate the process of whiteboard cleaning. The idea grows after viewing the manual process of whiteboard cleaning by teachers in ways to provide some comfort for teachers while cleaning the whiteboard.

We can save time and energy by using this automatic system as no manpower need to clean the whiteboard manually. The previous technic of cleaning whiteboard has no automatic cleaning function, so teachers wasting their time in erasing whiteboard in classroom. The structure of Smart Whiteboard Cleaner is simple, offer a solution of cleaning within time saving and it can provide convenient ways of use.

Methodology

This tool operate on principles of mechanical and electronics combination. The main objective of Smart Whiteboard Cleaner is to prepare an attachment for whiteboard which can operate automatically by pressing the button thus get rid of the drudgery of manually cleaning whiteboards. The duster can move up and down to clean the whiteboards by pressing Double Pole Double Throw (DPDT) button and powered with the help of DC Motor 12V. Double Pole Double Throw (DPDT) button is refer to electrical configuration of switch. Smart Whiteboard Cleaner uses the mechanism of

DC Motor for cleaning the whiteboard. The motor will support the rail which will convert into linear motion carrying the connecting duster attached to the whiteboard. The flow process of Smart Whiteboard Cleaner can be refer to figure 1. Figure 2 and figure 3 show the design of Smart Whiteboard Cleaner.

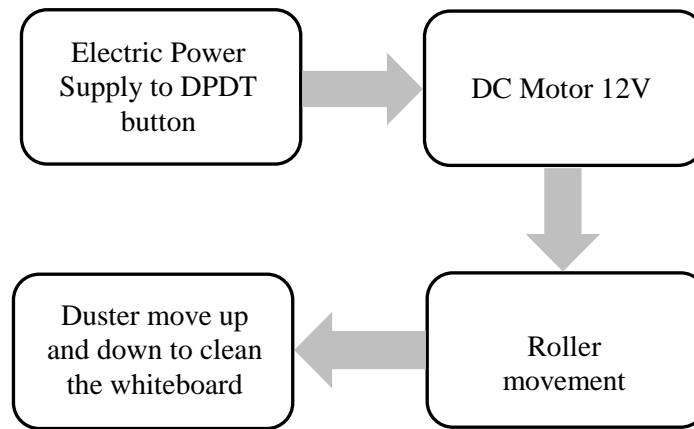


Figure 1: Flow Process of Smart Whiteboard Cleaner

Table 1: Components of Smart Whiteboard Cleaner

Bil	Components	Advantages
1	DC Motor 12 V (Power Window)	Widely used Easy installation
2	Ball Bearing	Wear resistance Widely used
3	Fibre (Duster)	Efficient clean
4	Mild Steel (Frame)	Easy fabrication Light

Figure 2: Isometric Drawing of Smart Whiteboard Cleaner

Literature Review

The Main objective of Automatic Duster Machine is to provide a concept of cleaning whiteboard or blackboard with a single key pressed as it can prepare low cost and user friendly ways. The machine can be operate in three selectable operation modes. In the first mode, it cleans the left side of the board while in the second mode it cleans the right side of the board. It cleans the whole area of the board in The third mode. The machine can move the duster in horizontal (x-axis) and vertical (y-axis) direction using stepper motor. Linear motor help the duster to move up and down in direction. Infrared transceiver is used to detect horizontal direction of motor. This machine apply four limit switches to detect the boundary of the board. The main purpose of dsPIC30F401 microcontroller which was programmed in C language is as the main controller in application of the machine [2] .

In ways to eliminate the problems related to chalk dust, inconvenient ways for the teachers and wasting time of erasing the boards, Gaurav Gangurde has design and develop a board cleaning system which is using application of DC geared motors to drive the rack and pinion mechanism to clean the blackboard and whiteboard. The motors will drive the pinions into linear motion on the rack carrying the connecting strip with duster attached to it by bearing rotation. The design also using small water sprinkler to spray the water on the blackboard. Sprinkling the water on blackboard will created pressure which is saving time and energy as it also can get rid the motor load by the use of wiper motor. In way to adjust the clearance between pinion and rack, Toggle mechanism is used. Gaurav Gangurde also suggest some new ideas and improvement for the design and development of board cleaning system in future. First it can be *Operate in schedule* which is this machine can operate in time we set for. Secondly the idea *Eye of machine* which is we can create machine that can operate by detection of dirty on whiteboards and erase it automatically [3].

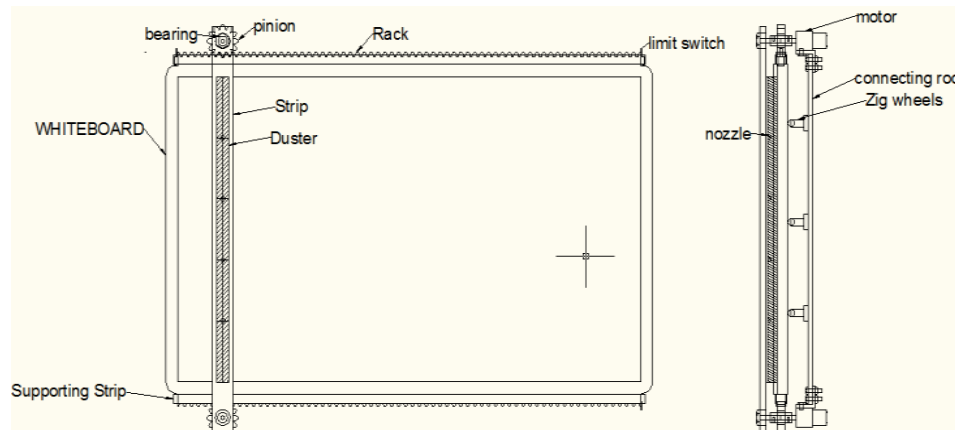


Figure 3: Front View and Side View of Automatic Whiteboard Cleaning system [3].

Sliding type wipe mechanism implement of motion analysis to detect the stain of blackboard chalk automatically and clean up the blackboard. This system apply three guide rails and three sliders. Motor A drives the left and right motion of cross rail beam C and motor B drives the vertical motion of slider 3 (wipe system) to clean the blackboard surface by moving the wipe system along the rail C together. This system using application of sensor which is located at right most of the blackboard to sense the right end position and signal passed to return the wipe system. Smart wipe has a good effect and runs smooth with good reaction speed compared with manually wipe. The rate of motion of the motor can be set in accordance with the need of the wiping speed to suit the need of different occasions. The smart eraser offers a simple structure as the operation is easy. The product is suitable for use in large, medium and small education centers [4].

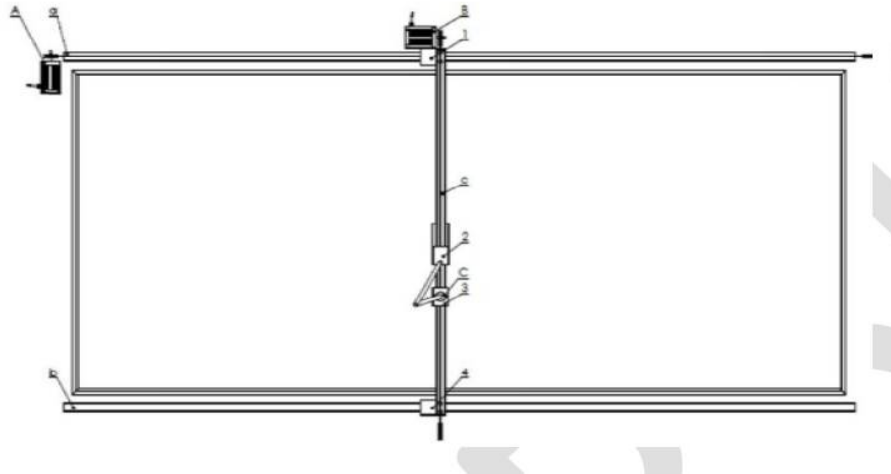


Figure 4 : Blackboard Erasing Mechanism[4].

Wall shape recognition using limit switch can be implement by Gondola typed robot system. In this system there are two limit switches. Limit switch is widely used mechanical sensor at robotics and factory automation. We applied this sensor to the gondola-typed building maintenance robot system to recognize the wall shape. With this sensor data, we will control the painting tool nozzles to protect windows and react to obstacles on the wall. Two limit switches sense the wall and the obstacle respectively. By adjusting stroke of limit switch, the sensor module can be applied to various environments. The ARS sensor and the height sensor are used to mapp 3D localization of the robot. If ARS sensor and height sensor are connected to other place of the gondola, the sensor data send to the limit switch module process algorithm. Two limit are used as the switches have different purpose and setting [5].

Findings

By the use of Smart Cleaner Duster, we can save time and energy as no manpower need to clean the whiteboard manually. The teachers waste time in erasing the whiteboard in classroom as the previous board has no automatic cleaning function.

Table 2: Time taken for Manual Whiteboard Cleaning and using Smart Cleaner Duster

Reading	Time (second)	
	Manual Whiteboard Cleaning	Smart Cleaner Duster
1	6.23	3.98
2	6.59	4.02
3	6.77	3.99
Average	6.53	4.01



Figure 5: Graph time comparison between manual whiteboard cleaning and using Smart Cleaner Duster

Refer to figure 5, the graph shows time comparison between manual whiteboard cleaning and using Smart Cleaner Duster. Finding shows that manual duster cleaning completed after 6.53 seconds while Smart Whiteboard Cleaner only takes 4.01 seconds. This makes Smart Whiteboard Cleaner worth to use as it can save time. Furthermore, the structure of Smart Whiteboard Cleaner is simple, offer a solution of cleaning within time saving and it can provide convenient ways of use.

Conclusion

People want every single thing in life look sophisticated, easy and fast in this new era of technology. They wish for something new in ways to upgrade their lifestyle and facilitate their routine by using the application of machines or robots. That's why development of machine and robot becomes high demand and faster in marketing. Development of Smart Whiteboard Cleaner is an alternative option to help lecturers, teachers and students to facilitate the cleaning process of whiteboards.

This project has a big potential to be developed as one of the advanced technology in future. It should be installed in school and higher education center over the world. Smart Whiteboard Cleaner was designed and fabricated which can potentially be used in classrooms to facilitate the process of the classroom housekeeping. Smart Whiteboard Cleaner is worth to use as it can save time. In conclusion, Smart Whiteboard Cleaner is a good option used to facilitate the process of the whiteboard cleaning as it can provide an easy and convenient ways of use.

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Student Understanding of Menstruation and *Istihadhah*: An Overview in PSMZA's Students

Che Nor Kharsiah binti Yasin^{1,a}, Noraini binti Ismail^{1,b},
Nor Hasniati binti Abdullah @ Mahmud^{1,c}

¹ Department of General Studies, Politeknik Sultan Mizan Zainal Abidin,
Dungun Terengganu, Malaysia

^akharsiah@psmza.edu.my, ^bnoraini@psmza.edu.my, ^cnor.hasniati@psmza.edu.my

Abstract. The debate on the issue of women's blood, menstruation is very delicate and thorough among scholars. It often causes confusion among students in particular and the community at large. This confusion arises from their misunderstandings and lack of knowledge Islamic teaching (*Fiqh*). The purpose of this study is to know with an understanding on menstruation and *istihadhah* among students, as well as the calculation during this situation. This is because it does not only involve women's personal hygiene but it also covers other Islamic rituals such as prayer, fasting, tawaf, recitation of the Quran and others. This study is a quantitative research conducted using questionnaire method. The sample of this study consisted of 200 students, randomly selected from four departments in PSMZA. The instrument used consisted of 15 question items in the form of likert scale. The data obtained are presented in a descriptive manner using frequency and percentage. The results of this study were analyzed using Statistical Package For Social Science (SPSS) version 21.0. The results show that there are still many students who are unable to distinguish between Menstruation and *Istihadhah*, difficulty on calculating the clean period and insufficient knowledge on Islamic rituals allowed and other practices during both conditions (Menstruation and *Istihadhah*). This problem could be worsened by the end of the menstrual period especially in the case of irregular blood. Therefore, all parties should play a continuing role and work together in an effort to promote understanding to the students.

Keywords: Student understanding, menstruation, *istihadhah*

Introduction

Menstruation is the blood that flows out of a woman's womb at certain times not due to an illness or by birth. It is a sunnatullah that Allah has assigned to a woman. In the book Sheikh Muhammad bin Abdul Rahman Ad-Dimasyqi [10] the minimum period of menstruation according to the most well-known Syafie sect is overnight and the maximum is 15 days and 15 nights. Normally, the color of menstrual blood is dark, warm, painful and smells bad [2]. According to Al Fadhil Ustaz Mansoor's Ismail al Hafiz [5] states that the blood which comes out is thick and warm and sometimes it is a liquid blood, unnoticed, painful or even numb.

Allah Ta'ala says (means):

They ask thee concerning women's courses. Say: They are a hurt and a pollution: So keep away from women in their courses, and do not approach them until they are clean. But when they have purified themselves, ye may approach them in any manner, time, or place ordained for you by Allah. For Allah loves those who turn to Him constantly and He loves those who keep themselves pure and clean.

(Surah al-Baqarah: 222)

This verse explains that Allah made the end of the prohibition a purity because illat (reason) of the law of prohibition from abstaining from wife is menstruation. The law works when a wife is in a menstrual state and the law does not exist when she is pure from menstruation.

Problem Statement

Various issues related to women's blood especially from students as there is no more syllabus related to Taharah in Islamic Education. Furthermore in polytechnics particularly, Islamic Education course has been replaced by Malaysian Studies Courses. Researchers have found that many more questions raised by students during or outside teaching and learning are related to such problems as irregular menstruation, menstruating daily, not knowing the difference between blood, blood flow for 30 days and so on. It is even more worrying if this problem arises for women who do not remember the date and time of their menstrual period. Although there are programs such as helwa lectures and talk conducted to give students insight, there is still confusion and complaints among students with various legal issues related to women's blood. Problems will become more complicated if educators and parents themselves cannot master this knowledge well.

Research Objectives

The main objectives of this study are :

- i- To identify students' understanding on menstruation and *istihadhah*
- ii- To identify the level of understanding on menstrual and *istihadhah*
- iii- To identify the calculation of period during menstruation and *istihadhah*

Research Questions

From the objectives of the study, the research questions are constructed so that the actual study could answer all the research questions. The research questions are:

- i- What is the understanding of students on menstruation and *istihadhah*
- ii- What is the level of understanding among students on menstrual and *istihadhah*
- iii- How to calculate menstrual period and *istihadhah*

Scope Of Study

This study involved Muslim students who were randomly selected from all academic departments in Polytechnic Sultan Mizan Zainal Abidin. This study also focused only on menstrual blood and *istihadhah*. Therefore, the information obtained from this study is based only on the items in the questionnaire.

Literature Review

The meaning of menstruation in terms of language means is "*saylan*" which means the flow [5]. According to Shari'a, menstruation is the name of blood coming out of the womb, which is not due to birth and then the blood flow becomes a regular tendency that occurs at certain times and is normal to a woman [1]. Menstrual blood is also defined as the blood flowing from the vagina of a nine-year-old woman until condition '*ayisah*', which is the despair of menopause. Scholars' Syafie Mazhab compiled a list of blood colors into five phases which are, black, red, brown, yellow and murmur [2]. Women in menstruation are prohibited from praying, fasting, entering the mosque, reciting and touching the Quran, *tawaf* the Kaaba and having sex [12]. While *istihadhah* is to flow while from Islamic syarie it means the blood of a disease that passes through the veins at the end of the uterus known as al-'Azil.[7] . Some scholars say that blood is associated with menstrual blood [11].

A study conducted on Smart Taharah: Problems of Menstruation and *Istihadhah* by Siti Suriyani Binti Sulaiman at the National Polytechnic Islamic Research and Education Seminar 2014. Results from a study involving 730 respondents, found that many still do not understand the status of the *istihadhah* in worship.

Methodology Of The Study

Research Design

This survey is one of the most popular non-experimental research methods used in various fields. This study represents all the research methods used to collect data directly from a group of subjects. Review studies are usually done by interviewing the subject of the study or providing a questionnaire to the subject of the study to be answered [4]. To study the students' understanding of menstruation and *istihadhah* among the students at Polytechnic Sultan Mizan Zainal Abidin, the researcher used questionnaires.

Population Of The Study

Population refers to all members of a group [6]. The total population of PSMZA students is 1578. However, the study population is comprised of Muslim students who are randomly selected from all departments namely the Department of Civil Engineering, Department of Mechanical Engineering, Department of Electrical Engineering and Department of Information Technology which about 306 students. However, the total number of completed samples according to the researcher's requirement is only 200. There are two important things to keep in mind when making a sample, namely issues related to adequacy and representation. Adequacy is whether the number of samples selected is sufficient for generalization, while representative is related to whether the number of samples actually represents the population studied [9].

Study Instruments

This study was conducted using a set of questionnaires. The questionnaire was constructed by the researcher based on the objectives and questions of the study. This questionnaire has two sections, section A and section B. Section A contains some questions about the respondents' background. Whereas section B is based on the objectives and research questions of identifying students' understanding of menstruation and *istihadhah*, identifying the level of understanding in menstrual and *istihadhah* in practices and identifying the calculation of menstrual period and sex.

Pilot Study

Researchers conducted a pilot study of 30 students comprising students from the Department of Civil, Mechanical, Electrical Engineering and Department of Information and Communication Technology. The pilot study was conducted to determine the reliability and validity of the questionnaire to be used by the researcher. The alpha value of this pilot study was 0.675 above the Cronbach alpha 0.60. This means that the alpha value of the questionnaire is acceptable to determine the reliability of the questionnaire.

Findings and Results of Studies

The majority of the respondents were 18-19 years old which is 184 (92.0%) out of 200 respondents. In level of education before entering polytechnic, most respondents attended National Secondary School (SMK) of 180 (90.0%), followed by Religious Secondary School (SMA) 12 (6.0%), Technical / Vocational High School 4 people (2.0%)) and 4 National Religious Schools (2.0%).

Questionnaire analysis and discussion :

Based on table 1 below, the results of the survey found that almost all respondents 96.5% said they understand what menstruation and *istihadhah*. However, their understanding on *istihadhah* was a bit disappointing as 43% agreed that *istihadhah* is a blood that comes out less than 24 hours.

Items BA4 showed the highest percentage of information related to menstrual and *istihadhah* by students was 173 respondents, of whom 86.5% were more likely to refer to a teacher than to read a related book. This shows that the teacher and ustaza plays an important role in assisting the students of the Polytechnic Sultan Mizan Zainal Abidin in understanding and solving the problems that arise among students regarding menstruation and *istihadhah*.

Table 1- Level of student understanding of menstruation and *istihadhah*.

Number of Item	Item	Number of Student	Percentage(%)
BA1	I understand what is menstruation and <i>istihadhah</i>	193	96.5
BA2	<i>Istihadhah</i> is blood that is less than 24 hours	86	43
BA3	Istihadhah is blood that exceeds the maximum period of menstrual period	180	90
BA4	I like to refer to a teacher or ustaza	173	86.5
BA5	I think that yellowish and murmur are not considered menstruation if they are not present at menstruation period	132	66

According to table 2 below, percentage for item BB1 and BB2 on Islamic rituals are higher between 72% and 69% . However, the percentage on BB3, BB4 and BB5 are quite unsatisfying which indicates that most of the students are not well versed in the rituals and practices allowed between both conditions, menstruation and *Istihadhah*.

Table 2- Level of understanding in the practice of menstruation and *istihadhah*

Number of Item	Item	Number of Student	Percentage(%)
BB1	I can pray and fast while <i>istihadhah</i>	144	72
BB2	I can recite the Quran in case of <i>istihadhah</i>	139	69
BB3	Jima '(sex) can be done during <i>istihadhah</i>	57	28.5
BB4	I can cut hair and nails during menstruation	89	44.5
BB5	I can perform pilgrimage such as wuquf in Arafat, spend the night in the Muzdalifah and throw in Jamrah during menstruation	39	19.5

The finding based on table 3 below, respondents care about the calculation of menstrual period and pure from menstruation and well-versed in the calculation of menstrual periods and *istihadhah*, while have the finding had continuous blood loss for a month or more. This would be even more complicated if these respondents were among those who did not care about the calculation of menstrual period and *istihadhah*.

Table 3- Calculation of menstrual periods and *istihadhah*

Number of Item	Item	Number of Student	Percentage(%)
BC1	I know how to calculate the pure from menstruation period between menstrual period	173	86.5
BC2	I care about calculating menstrual period and pure from menstruation	182	91
BC3	The maximum number of menstruation is 15 days and 15 nights	164	82
BC4	I always record the date and time of my menstrual period	136	68
BC5	I have had continuous bleeding for a month or more	26	13

Conclusions And Recommendations

By looking at the objectives of this study, which is to identify student's understanding on menstruation and *istihadhah*, to identify the level of understanding in menstrual and practices and to identify the calculation of menstruation and *istihadhah*, the study found that almost all respondents knew and understood about menstruation and *istihadhah*. Studies have also found that students are less knowledgeable in what they may perform do or vice versa during menstrual and *istihadhah*. Studies have also found that most students are concerned about the calculation of menstrual periods and *istihadhah*. However, there are some respondents who have had continuous blood flow for a month or more and it will be more complicated if they are among those who do not care about the calculation of menstrual period and *istihadhah*.

There are a number of suggestions that can be made to ensure that every student can address issues related to this issue, such as conducting a special talk (helwa lecture) over the weekend or free time for female students related to women's fiqh. In addition, the latest books on women's issues (Menstruation & Istihadhah) that students can refer to should be available at the PSMZA library or Islamic Center. In addition, parents and teachers need to strengthen the knowledge of women's blood in order to solve any problems or misunderstandings that arise among children or students themselves. Lecturers especially ustaz and ustazah also need to work together and be willing to listen and help students to solve problems related to this issue. Finally, a special seminar on menstrual issues and lectures to all Islamic Education lecturers in particular and PSMZA lecturers should be organized based on current issues raised today.

Based on this study, several suggestions can be highlighted for future studies such as the researcher need to obtain larger sample to obtain better reliability of the findings. In addition, the researcher also recommends that the study be conducted in a qualitative manner by interviewing the students for more in-depth and detailed information.

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Study on Utilization of Invasive Species Apple Snail (*Pomacea* spp) As Protein Substitute in the Pellet Diet of *Clarias gariepinus* Fingerling

Nur Farahiah Binti Zakaria^{1,a}, Noor Ain Binti Abd Hamid^{1,b},
Nur Aina Lyana Binti Mohamad Ali^{1,c}

¹Jabatan Agroteknologi dan Bio-Industri, Politeknik Jeli, Malaysia

^afarahiah@pjk.edu.my, ^bnoorain@pjk.edu.my, ^cnuraina@pjk.edu.my

ABSTRACT. Expensive protein source which mainly fish meal, experience decrease of supply from fishery resources. Aquaculture is facing great decline in production if sustainable sources cannot be found to replace fish meal. Apple snail (*Pomacea* spp) is invasive pests that now pose serious damage to rice growers in Malaysia which was brought into the country around the early 1990's. It has been able to adapt in Malaysia because there are no natural enemies able to prey them, also fast and quick reproduction. Despite the damage brought by apple snail, the protein content can be up to 50%. Typical diets for fish should contain from 32% to 45% of total protein content. Due to that, it can be a good replacement to fish meal. This study has been conducted by producing a dry pellet with apple snail, palm oil and flour as raw ingredient. The objective was to satisfy the fish diet by providing this new protein source. The experimental design involves *Clarias gariepinus* fingerling fed on apple snail pellet compared with commercial diet. Result shows that, there is no significant different in average of *C. gariepinus* weight gain which were 2.67g in GOWEM pellet whereas commercial diet was 2.88 during 8 weeks of experiment. There was also, no significant difference in food conversion ratio (FCR), ($P.0>05$) in the mean weight gain specific growth rate (SGR) and survival rate. Thus proved that apple snail can be utilize as protein source in aqua feed.

Key Words: Apple snail (*Pomacae* sp.), Protein substitute in fish pellet, Invasive species, *C. gariepinus* fingerlings.

Introduction

Aquaculture is a growing and highly potential industry where 60% of the production cost was contributed by feed and feeding [11]. Feed ingredients such as fish meal, soybean meal, groundnut cake and others, which are available for human consumption, are also being demanded for by the livestock industry. This has been a major factor affecting the development and expansion of aquaculture industry in Malaysia. The success of fish farming worldwide depending on provision of suitable and economical fish feed. The second largest phylum in the animal kingdom is Mollusca with having about 100,000 living species [13]. One of them was apple snail (*pomacea* sp.) This species originality is from South Africa and has been brought to this country for ornamental purposes, and from water based vegetables and ornamental aquatic plant that has been imported from neighboring country. It is believed that these plant carrying the eggs apple snail [12].

Research Background / Problem Statement. Fish meal which forms the major component of fish feed is very limited but, highly competitive for consumers and is the source of the high costs in formulation. The objectives to reduce the quantity of fish meal while maintaining the protein quality in fish feed has been the focus of many fish nutritionists for several years.

Several studies on replacing fish meal with plant protein [10] and other animal sources has been made, like mussels [7], crabs and frogs [20], lizard [5], and poultry meat meal [18]. On the other hand, the life cycle of apple snail is very rapid and the reproduction is mass. This species is hermaphrodite which is having both male and female sex organs, with all year breeding season. An apple snail is able to produce 8000 eggs during 6 month of life cycle. According to the report by 'Rancangan Selamat Pagi Malaysia' on 20 January 2017 [16], apple snail destroyed the rice plant at Kelantan, Kedah and Pahang since 2010. In Kelantan only, 250 hectares has been destroyed every season. It also has been invaded by neighboring country [6][1]. According to report made by International Paddy Institute, eight apple snail able to destroyed 93% paddy seed in 1m³ Farmers facing great financial loss due to that. This could kill country's food industry. In this research also, fingerling catfish has been used as subject of experiment. The reason is that, Clariidae (mudcatfish) are widely distributed throughout Malaysia. They inhabit tropical swamps, lakes and rivers. It is one of the most cultured species in Malaysia. *C. gariepinus* also has been considered to be used in this study due to ability to feed on a variety of food items in the wild up to fish to zooplankton as well as phytoplankton [14].

Research Objectives

The objectives of this study were to discover the potential of apple snail protein to replace fish meal as a major protein contribution in fish feed. This is not new, since apple snail has been used as ingredient in poultry feed mill [15]. This is based on report from Veterinary Department of Kedah proved that apple snail contains 40% protein content. Other than that, an article by M. Ambari, Jakarta on 6 January 2016 stated that Ministry of Marine and Fishery of Indonesia suggested that '*bekicot*' snail as replacement for protein source to be fed to African Catfish. At Philippines also, they have suggested apple snail to be fed to poultry, prawn, fish and other livestock [2]. Other than that, this research has potential to created predator to the apple snail which is human. Apple snail can be caught and processed to become main ingredient in fish pellet. This will solve the farmer's problem and on the other hand, reduce aquaculture management cost [17][23].

Methodology

The methodology has been separated to sampling and processing of raw apple snail, dry pellet processing, test feeding, sampling, measurement and analysis and statistics.

Apple Snail Sampling and Processing. Random sampling has been done around Kelantan district such as Pasir Mas, Pasir Putih and Tumpat. There is no specific size and weight targeted. All has been collected by hand pickling and put into the cool storage to prevent spoilage during transportation. Upon arriving, the sample has been kept in freezer with -4°C at Fish Propagation House, Politeknik Jeli. The processing of apple snail starts by thawing it to the room temperature. Then it has been boiled till water temperature reached 100°C and cooled. The flesh of the snail has been pulled out using skewer and shells have been grind using grinder [19] and weighted. The flesh has been dried using microwaved oven at 80°C until dry then grinded until reach the consistency of flour.

Pellet Processing & Production. Three main raw ingredients has been used which were boiled apple snail flesh, wheat flour and oil with ratio 8:2:1 respectively. Vitamin and mineral premix also has been added in the formulation. The pellet formulation has been calculated by using Pearson's Square method. Series of basic processing methods has been used started with weighing, grinding, mixing, pre-conditioning, pelleting, drying, enrobing and packaging.

Pellet Test Feeding

Experimental Design. A total of six experimental indoor mini flow through system with plastic tanks of fifty litres capacity were used, carried out in the Fish Propagation House, Politeknik Jeli Kelantan. The tanks were cleaned, disinfected and allowed to dry for 24 h, after which they were filled with dechlorinated tap water to two-third size of the tank. Two type of treatment has been given which is on experimental pellet and commercial pellet. Each of the treatment was replicated thrice. Each of the tanks has been put with 40 African catfish fingerling of average 1.5 inch and has been acclimatized for one week after obtained from supplier.

Water Quality Monitoring. Dissolved oxygen and pH meter was determined using the YSI multiparameter, while temperature was taken daily before feeding at 07.00-08.00 am with thermometer.

Measurement and Analysis. The weekly weights recorded and feed supplied were used to compute the growth as follows:

Mean weight gain = $(fw - iw/n)$ (where iw; initial body weight, fw; final body weight, t = duration of experiment in days and n = number of experimental fish).

Relative growth rate = $(\text{Fish Weight gain} / \text{Initial body weight}) \times 100$

Specific growth rate = $(\text{Lnfw} - \text{Lniw}) / t \times 100$

Feed Conversion Ratio = $\text{Feed fed (g/kg)} / \text{Weight gain (g/kg)}$

Survival rate = $(\text{Number of fish during harvested} / \text{Number of fish stocked}) \times 100$

Statistics. (ANOVA) One way analysis of variance has been done to test the variation of significant among the treatments. Statistical test were performed based on statistical software SPSS (statistical package for social science) version 10.00. The findings of the research were presented in text. The statistical units were defined as tanks and the level of significance was set to 0.05.

Result And Discussion

Apple snail processing. A whole snail was weighted 1 kg, washed, boiled and unshelled, yields about 250 g of snail flesh. The step to boil until temperature reaches 100°C is very crucial due to fresh snail meat spoils easily. The snail flesh should be cooked and dried if the snails cannot be used right away. Other than that, it is to facilitate the separation of the meat from the shell and remove pathogens [22].

Water Quality Parameters. The data of water quality parameters were temperature, 27.8 ± 0.40 °C; dissolved oxygen, 5.7 ± 0.32 mg/l and pH range of 7.5 – 8. The optimum levels of water quality parameters make the test subject in high acceptability of feed, so any cause of the mortalities is not due to culture condition. This might be due to stress during stocking at the second week.

Fish Performance. As shown in Figure 1, the performance of apple snail meal in the experimental diets positively affected the growth of fish in this study. There was a continuing increase in growth rate from the beginning (2.68 g/fish) to the end (6.05 g/fish) of the

experiment. Table 1 shows a summary of the growth performance of the fingerlings. Fish fed with apple snail pellet diet had slightly lower mean weight gain which was 2.58g while on commercial pellet was 2.88g. It is also has been observed in specific growth rate which was recorded slightly high (0.35%) in fish fed commercial die while 0.33% in apple snail dry pellet. But, there is no significant different ($p \leq 0.05$) from specific growth rate between diets. The value for FCR was 1.4 for both of the experiment. High survival rate has been recorded in both diets, about 95-96%.

Table 1 Growth Performance of *C. Gariepinus* Fingerlings Fed on Experimental Pellet and Commercial Pellet

Parameters	Experimental pellet	Commercial pellet
Mean Initial weight (g/fish)	2.58	2.88
Mean final weight (g/fish)	5.27	5.42
Mean weight gain (g/fish)	2.28	2.56
Relative growth rate (%)	102.30	99.34
Specific growth rate (%/day)	0.33	0.35
Feed Conversion Ratio	1.40	1.40
Survival (%)	95.8	96.3

Result shows that, there was no significant variation ($P > 0.05$) for SGR, RGR, MWG and FCR in experimental pellet compared to the commercial diet. This indicates that the protein quality in the apple snail compares well with that of commercial diet. It can also be concluded that there is no component of growth suppressor in apple snail flesh. Plant or animal protein origin in fish feed acts as both energy and structural components (Brett and Grooves, 1979) which quantity and quality have influence on the growth rate of fish if other physiological requirements are fulfilled [21]. The fish weight-gain observed in the experimental pellet are indications of the variation of protein utilization by *C.gariepinus*. The acceptance of apple snail meal by fish and the high nutrient value of this ingredient indicate that their commercial exploitation could be profitable to feed industries and fish farmers. The lower value of feed conversion ratio indicates better utilization of the feed by the fish fed this diet. The feed conversion ratio results from this study which is 1.4 is within the reported range by the authors. According to De Silva and Anderson [3] the range between 1.2- 1.5 is appropriate for fish fed carefully prepared diets.

Feeding *C. gariepinus* fingerlings with experimental pellet diet showed high survival rates as well as in commercial diet, which indicate that it could enhance survival of fish. This may probably due to suitability of fish on the snail-based diets which gives better feed conversion and utilization. This is supported by Holm and Torrison [9] that reported that animal feeds and living organisms do enhance healthy state and survival and of fish at their early stages.

Conclusion

Total eradication of established populations is nearly impossible. One of the most successful methods is hand picking done as a community effort on a regular basis which could contribute to local community. Apart from that, the use in animal feeding of invasive snails species such as the apple snail is a way to control their development and limit their environmental impact. With this level of acceptance and utilization the use of garden snails in the diet of *C. gariepinus* will go a long way in reducing the high cost of rearing fish and improve production through aquaculture. This was a preliminary research and more research should be carried out for development of culture and harvesting techniques, so that the supply of this protein source could catch up demand.

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Study on the Effect of Sea Cucumber, *Stichopus horrens* and Aloe Vera, *Aloe barbadensis miller* Mixed Gel on External Wound-Healing

Nur Aina Lyana Mohamad Ali^{1, a}, Nur Farahiah Zakaria¹

Mohd Mukriz Mohd Kasim^{1, b}

¹Politeknik Jeli Kelantan, Jalan Raya Timur Barat, 17600 Jeli, Kelantan.

aina@pjk.edu.my, mukriz@pjk.edu.my

Abstract. This study examines the reaction of Sea cucumber, *Stichopus horrens* and Aloe Vera, *Aloe barbadensis miller* mixed gel on the external wound healing of animal. Sea cucumber or as well known as Gamat in Malaysia, is one of the Holothurians that lives in marine habitat and has been widely used by various industries such as pharmacy, cosmetics and others. The sea cucumber is reported to have rich amount of glycine, arginine and has about 70% collagen. Hence, it has been used traditionally to treat wound. Along with the Sea cucumber, Aloe Vera, is another one of the natural remedies that rich in various nutrients that have been used traditionally to soothed the wound besides to promote scars healing and else. In this study, we used both the natural ingredients to promote external wound treatment and scars healing of the Albino mice, *Rattus norvegicus*. The objective of this study was to produce a product of mixed gel containing Sea cucumber and Aloe Vera, to determine the chemical content in the gel produced and lastly to study the effect of the gel on external wounds of Albino laboratory mice. Gel sample have been analysed to laboratory for detection of potential hazardous component. The result shows promising effect which takes short time to heal and does not leave scarring on Albino's external wounds. Therefore, this formula could have a great potential to be marketed however, some further study of suitability on different skin type, allergen reaction, the stability and expire should be done first.

Keywords: Sea cucumber; *Stichopus horrens*; Aloe Vera; *Aloe barbadensis miller*; gamat gel; Wound healing; natura;, aqua cosmetic.

Introduction

A wound is defined as damage or disruption to the normal anatomical structure and function [1]. This can range from a simple break in the epithelial integrity of the skin or it can be deeper, extending into subcutaneous tissue with damage to other structures such as tendons, muscles, vessels, nerves, parenchymal organs and even bone [1]. The wound can be caused by cut, burn, blow, broke, pressure and else. The history of wound healing basic principles have been known since 2000 BC started from the use of clay or mud plasters, beers, honey, animal fat, vinegar, until in the 19th century which antiseptic technique become a major breakthrough [2]. There are more than 5,000 wound cares products are reported in the present time [2]. The medicinal or cosmeceuticals products are usually made either in liquid, solid, cream or gel form. Gel is a type of jelly like and transparent material. Texture of gel is more fluid and less stickiness because most of it is water based. Gels are widely used in the production of both cosmetic and medicinal products. Natural cosmetics or medicinal products that incorporate marine-based extracts are being increasingly sought after in the industry, with more and more consumers demanding products that are of natural origin [3].

Sea cucumbers and Aloe vera shows great potential as a cosmeceutical ingredient in the cosmetic industry. Sea cucumber itself has become one of the most important products because of its higher nutraceutical and pharmaceutical value [4]. Sea cucumbers have been documented to have valuable nutrients such as Vitamin A, Vitamin B1 (thiamine), Vitamin B2 (riboflavin), Vitamin B3 (niacin)

and a number of pharmacological activities including anti-angiogenic, anticancer, anticoagulant, anti-hypertension, anti-inflammatory, antimicrobial, antioxidant, antithrombotic, antitumor and wound healing have been reported to have high amounts of collagen that helps in damaged tissue repairing [4]. Sea cucumber also contain specific nutrient that act as antibacterial, anticancer as well as antifungal [5].

Aside from Sea cucumber, Aloe vera also is gain attention from the ancient time to treat wound even reported as highly effective in treatment of chronic wounds. According to [6], Aloe vera gel stimulates the growth of the epithelium and increases wound healing, stimulates the granulation tissue. Aloe vera seems to treat a variety of conditions because of its wound healing, anti-inflammatory, immunity, antidiabetic, antioxidant, laxative, antibacterial, antifungal, antiviral and antitumor effects [7]. Apart from being efficacious in wound healing, Aloe vera gel is also a safe product. No allergic reactions/ infections were associated with Aloe vera gel. Aloe vera gel heals wound faster as compared to the conventional therapy. Aloe vera gel is also very cost effective as compared to the conventional therapy [8].

Methodology

Extract Sampling. Sample of dried Sea cucumber were bought from Pulau Langkawi. The extract of sea cucumber was prepared by rinsed, soaking it for 24 hours before boiled for 1 hour. Next the sample has been grind, sieved using fine mesh and keeps in clean container. The extract then was kept at -4°C. Meanwhile, sample of fresh essence extract of Aloe Vera was prepared by collecting the aloe gel from the inner leaf, rinsed and grind before sieved and kept under -4°C.

Gel Preparation. There are two types of gel that have been prepared for this experiment. The first gel contain only Sea Cucumber (10%) as the active ingredient called G gel meanwhile the latter contains the mixture of 5% Sea cucumber and 5 % Aloe Vera as the active ingredient and noted as GA gel. The gels were produced by first preparing clean hot water in the bowl; add on xanthan gum powder (binder) slowly to thicken the mixture. Stir slowly before adding Sea cucumber and Aloe Vera extract into the mix. Stir again before adding some essential oil to lighten the smells of sea cucumber. The mixed gel then was kept at -4°C. The gel sample then was send to KBioCorp at Kedah for analysis of chemical content (cadmium, arsenic, mercury, lead).

Experiment setup. There were forty mice were used in this preliminary study. The mice were divided into two groups which are the control group and the treatment group. Control group are the group of mice that have been treated with the Sea cucumber gel only while the treatment group involve of mice that have been treated with the mixed gel. The mice have been sedated using formalin. The mice hairs were shaved at the area of experiment which was at the back of body. Alcohol isopropyl were used to disinfect the area of wound. The part of incision was first mark using a marker for about 1.5 cm of length before cut using a sharp scalpel. Another pad of alcohol was pat and iodine was applied after the incision. After the blood has dried, the prepared mix gel was applied twice per day for 14 days length of time. The observation data of wound size, wound colours and characteristic were collected every two days.

Result and Discussions

Gel production. Two types of gel were prepared throughout these experiments which are gel containing 10 % of sea cucumber (control) and the other gel containing mix ingredients of sea cucumber (5%) and aloe vera (5%). The gels were kept in separate bottle for a month. No characteristic of fouling were access from the bottle.

Wound Healing. Table 1 and Figure 1 show the activity of gels on wound size against time for Albino mice. For both of gels, it seems like the activity of wound healing is faster for group of Albino mice that have been treated with GA gel compared to using G gel.

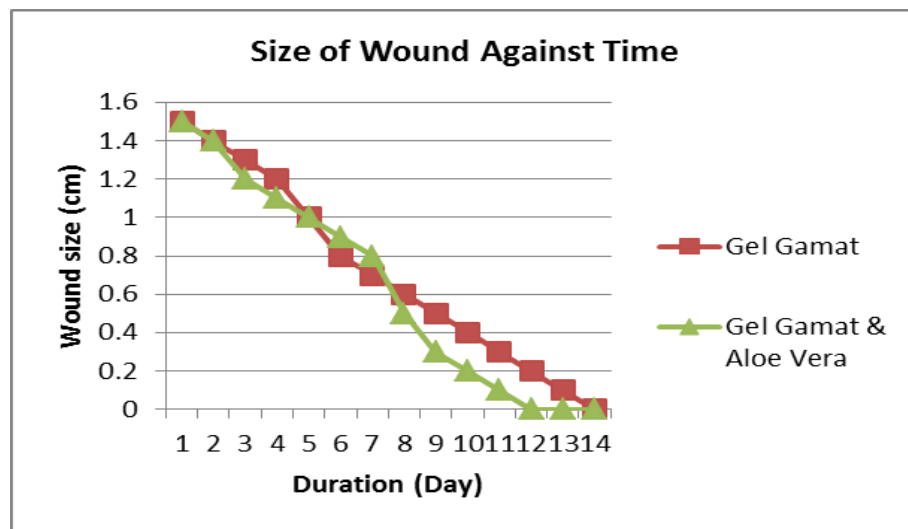


Figure 1: Graph of wound healing progress of Albino mice for both of G gel and GA gel.

Table 1: Wound size of Albino mice from day 1 to day 14.

Duration (Day)	Average of wound size (cm)	
	Sea cucumber (G)	Sea cucumber + Aloe vera (GA)
1	1.5	1.5
2	1.4	1.4
3	1.3	1.2
4	1.2	1.1
5	1.0	1.0
6	0.8	0.9
7	0.7	0.8
8	0.6	0.5
9	0.5	0.3
10	0.4	0.2
11	0.3	0.1
12	0.2	0
13	0.1	0
14	0	0

Albino mice external wound that was treated with G gel is recovered on day 14 while 11 days of tissue recovery for group that was treated with GA gel. According to [9], there were three phases of wound healing which are inflammation, tissue formation and tissue remodeling. The healing process involves three overlapping phases in order to achieve the tissue integrity and homeostasis [9]. In this study, the wound healing process is sum up in Figure 2. The first stages of wound healing (inflammation) have been seen on the mice from day 1 to day 5. The second stage (tissue formation or fibroblastic) have been seen from day 6 to day 10. The last stage (tissue remodeling) has been seen from day 11.

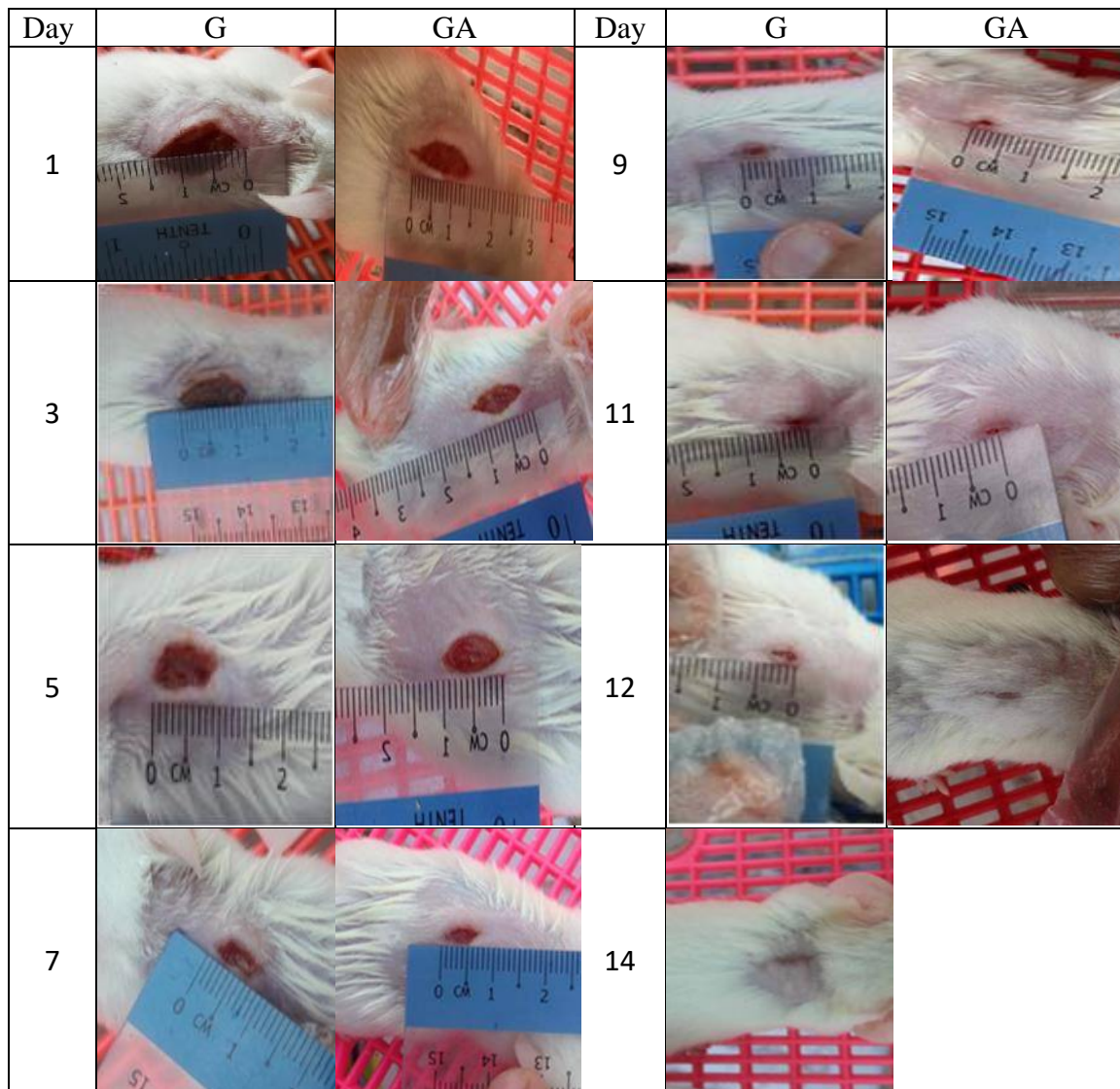


Figure 2: Photograph of the wound from day 1 until day 14.

Another difference between both group of Albino mice is GA gel groups seems to grow hair faster at day nine while G gel group hasn't observed to grow hair until day 14 throughout the observation. The result might suggest that the Aloe vera have a good combination and can work together to give better and faster result that Sea cucumber alone. Sea cucumber was said to have important omega 3 fatty acid (EPA and DHA) which can help to wound-healing and act as antioxidant and anti-inflammatory compound. Meanwhile Aloe vera have been said to have characteristic of antiseptic and antibacterial as well as contain Cu, Zink, and Vitamin C and Vitamin A which is good for wound healing, anti-coagulant, and so on.

Conclusion

As a conclusion, both sea cucumber gel and Sea cucumber mix Aloe vera gel that have been produced in this preliminary study shows promising result to be used as natural wound-healing gel with mix gel gaining faster result in less than two weeks application. This product can benefit the communities especially those who is pro-natural products. However, further study on the stability of ingredient and allergic test for any ages and parts of human skin as well as other properties needs to be further investigated.

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Design and Development Mini Compression Molding for Teaching and Learning

Sullyfaizura Mohd Rawi^{1, a}, Suzilawati Alias^{1, b} and Siti Aishah Wahid^{1, c}

¹Department of Mechanical Engineering, Politeknik Sultan Mizan Zainal Abidin,
Km08, Jalan Paka 23000 Dungun, Terengganu, Malaysia.

^asullyfaizura@psmza.edu.my, ^bsuzilawati@psmza.edu.my, ^csiti.aishah@psmza.edu.my

Abstract. Compression molding is a major technology in the plastic industry, and the one of the original processing technique for manufacturing plastic. The current study was aimed to design and fabrication of mini compression molding machine for use in laboratory workshop or education institution. This machine was designed and fabricated to reduce the cost of expensive purchasing and cost maintenance of compression molding machines used in the industry. Mini compression molding provides for study of implemented to facilitate the production process of plastic products according to the mold provided. This machine used an oven as a heater to melt the resin in the mold provided and car jack as pressure to compress the resin after melting. The parameter has been considered is a temperature and pressure of the process of flow raw material into the cavity and period of time of melting. Based on the test, the optimize of temperature suitable for heating the polypropylene plastic (PP) to melt is at 250°C, while the best time to melt of at 250°C is within 15 minutes. From the results obtained based on the quality of mold produced by the mini compression molding machine, the fabricated machine performance was satisfactory and can be used locally institution and industrially in small scale. This Mini compression molding used in Manufacturing lab in PSMZA for subject of DJF2012 (Manufacturing Workshop Practice 2) as development aids in Teaching and Learning.

Keywords: Compression molding, plastic product, parameter, teaching and learning, institution.

Introduction

Compression molding is a technique to develop variety of composite products and can produce complex composite without use CNC machining[1]. In [2] explained the compression molding of composite material has been used in industry since 1940 caused by suitability for high volume production, repeatability, and, more recently, production of superior surface finish. Compression mold are rated by their closing force capacities. There is can be manual, semiautomatic or fully automatic. The compression molding preform temperature, molding temperature, molding pressure, molding time and cooling time are the most important design parameters. Cavity depth is important to increase the proper molded density [3].

Compression molding commonly used in manufacturing thermoset part. The raw material for compression molding are regularly in the form of granules, putty like masses. The main concept of manufacturing process for plastic molding is placing a polymer in a molten state into the mold cavity so that the polymer can take the required shape with the help of varying temperature and pressure. The mold is then closed and pressure is applied to force the materials to fill the cavity. A hydraulic ram is often utilized to produce sufficient force during the molding process. The heat and pressure are maintained with the period time until the plastic is used[4].

In [5] describes technique in process of compression molding involves three steps of procedures specifically:

- i. Preheating samples at specific temperature for certain times to soften them.
- ii. Compressing preheated samples at the same temperature to match to the mold shape.

- iii. Cooling compressed samples under pressure for particular intervals to cool the sample.

In principle, a compression molding machine is a kind of press which is oriented vertically with two molding halves top and bottom halves. Generally, hydraulic mechanism is used for pressure application in compression molding. The controlling parameters in compression molding method to develop superior and desired properties of the composite. Recently in [6] all the three dimensions of the model pressure, temperature and time of application are critical and have to be optimized effectively to achieve tailored composite product as every dimension of the model is equally important to other one.

Compression molds and tooling are more expensive because the mold are made of hard metal and can be highly polished to obtained good surface finish [7]. Additionally, for compression molding, maintaining the highest part quality must coincide with faster processing and more efficient and material usage[8]. According to [9], subsequent for machining and finishing are minimal using compression molding and the labor cost of are reduced. In [10] describes some of advantages compression molding is more uniform density, low cost, uniform shrinkage due to uniform flow when the material being compressed, improved impact strength, dimensional accuracy and internal stress and warping are minimized.

The concept of manufacturing process for plastic product using compression molding has a strong comprehensiveness and practically when its deliver with theoretically for student. However, in current teaching process, most theoretical course is separated from practical operation. In [11] described the blind lecture teachers easily lead to cramming education phenomenon, it is because the acceptance and poor learning effect for student is low. By reforming the practically method student has a firm of knowledge and allowing them to achieve teaching objective.

Methodology

The main objective of this project is to design and fabrication of mini compression molding machine for use in laboratory workshop or education institution. The size compression molding machine in industry is large and heavy for lifting and it is not suitable for education purpose. This mini compression molding can produce small size and limited of the product using plastic material. Besides that, mini compression molding machine which is small, and easy to lift anywhere for used a new equipment/tool in laboratory, educational and institution. The design of mini compression molding was generated in Figure 1.

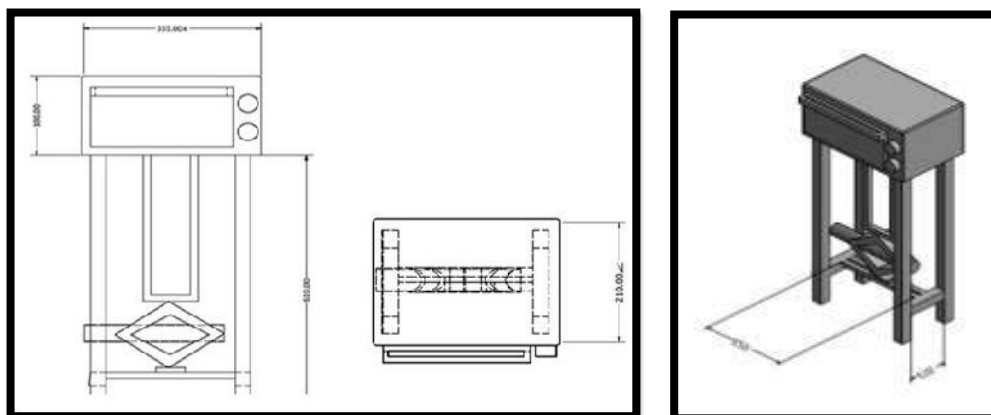


Figure 1: Design of Mini Compression Molding

The hollow steel was choice as a main of material selected to assembly of mini compression molding for the base of machine. Based on product design, the hollow steel was a cut and connected to oven as a equipment of to ensure that there is application of heat for the sole purpose of acquiring the required shape of the mold cavity with high dimensional accuracy. For the base product, hollow iron is welded to another part to assembly with supported car jack for the purpose to compress the mold after the resin was melt. The complete of mini compression molding machine is shown in Figure 2.



Figure 2: Mini Compression molding Machine

Based on the flowchart in Figure 3, it shows the basic step of procedures to use the mini compression molding. First of all, the preparation of plastic granules such as polyetehlene plastic are places in between the molding plates. After ON the oven, parameter of the temparature and time has been setup using oven knob. The mold close under heat temparature using oven as heater to melt the granules of Polyproplene. After the resin completely melt, car jack use to compress the mold. The mold was open and the quality of the final product has been testing to find optimize of parameter setting for temparature and time with the completely melting of the resin. If the quality of the product not perfectly melting, the temperature and time is setup again until the final product is in good condition.

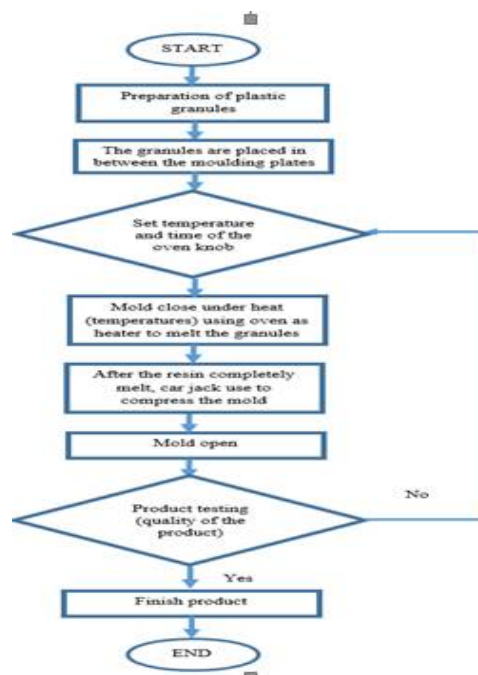


Figure 3: Flowchart for the process of Mini Compression molding

Result and Discussion

In this project, fabrication of mini compression molding machine carried out for performance evaluation. This project produces a machine where it is implemented to facilitate the production process of plastic products according to the mold provided. This project uses an oven as a heater to melt the resin in the mold provided and car jack as pressure to compress the resin after melting. With the manufacturing process, it was essential to choose (polypropylene) that can withstand the quality of the final product. As a result of the project that has been implemented and two types of testing have been performed on mini compression molding. It was crucial to find out if there were any defects in the final product and the perfect melting with the optimize parameter based on temperature and time.

Effect of Temperature testing

The first test is carried out on the 3 trial sample with different temperature and the time is constant. Based on the Figure 4, the result of the 3 trial shown, the resin not fully melt with using 200°C and 225°C does not fully melt in 15 minutes. Even though the polypropylene melting point is 160°C, the surrounding temperature might affect the temperature of the machine during the testing process. This is because there are no refractory materials around the oven to prevent heat loss. However, the trial 3, the resin can fully melt using this 250°C temperature proving that the temperature of 250°C resins can be melting because the temperature is enough even with surrounding heat loss. However, the trial 3, the resin has complete melting when the temperature at 250°C is within 15 minutes. Analysis of temperature testing shown in Figure 4.

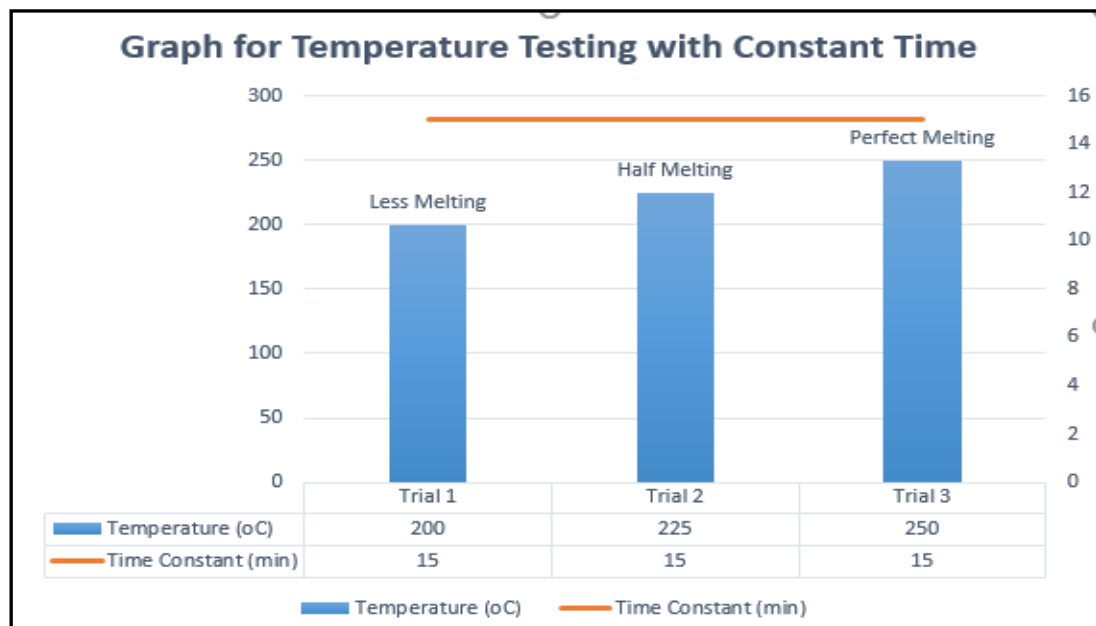


Figure 4: Analysis of the temperature testing

Effect of Time testing

The second test is the different time with constant of the temperature with 3 trial for the sample of polypropylene. Refer Figure 5, the result shown for comparison of 3 trial used 250°C as constant temperature with the different time of setting parameter. For the trial 1, the result shown, the resin not complete melting in 5 minutes with 250°C temperature. The same problem occurred for the trial 2, the resin does not fully melt using 10 minutes because it is not enough time to melt of the granules. The complete melting of the resin shown in trial 3 with the 250°C temperature and the time is 15 minutes. The result of analysis time testing shown in Figure 7.

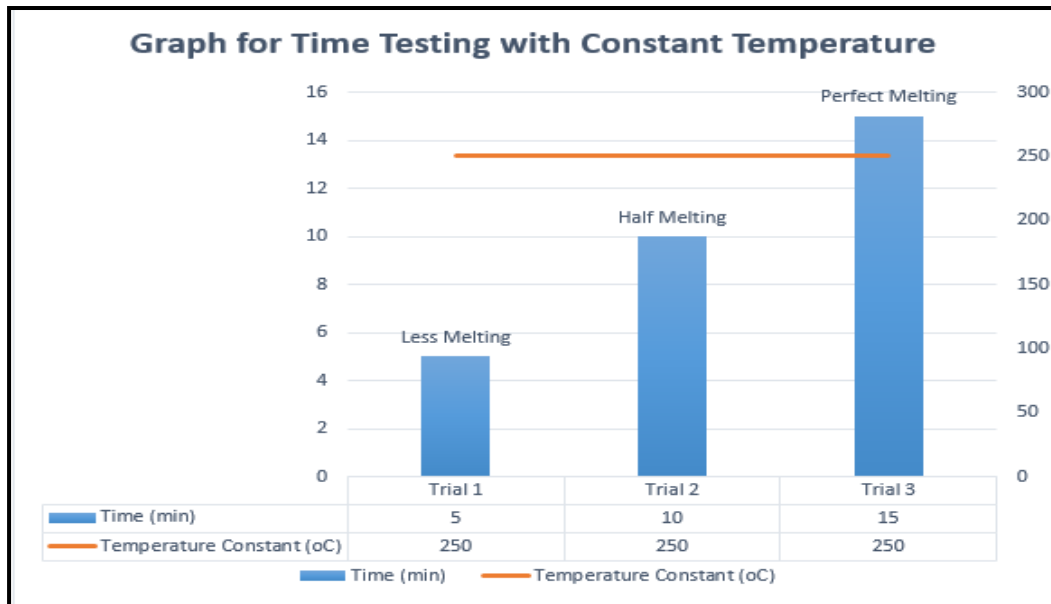


Figure 5: Analysis of the time testing

Final Product testing

The quality of the final product also shown in Figure 6 with the 3 trial of the product sample with the different of setting parameter. The product attention become less melting when the temperature is 200°C and the time 15 minutes. This is because the heater not enough to melt the polypropylene resin.

In the sample 2, the result shown the quality of product was half melted when the temperature setting is 225°C and time is worn in 15 minutes. This effect because the heater required more heater to melting the resin. Finally, in the sample 3 shown the product complete melting with the 250°C temperature and the time is 15minutes. The product attention become melting complete because the heater is enough to melting the resin.

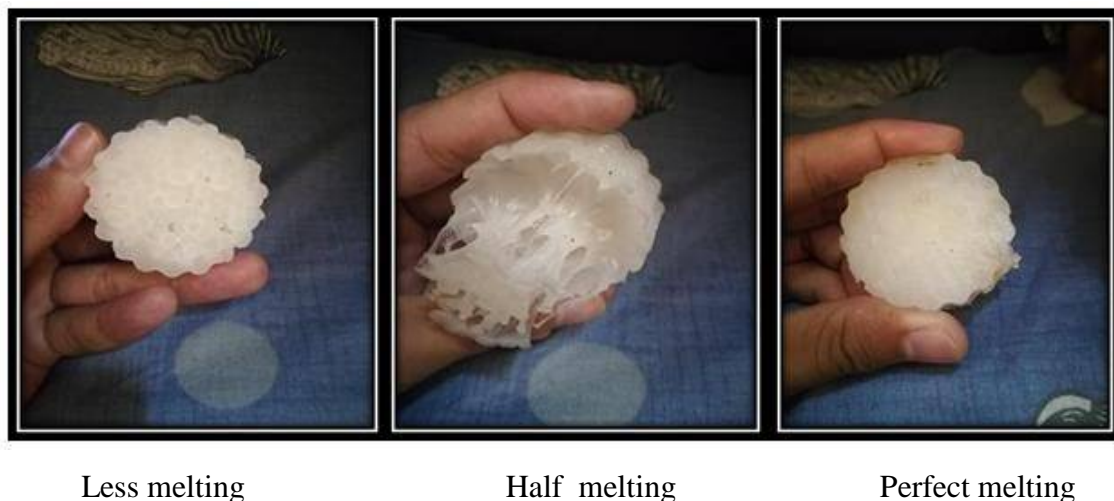


Figure 6: Quality of Final Product for Melting Resin.

Conclusion

In a nutshell, through this project it can be concluded the “Mini Compression Molding” is a new creation without changing the original way of Compression Molding Process. This machine can have provided convenience to the users of an education and the fabricated machine performance was

satisfactory and can be used locally institution and industrially in small scale. Test performance was carried out on the fabricated mini compression molding machine. Polypropylene materials in granules were complete melted 250⁰C. The time to melt of the resin is 15 minutes. Mini compression machine can be used for to demonstrate of manufacturing process of plastic product. This machine also can be used as prototype for study of optimize parameter considered of temperature, pressure and period of time for various types of plastic. Besides that, this machine can be improving the development product in Teaching and Learning. Lecturer will be able to organize the Outcome Based Education (OBE) concept in the classroom using mini compression machine. Students can be handle this machine individually and also practice the concept of OBE in learning process.

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Effects Of Tobacco (*Nicotiana tabacum*) Application On Population Of Termites (*Coptotermes formosanus*)

W Noor Aida, W. M.^{1, 2, a}

¹ Department of Agrotechnology and Bio-Industry, Politeknik Jeli Kelantan,
Jalan Raya Timur Barat, 17600 Jeli, Kelantan, Malaysia.

² Faculty of Agro-Based Industry, Universiti Malaysia Kelantan.

^aaidamuhamad123@gmail.com/ aida@pjk.edu.my

Abstract. Tobacco is cultivated for their by-product. In this research, by using tobacco as a basic ingredient for botanical insecticide making, it had been tested on termites (*Coptotermes formosanus*) population. Simple extraction from tobacco leaves containing nicotine as active ingredients were mixed with garlic, salt, stone paste and fermented for 3 days. The application based on different dilution series which are T1 (distilled water/control), T2 (pure stock), T3 (5 ml pure stock: 10 ml distilled water), T4 ratio (1: 2) T5 (1: 3), T6 ratio (1: 4) and T7 with ratio (1: 5). A 1.5ml of dilution is being put on filter paper inside a petri dish which consists of 30 live termites. Each treatment consists of 3 replications. Data collections of percentage dead termites are recorded for 1, 3 and 5 minutes interval. All collected data had been analyses using Two-way ANOVA using SPSS version 24. The percentage of died termites recorded at 96.67% in treatment 2 and shown significant difference. Other treatments that show significant differences are treatment 3 and 4. The best treatment was treatment 2 with highest percentage of dead termites and shortest time intake. These botanical insecticides are effective in controlling termites population thus it can be commercialized and safe to our environment.

Keywords: tobacco, botanical insecticides, termites

Introduction

Currently we are facing a lot of side effect from commercial pesticides that harm our environment and human health. The residues lead to serious health effect. Thus this project contributed to new knowledge in botanical insecticide from tobacco leaves. Tobacco (*Nicotiana tabacum* L.) is an economically important non-food crop cultivated and consumed largely all over the world. Tobacco belongs to the family Solanaceae, which contained more than 64 species, and *N. tabacum* is the most cultivated and commercially consumed species of this family Nicotine. Tobacco is used for cigarettes, water pipe smoking, medicine, creamy snuff, and chewing tobacco [1]. However there are many other benefits from tobaccos leaves that not well discovered. Previous study claimed that the total sugar, total nitrogen, potassium and starch contents of leaves depend on cultivation areas [2].

Termites are group of insects belonging to class Isoptera consisting of 2,500 species of which 300 are considered as pests. Termites are one of the most damaging pests in the tropics and can cause considerable problems in agriculture, forestry and housing. The most troublesome type of termites in agriculture is the fungus-growing termites. They feed on dead organic material such as crop residues, mulches and soil organic matter (humus). However when this type of food is not available they will eat live plant material including crops such as groundnuts, millets and maize. Termites can attack plants at any stages of development from the seed to the mature plants. Termite population contributes to great damage in agriculture sector [3]. Thus, these researches focus on producing botanical insecticide from tobacco leaves and identifying the effectiveness of botanical insecticide produced towards the population of termites.

Methodology

Botanical Insecticide Preparation: Basic ingredients of botanical insecticide are tobacco leaves, garlic, salt and stone paste. 100g of dried tobacco leaves were selected and used. Put all the ingredients inside the blender. Add 30g of limestone paste, salt and garlic. Add 1 liter of water and blend the mixture well for 15 minutes. The mixture solution then will be filter few times using filter paper. The solution is left at room temperature for fermentation process for 3-7 days. The methods used are according to [4] with modification.

Sample Preparation: Termites' population had been collected from random nest located in Jeli, Kelantan, Malaysia. 630 termites had been used for this research. 30 termites placed on Whatman No.1 filter paper with 9cm diameter placed inside petri dish. Then 1.5ml of different dilution of botanical insecticide will be drop to filter paper according to [5] with modification. Termites were considered to be dead if appendages did not move when prodded with a probe.

Research Design and statistical Analysis: Experimental design used: Complete Randomized Design (CRD) with 3 replication. There were seven treatments to reduce the population of termites. First treatment which is T1 (control) we used water only. Then, second treatments was T2 which is pure stock botanical insecticide and for the third treatments was T3 with the ratio 1:1 that mix with 5ml pure stock and 5ml water. The next treatment was T4 with the ratio 1:2 that mix 5ml pure stock and 10ml water. Treatment five which is T5 with the ratio 1:3 that mix 5ml pure stock and 15ml water and the T6 was for treatment six and the ratio 1:4 with the 5ml pure stock mix 20ml of water. T7 was the last treatment with the ratio 1:5 with 5ml pure stock and 25ml of water. The time interval that used was 1 minutes, 5 minutes and 10 minutes for 30 termites. The data has been analysed using Two Way ANOVA in SPSS version 24. Numbers of dead termites were counted and percent mortality was calculated according to the following equation and corrected using [6] equation.

Results

The result shown mortality percentages of termites (%) versus treatments and the second is mortality percentages of termites (%) versus time interval (minutes). 7 treatments shown different effectiveness on botanical insecticide applied. **Mortality Percentages of termites (%) over treatments.** Based on the Figure 1, mortality percentage of termites was calculated based on average percentage at 10minutes after application of pesticides. For the treatment 1 with is control (distilled water), percentage of death termites is 58.14%. Meanwhile, for treatment 2 with is (pure stock) shown 96.67%.

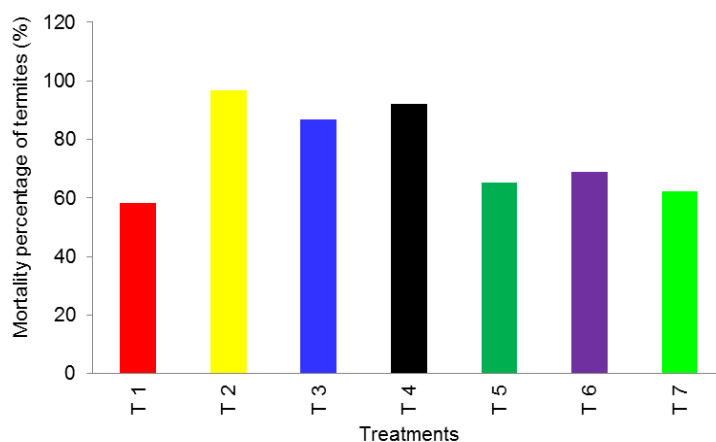


Figure 1: Mean Mortality Percentages of Termites (%) at 10 minutes for every treatment.

Treatment 3 with the ratio (1:1), the percentages is 86.66%. Next, for the treatment 4 with the ratio (1:2), percentage of mortality of termites is 92.22% which is second highest after treatment 2. Then,

for treatment 5 the percentages of mortality slightly decrease using ratio (1:3) which is 65.18%. Treatment 6 using a ratio (1:4). Only recorded 68.88% of percentage mortality of termites. Lastly, treatment 7 by ratio (1:5) recorded only 62.15%.

Mortality Percentages of termites (%) over treatments over time interval (minutes). Based on Figure 2, the result have showed that treatment 1 for minutes 1 is (53.33%), minute 5 (60%) and minute 10 (61.11%). After that, for the treatment 2 in minute 1 the percentages mortality of termite is (90.00%), minute 5 (100%) and for the minute 10 (100%). Next, for the treatment 3 at minute 1 the mortality percentage is (60%), minute 5 (100%) and followed by minute 10 (100.00%). Then, for the treatment 4 at minute 1 (78.89%), minute 5 (97.78%), and minute 10 (100%). The treatment 5 at minute 1 (40%), minute 5 (66.67%) and minute 10 (88.89%). For the treatment 6 at minute 1 (55.56%), minute 5 (66.67%) and minute 10 (84.44%). Finally, for treatment 7 at minute 1 (51.33%), minute 5 (61.11%) and minute 10 (74%). Maximum mortality (100%) recorded by treatment 2 and treatment 3 at 5 minutes interval, meanwhile for treatment 4 at 10 minutes interval. The lowest mortality percentage was 51.33% recorded treatment 7 at 1 minute's interval.

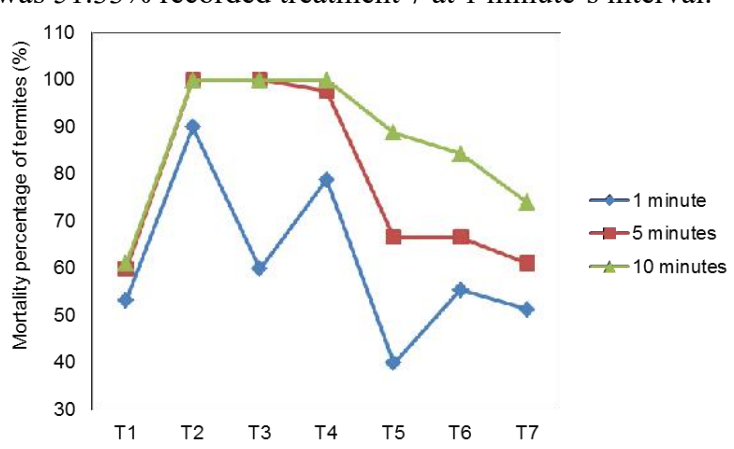


Figure 2: Percentages mortality of termites (%) over Time interval (minutes)

Table 1: Average time for 30 termites to completely die (minutes) over treatments

Treatments/time	Average time for all 30 termites to completely die (minutes)
Treatment 1	35
Treatment 2	2
Treatment 3	3
Treatment 4	4
Treatment 5	19
Treatment 6	27
Treatment 7	28

Discussion

Mortality Percentages of termites (%) over treatments. For the percentage mortality of termites, the result shows that treatment 2 which is (pure stock) with significance result with percentage of mortality is 96.67%. This is due to high concentration of nicotine compared to other treatments that had been dilute with water. Treatment 3 and treatment 4 for also showed high percentage mortality more than 80%. Thus, this can be concluding that higher concentration of organic pesticides lead to higher mortality percentage of termites [5]. Even though this research does not proceed with active ingredients and botanical compound analysis, it is yet believe consist of nicotine. Tobacco leaves (*Nicotiana tabacum* Linn. Solanaceae) have been used as pesticide for long time [7]. Nicotine, rotenone and pyrethrum which extracted from tobacco, derris root and chrysanthemum among the earliest natural pesticides been produced [8]. Besides that, the secondary

metabolites that derived from plant such as alkaloids, steroids, terpenoids, essential oils and phenolics studied to have insecticides activities [9]. Moreover, various plants have been developed into economically important products including nicotine, rotenone, ryania, sabadilla and pyrethrum [10]. Meanwhile, [11] [12] [13] claimed that the presence of toxic and insect-repellent compound on any botanical extracts indicate the effectiveness of against termites' populations. In addition, plant pesticides are safe, easy to process, affordable and suitable for local farmers compared to conventional pesticides [14] [15]. Moreover, natural insecticide derived from plants does not develop resistance in pests and pathogen due to the presence of various active compounds [16]. On the other hand, natural pesticides easily degrade [17]. Thus, it leads to less risk of pesticides residue on food consumed [18]. The mortality percentage of termites shown positive result with greater concentration of pesticides [19].

Mortality Percentages of termites (%) over treatments over time interval (minutes). Based on the time interval 1, 5 and 10 minutes, the mortality percentage of termites shown the results that have significant difference of 7 treatments. Table 3.2 showed that treatment 2 was the shortest time taken to kill all the 30 termites. Increasing in botanical insecticide concentration will decreasing the time taken for termites dead. Eventhough the time taken for conventional pesticides much shorter than botanical insecticide, but it give negative effect towards environment compared to botanical insecticide which safer. Botanical insecticide from tobacco based can be home made, they are less expensive, easy to use and are not harmful. They have little impact on natural enemies of pests [20]. Hence can be used in the development of integrated pest management systems [21]. Botanical plants insecticidal properties and application have drawn attention for extensive research, which are now highly encouraged in order to meet the demands of Integrated Pest Management and environmental safety [22].

Conclusion

Our research showed that botanical insecticide based on tobacco leaves are effective towards reducing the termites' population. Overall, the result show that the mortality percentage increasing within increasing botanical insecticide concentration over time. The finding of this study can be applied by small farmers and contribute to new knowledge of termites control and botanical insecticide. This study should be further with application on larger termites' population at field. And further study on botanical effect and content towards other pest. The use of botanical insecticide should be encourage and commercialize for green future.

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Electrical Wiring Fault Trainer

Mohd Nasran Mohd Naw^{1,a}, Muhamad Syafiq Rusli^{1,b},
Amirul Shah Mazzuri Mazlan^{1,c}

¹Politeknik Sultan Mizan Zainal Abidin, Dungun, Terengganu, Malaysia

^anastrade@gmail.com, ^bsyafiqrusly@gmail.com, ^camirulshah699@gmail.com

Abstract. The Electrical Wiring Fault Trainer is designed to develop the technical skills and instruct electrical technicians, students and lecturers in the operation, theory, problem diagnosis and repair of the accessories used in electrical wiring. It is applicable to experimental teaching of electricity for all types of institutions of higher education as well as college and vocational schools. In fact, it allows the implementation of theoretical-practical courses, for the study of electrical wiring. This trainer can save lecturers and students time and specifically designed to offers students the hands on opportunity to work in a real-world environment.

Keywords: Electrical Wiring, Wiring Fault, Technical Skills, Electrical Technician, Trainer.

Introduction

One of the aims of technical and vocational education and training is to prepare individuals for the world of works [1]. Based on this, students and trainees in this field of education sometimes alternate learning and training between school or training centres and workplace to expose them to practical and hands-on activities. In technical and vocational education and training, one of the frequently used instructional strategies is demonstration. According to [2], during demonstration, the teacher takes steps to perform the intended task or skill to be learned while students observe. [3] posited that demonstration is a very viable instructional strategy for teaching subjects that are practically oriented. [4] also recommended demonstration as one of the teaching strategies to be employed in the effective teaching and learning of vocational education.

The main idea of the project is to help students and lecturers in learning and teaching processes related to the wiring fault topic especially for Electrical Wiring course in Polytechnic. According to [5], faulty and improperly installed electrical wiring is a leading cause of fires in homes and commercial buildings. As shown in Figure 2, home fires due to electrical failure or malfunction primarily involve some form of arcing, which results from an unintentional discharge of electrical current between conductors. Given sufficient time and level of current, arc faults can produce enough heat to ignite a fire. Arc faults are produced by damaged conductors and connectors and may involve damaged wiring, frayed appliance cords, loose connections in wall outlets, or faulty switches and junction boxes. Arc faults may originate in different areas of the home or virtually any electrical fixture or equipment.

As shown in Figure 3, wiring and related equipment accounted for two-thirds of home fires caused by electrical distribution and lighting equipment and the same share of direct property damage, as well as over half of the civilian deaths and injuries. Faulty wiring in concealed spaces, such as attics or behind walls, is particularly dangerous because it can start fires that burn for a prolonged period of time before detection.

This Electrical Wiring Fault Trainer have been created for learning of connection circuit and finding fault points of RCCB and MCB tripping, open circuit, damaged to earth, wire loose, over load, leak to earth and short circuit. There are hands-on experiments take a student through the construction, troubleshooting, and repairing of common problems that will happen on electrical wiring. As well as a series of fault were created in a range of levels is guaranteed to challenge each student at an appropriate level. Using this trainer and through hands-on exercises, students identify

problem areas and explain how they reached their conclusion. This technique builds knowledge and promotes critical thinking.

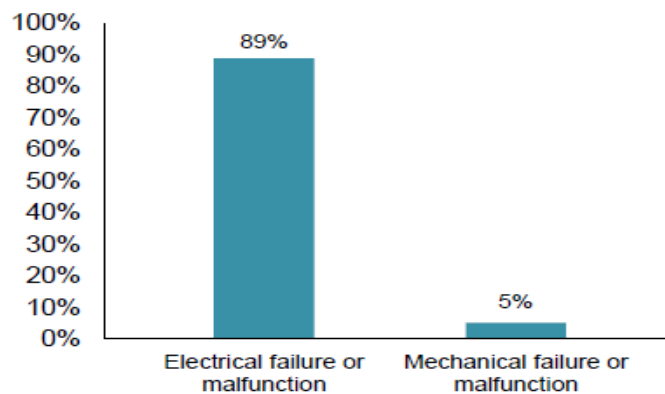


Figure 1: Factors Contributing to the Ignition of Home Fires Involving Wiring and Related Equipment, 2012-2016 (NFPA Research, 2019)

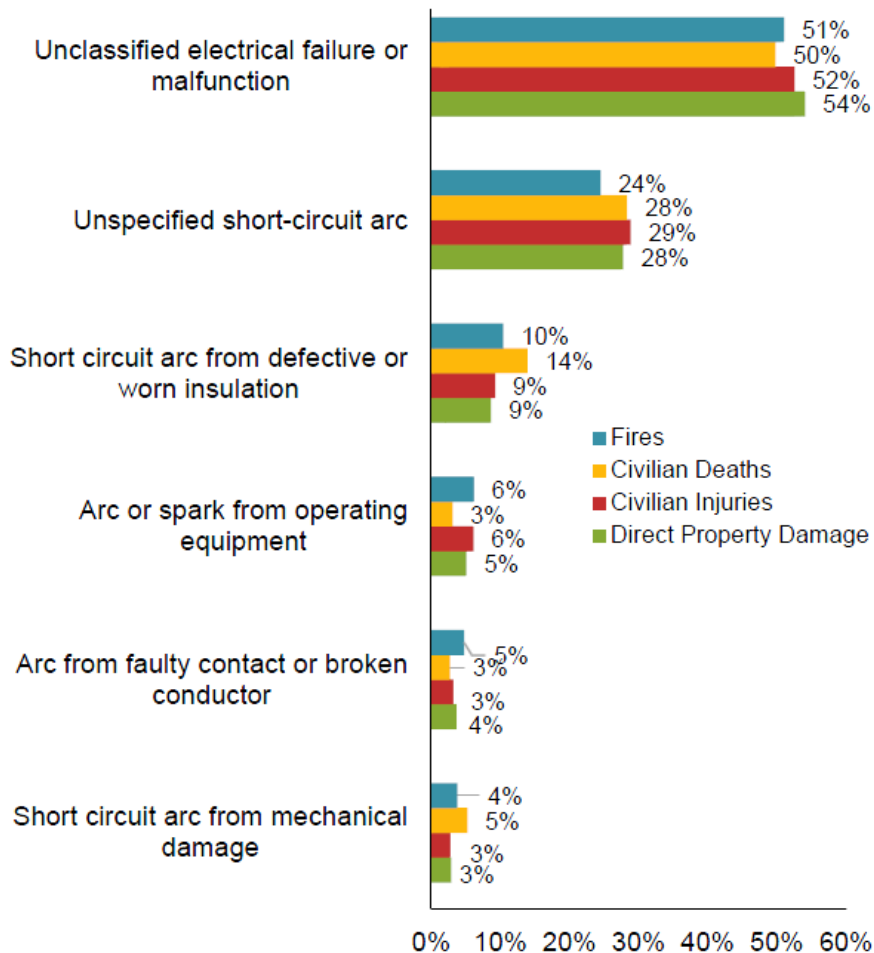


Figure 2: Home Fires Involving Electrical Failure or Malfunction by Factor Contributing to Ignition, 2012-2016 (NFPA Research, 2019)

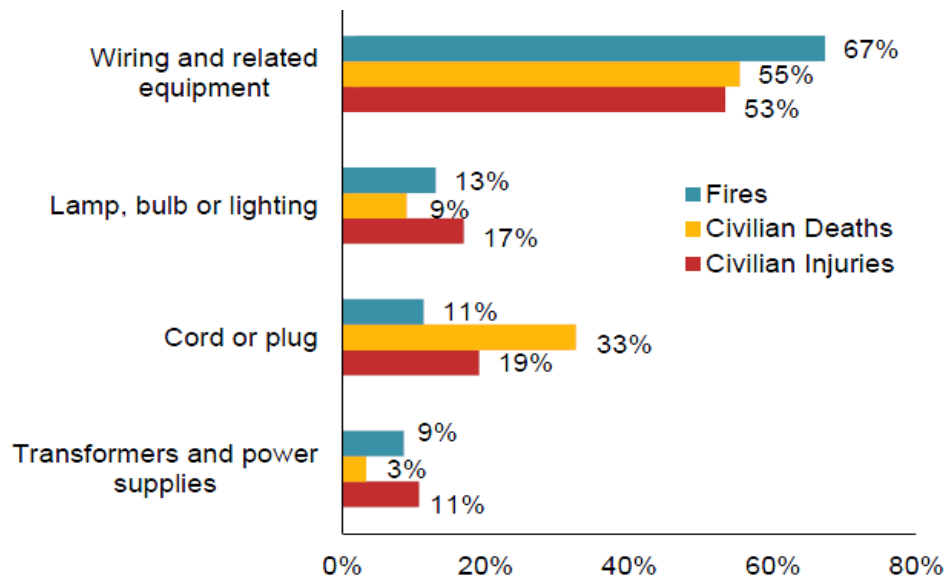


Figure 3: Types of Electrical Distribution or Lighting Equipment Involved in Home Fires, 2012-2016 (NFPA Research, 2019)

Methodology

Basically, this Electrical Wiring Fault Trainer consists of 7 part of training. Each part has a same procedure for testing and inspection.

Inspection and testing. The test procedures must be followed carefully and in the correct sequence as indicated by regulation 713-01-01. This ensures that the protective conductors are correctly connected and secure before the circuit is energised. The aim of the visual inspection is to confirm that all equipment and accessories are undamaged and comply with the relevant British and European Standards, and also that the installation has been securely and correctly erected.

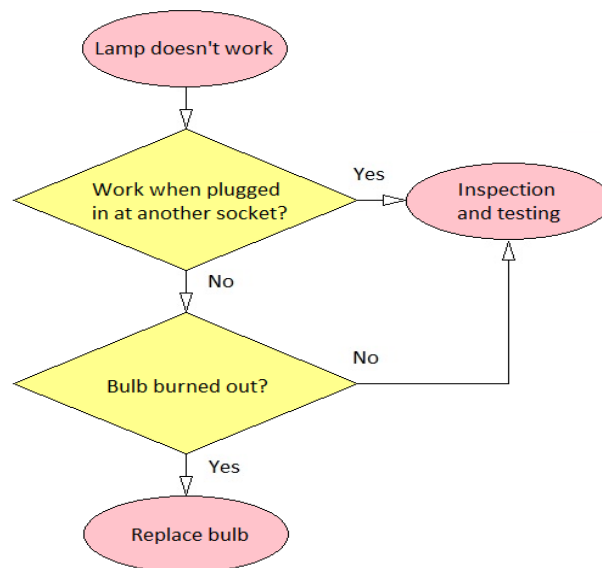


Figure 4: Testing flowchart

The tests must be carried in the following sequence:

Before the supply is connected.

- 1) Test for continuity of protective conductors including main and supplementary bonding.
- 2) Test the continuity of all ring final circuit conductors.
- 3) Test for insulation resistance.
- 4) Test for polarity using the continuity method.
- 5) Test the earth electrode resistance.

With the supply connected

- 6) Recheck polarity using a voltmeter or approved test lamp.
- 7) Test the earth fault loop impedance.
- 8) Carry out functional testing (operation of RCCB)



Result and Discussion

Table 1 shows the results and explanation of the outcomes.

Table 1: Result and Discussion

Case	Problem	Indicator	Test Method	Cause
1	Trip	RCCB or MCB trip when switch ON	Using Test pen or Multimeter	Lightning or fault wiring
2	Open circuit	The bulb does not light up when switch ON	Using Test pen	Cable Break
3	Damaged To Earth	RCCB trip when switch ON	Using multimeter, test pen or current detector	Touch live cable or appliance electric (metal)
4	Wire loose	The bulb does not light up or blinking when switch ON	Using Test pen	Old wiring, loose cable or screw
5	Over Load	MCB trip when over current	Upgrade MCB and size cable	Use more load
6	Leak to Earth	RCCB trip when switch ON	Using test pen or multimeter	Unbalanced current or damaged to earth
7	Short Circuit	MCB trip when switch ON	Using Multimeter	Live cable touch neutral cable

Conclusion:

After using this trainer, electrical technicians or the students will be able to identify electrical wiring fault based on faulty and improperly installed electrical wiring in homes and commercial buildings. They also learn how to use measurement tool and equipment such as multimeter, test pen and current detector to trace fault on electrical wiring by taking safety precautions.

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Development Of Smartphone Controlled Automatic Fish Feeder

Mohd Mukriz Mohd Kasim^{1, a}, Asvindra Chinniah^{1, b},

Nur Aina Lyana Mohamad Ali^{1, c}

¹Politeknik Jeli Kelantan, Jalan Raya Timur Barat, 17600 Jeli, Kelantan, Malaysia

^amukriz@pjk.edu.my, ^b asvindraicekidz123@gmail.com, ^caina@pjk.edu.my

Abstract. Smartphone Controlled Automatic Fish Feeder (SMART FEEDER) was built using PIC P16F877 micro-processing intentionally to feed fish automatically. This tool is designed to save time and labor more efficiently than conventional feed distribution methods. The objective of this project is to develop an automatic fish feeder device using PIC P16F877 micro-processing and to integrate the device with the smartphone as a controller. Current feeding practices problems include unsystematically, overfeeding and costly. Therefore the device could help reduce the surplus of fish food in the pond and create a tool that is more systematic and more practical. The development of this project involves electronic, electrical and woodworking. To control the setting time, electronic devices such as timers and the microcontroller is used. This device allows the feeding to be more systematic base on time that has been set. Surplus food can also be reduced with the use of electronic devices where the food is given in the pond based on the time setting. The results of testing conducted; this project has been functioning well and has achieved the objectives of the construction of this invention. With the development of this invention indirectly can become an innovation to the aquaculture industry in the future.

Keywords: Aquaculture; automatic fish feeder; smart feeder; industrial revolution 4.0, Raspberry Pi.

Introduction

Food is one of the most important aspects of fish growth and production. Adapting the food to meet the needs of the fish is crucial to maximizing income and benefits [1]. Entrepreneurial activity in the growing aquaculture, contributes to food security and poverty reduction in many developing countries. However, fish feed-management contributes to the largest production cost in the fish farming system. The supply of fish food involves the cost of the raw material itself, the cost of labor, transportation and so on. The main challenge facing aquaculture development is the management of the nutrition system. The efficiency and benefits of aquaculture practices can be enhanced with better technology. This requires the design, development, and construction of automated nutrition equipment to meet nutritional needs and to reduce labor demand, thereby reducing the cost of fish production. Therefore, this product is designed to ease fish farmers to provide easier feeding for fish in term of enhancing time management and labour cost. Automated fish feeding machines using open-source applications on smartphones are a new technology developed to facilitate farmers to feed their fish.

Literature Review

The feeding of fish in the fish culture is generally done traditionally by hand which inappropriate handling can causes the amount of food supplied to be inaccurate. Excessive feeding could cause problem to water quality due to accumulation of ammonia and can lead to fish death causing loss to fish farmers.

Automated feeder system using Raspberry Pi using microcontroller and Raspberry Pi based web application [2] had been proved to relax the distressed fish owners in feeding their fish on time. This

designed smart system is also a great opportunity to overcome the problem of fish dying due to fish feeder malfunction. With this design, the fish owner can monitor the fish tank for correct functioning of the fish feeder. Also, the user can set schedules for feeding the fish through the web application.

Innovations are made by developing automatic fish feeding tools [3]. The methods used in this innovation show that fish feeding tools are automatically equipped with alarms as indicators of fish food in the funnel until finished. Results showed automatic feeding accuracy of up to 95.90%, feed volume increase up to 99.46% and pellet loss less than 1%. The innovation of intelligent fish feeding systems is the most effective tool that can be used to determine the sensory behavior of an animal, which can record the eating behavior of fish and determine the degree of their hunger, and, finally, to feed them [4]. Moreover, small fish are shy, provokes their malnutrition. A smart feeding system can solve the issue of uniform the distribution of food for all fishes. The development of an automatic feeder system has led to the creation of a smart system, which is controlled using artificial intelligence. The idea is to monitor the feeding process continuously utilising the interface. The device uses the Global Standard for Mobile Communication, which enables the firm to track the progress of the feeding program remotely [5].

In this study, the automated fish feeding system was developed using Raspberry pi. Raspberry pi is a small credit-card sized computer capable of performing various functionalities such as in surveillance systems, military applications, and so on [6]. The software used to develop the application is open source software. The term “open source” refers to something that people can modify and share because it is publicly accessible. Open source software, therefore, is software with source code that anyone can examine, modify and enhance.

Methodology

The innovation of this machine is to solve the problems of fish feeding such as unsystematic fish feeding factors, reduce excess fish feed in the pond and create a more systematic and more practical tool for breeders as the Industrial Revolution 4.0 progresses today. The project also includes electronics, hardware, electrical and woodworking. To control time settings, electronic devices such as timers and microcontrollers are used. This device allows for more systematic feeding times according to the set time. The surplus of food can also be reduced by the use of this electronic device where food is provided in a particular measure based on the time setting. In this innovation, the application is designed to have a user interface that the user can send command to the smart feeder. The user sends the command by pressing the input button on the applications on smartphone for each smart feeder functions.

Software. Open-source software is kind of software that can be used, developed and expanded without the need for a seller. The availability of open source applications was created either at great cost or with low pay and reduced knowledge in its development. With the strengthening of good human resources, open source applications will be more promising. The concept of open source is based on user freedom of use, distribution and more and great software. Open-source software is greatly appreciated by netizens on the internet. Initially, open-source technology didn't have many users. But it has been used by people with expertise in coding, a process for creating computer applications.

Design tool. This invention is intended to produce an automated fish feeder machine that uses PIC P16F877 micro-processing. It was the main guard stationed on the fish farm. . The code for the fish feeder is being programmed using open source software. A code that can be written and run in the Raspberry Pi version 4. This code will be written to connect to the smart feeder. The code will be run when the user sends the command from the application. The Raspberry Pi will then send the command to the automatic fish feeder. The database for authentication is also saved in the Raspberry Pi.

The Raspberry Pi is also enable the user to access smart feeder using the internet or wifi. The Raspberry Pi make sure the smart feeder stay connected to the network.

Testing. Effectiveness of smart feeder to integrate software from smartphones was tested 10 times with different types of smartphones with different operating systems (IOS, Android). Figure 1 shows how the applications system work on smartphone to smartfeeder.

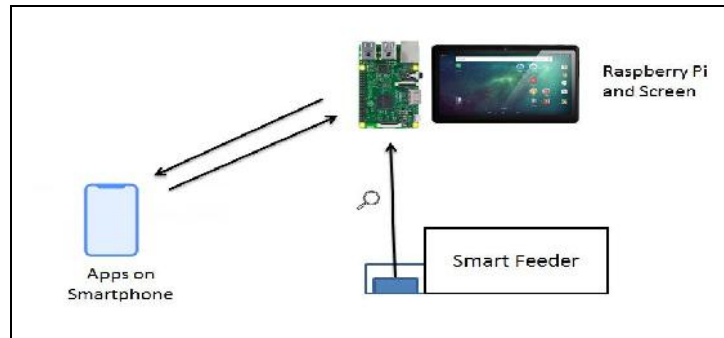


Figure 1: Proposed design of smartfeeder

Results and Discussion

This application has been successful developed and can be downloaded for free in the playstore (Android) or IOS (Apple). This application is created on the Raspberry PI CPU and is accessible to control using Android or iOS smartphone. In addition to this application there are various tools used. Small cameras, screens, and motor protectors have been used in this project. Figure 2 showed that screen that had been used to monitor smartfeeder system.



Figure 2 : Application Programming Interface - CHINNIAH

In this innovation, a layer of code used to develop applications for the Raspberry Pi motherboard using Application Programming Interface (API) by the name of C.H.I.N.N.I.A.H designed for the Raspberry Pi in this model.

C = Computerized
H = High-efficiency
I = Internet
N = Network
N = Node
I = Intergrated
A = Application
H = Host

In addition, the innovation used the Linux Kernel in conjunction with the creation of API. Linux is one of the most prominent examples of free software and open source collaboration. Source code may be used, modified and distributed — commercially or non-commercially — by anyone under the terms of its license, such as the GNU General Public License User interface, also known as a shell, either a command-line interface (CLI), between graphical user interface (GUI), or control attached to related hardware, which is common for embedded systems. For smartphone systems, the default user interface is usually graphical, though CLI is usually available through a terminal emulator window or on a separate virtual console.

Conclusion

Smartfeeder that had been develop using an open software have been successfully integrated with the application on smartphone as controller at hatchery in Politeknik Jeli Kelantan. Further study on developing sensor to monitor the behavior and understanding the growth of fish need to be done.

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Development of Rectifier Education Aid

Wahidah Abd Manap^{1, a} and Tengku Suzi Mas Ayu Binti Tuan Ameri^{1, b}

¹Jabatan Kejuruteraan Elektrik, Politeknik Sultan Mizan Zainal Abidin,
23000 Dungun, Terengganu, Malaysia

^awida_manap@psmza.edu.my, ^btengku.suzi@psmza.edu.my,

Abstract. Rectifier is an electrical device which converts an alternating current into a direct one by allowing a current to movement through it in one direction only. Half wave, full wave and bridge rectifier are the circuit using the diode applications. This education aid consists the application as a rectifier for the DEE20023 Semiconductor Devices's students indulgent. It shows the relation between the theoretical and practically the rectifier application to the students. The half wave, full wave and bridge rectifier circuit on the printed circuit board attach straightforwardly to the external interface. It has the combination of the half wave, full wave and bridge rectifier circuit on the same PCB. It operates either a type of rectifier or all type of rectifier. The input of rectifier such as the power supply and the output of rectifier such as the oscilloscope are certainly connecting to this education aid. The portable characteristics of this learning aids made is more the excessive product. This education aid gives more understanding to the Semiconductor Devices' students which is difficult to comprehend. This education aid will assistance the Semiconductor Devices' students develop the best grade compared to the previous students.

Keywords: Rectifier, half wave, full wave, bridge rectifier.

Introduction

The purpose of rectifier education aid designated is to help students to study and understanding the operation of half wave rectifier, full wave center-tapped rectifier and full wave bridge rectifier circuit. The process is known as rectification where its converts alternating current (AC) to direct current (DC)[1]. Rectifier have many uses including as components of power supplies as amplitude modulation detectors (envelope detectors) of radio signals. Rectifiers are most commonly made using solid state diodes but other types components can be used when very high voltage current are involved.

Main component in rectifier circuit is diode because diodes conduct current in one direction only and block current flow in the other direction [2]. Therefore, is an alternating waveform is applied to a diode, then it will only allow conduction over half the waveform. The remaining half is blocked. Capacitor is another main component in rectifier because its helps to reduce the ripple voltage by increasing the smoothing capacitance [3]. The main function capacitor is to charge up to the pick voltage value during the positive half waves and to discharge on the load between one half wave and the subsequent. The capacitor has to charge by diode current during small fractions of the cycle and an increased capacitance means more charge current in shorter time. The diode must be sized consequently.

In the DEE20023 Semiconductor Devices's course students need to familiar and know the waveforms of rectifier. Beside that students have to identify the circuit for each types of rectifier. To help the students in this course, the rectifier trainer is built to be more simple and compact. So the rectifier trainer board is built for beginners to explore the fundamentals of a basic circuit in analogue electronics. The board is very user friendly and support self-learning through flexibility of making circuit connections. Schematic diagrams on the board provide easy understanding of the concepts. Test points are provided to observe the waveforms or signals and to measure voltage at different nodes.

Methodology

The focus of this education aid is the three types of rectifier circuits. Which are half wave rectifier, full wave center-tapped rectifier and full wave bridge rectifier. As the theoretical for the rectifier circuits as shown in the Figure 1, Figure 2 and Figure 3 below.

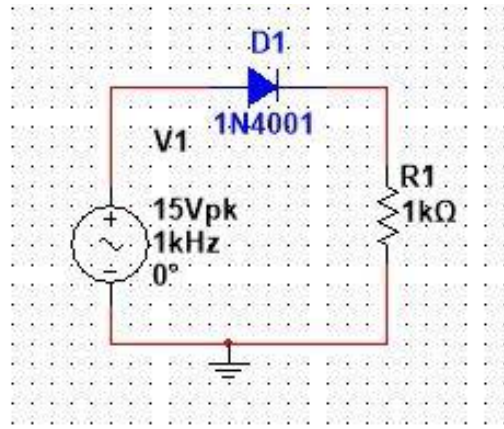


Figure 1: Half wave rectifier circuit

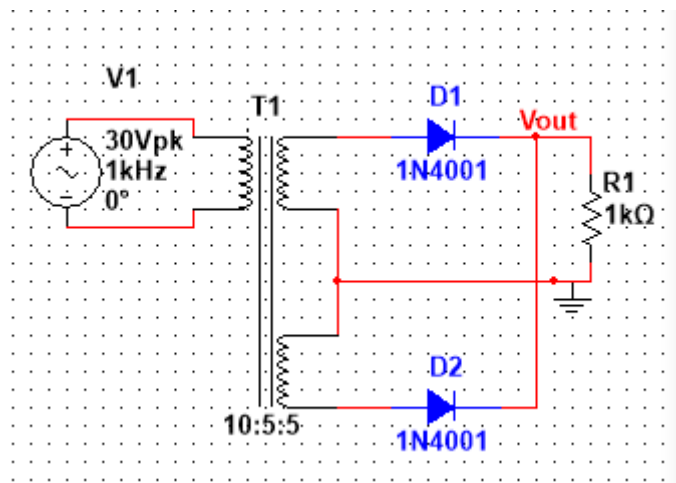


Figure 2: Full wave center-tapped rectifier circuit

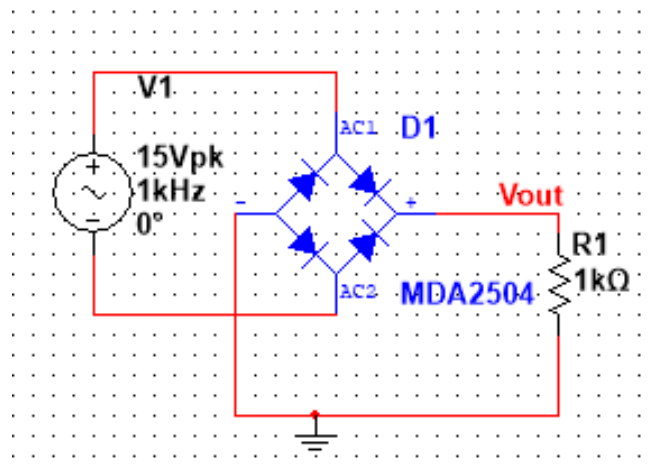


Figure 3: Full wave bridge rectifier circuit

Result and Discussion

After designed the rectifier circuits in the multisim software, the waveforms can be observed by transient analysis. Figure 4 shown the waveform of half wave rectifier where it displays only the positive cycle of waveform since the negative cycle is being blocked. Usually a half-wave or a full-wave bridge rectifier is used together with an electrolytic capacitor of a sufficient value to smoothen out the rectified waveform so that the output is an average DC voltage [4]. While Figure 5 shown the waveform of half wave rectifier with capacitor connection. Figure 6 shown the waveform of full wave center-tapped rectifier where the waveform is full because both diodes are take turns to conduct in the forward biased direction. The waveform of the full wave bridge rectifier circuit as shown in Figure 7 also same as full wave center-tapped rectifier. The different is the connection of diode and numbers of diodes using. The advantage of full wave bridge rectifier circuit also does not required a bulky center-tapped transformer, it can be in the applications where output terminal is ungrounded. The transformer is less costlier as it is required to provide only half the voltage of an equivalent center-tapped transformer used in a full wave rectifier circuit and no center tap is required on the transformer [5]. While the Figure 8 shown the waveform of full wave bridge rectifier with the connection of capacitor where the capacitor is to smooth the waveform.

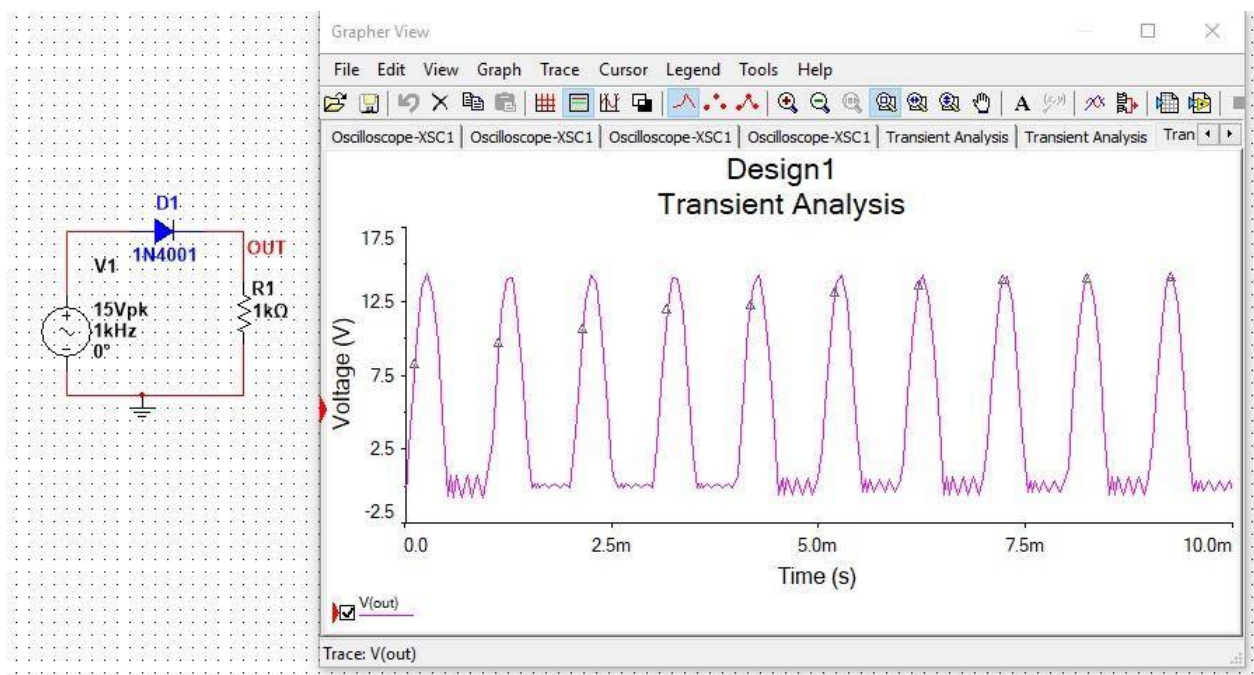


Figure 4: Output of Half Wave Rectifier

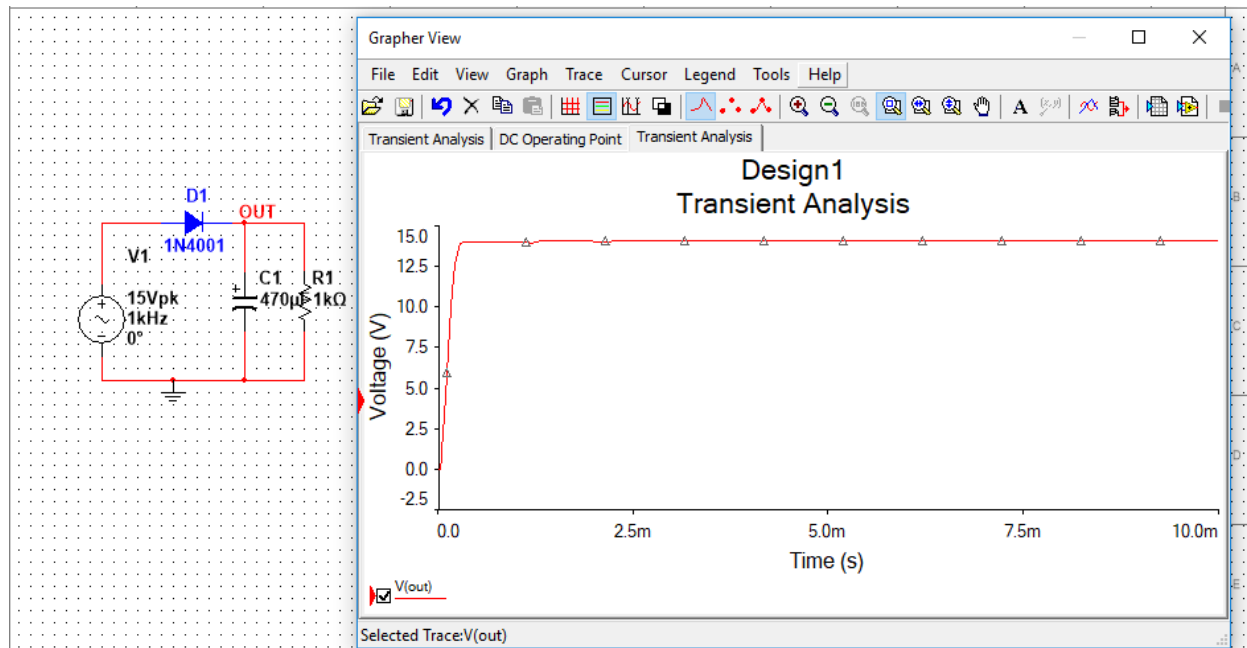


Figure 5: Output of Half Wave Rectifier with Capacitor

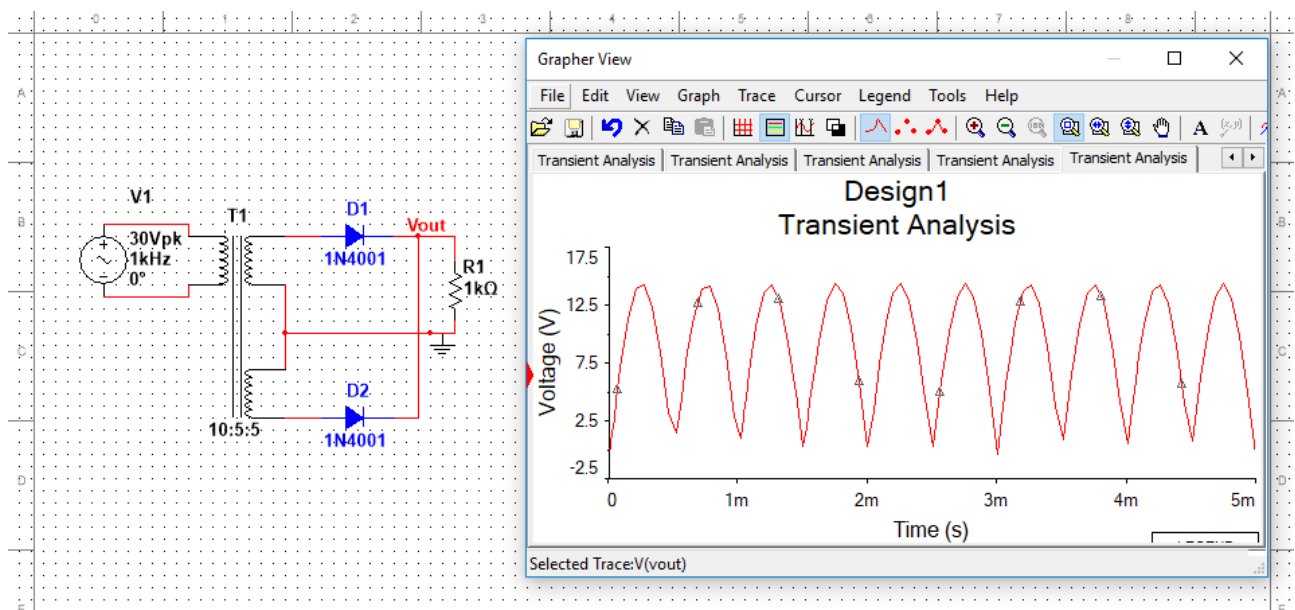


Figure 6: Output of Full Wave Center-Tapped Rectifier

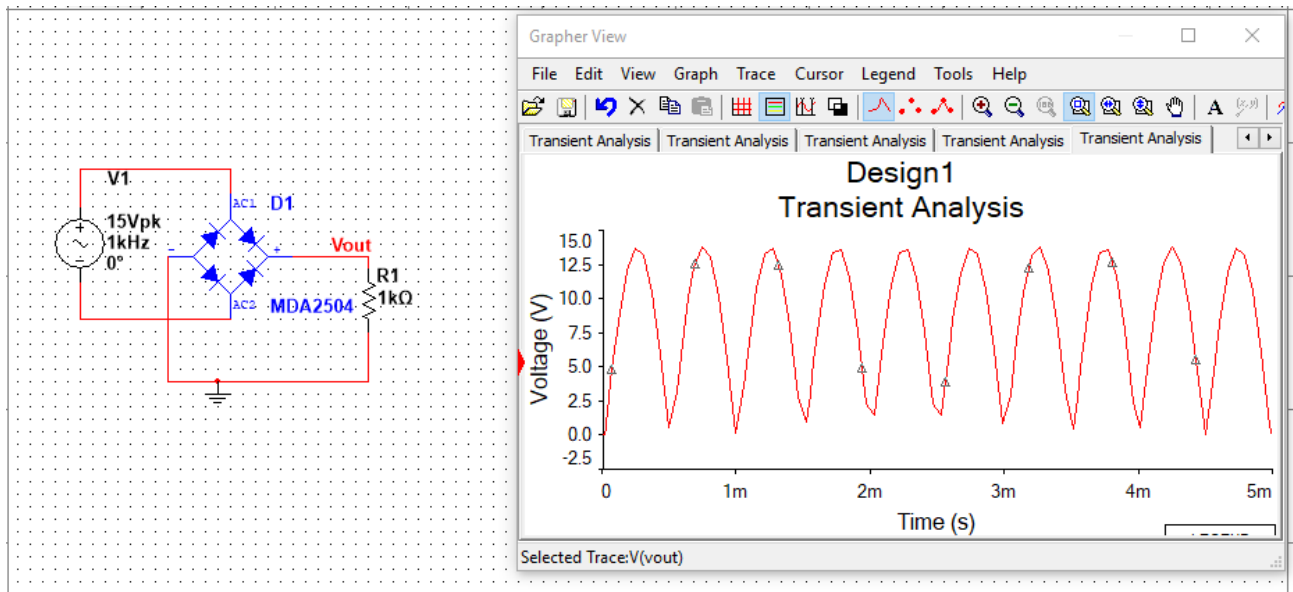


Figure 7: Output of Full Wave Bridge Rectifier

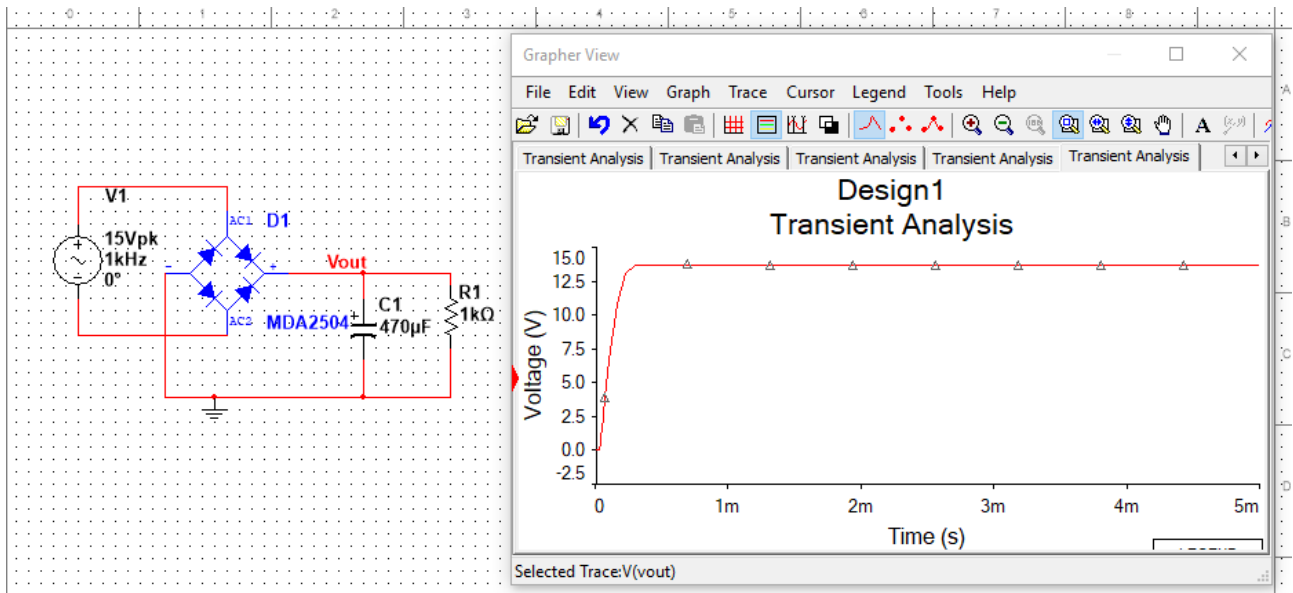


Figure 8: Output of Full Wave Bridge Rectifier with Capacitor

Conclusion

As a conclusion, the rectifier education aid is helped students more understanding about the rectifier circuit and can differentiated types of rectifier circuits. Students can save the time and no need waste time to build the rectifier circuit during practical work at the laboratory. The waveforms also can observe directly using oscilloscope at the test points provided. Also easy for student to understanding and can compare the theoretically and practically.

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Potential Use Of *Moringa Oleifera* In Water Turbidity Treatment For Aquaculture

Nuraini Khalil^{1,a}

¹Jabatan Agroteknologi Dan Bio-Industri, Politeknik Jeli Kelantan
Jalanraya Timur-Barat, 17600 Jeli, Kelantan

[a
nuraini@pjk.edu.my](mailto:nuraini@pjk.edu.my)

Abstract. Water is a very important physical support in aquaculture. Water turbidity is caused by soil, mud, organic matter, algae and other microscopic organisms. High water turbidity can cause a variety of problems including gill injury, lower egg growth rate and fish larvae, reduce food growth and increase ammonia levels in ponds. This study is conducted to test the effectiveness of using *Moringa oleifera* seeds in reducing turbidity of fish cement pond water. 8 samples of cement pond water at Politeknik Jeli Kelantan were taken with 300ml volume for each sample. Each sample of water was tested with crushed *Moringa oleifera* seeds weighing 0.5g, 1g, 1.5g, 2g, 2.5g, 3g, 3.5g, 4g with one control. Using quantitative methods, water turbidity readings were taken before and after treatment using Colorimeter LaMotte Smart 3. Based on the results obtained, treatment using 1g of *Moringga oleifera* seeds resulted in significant less turbidity than other water samples with 87% reduction in turbidity. The seeds of the *Moringa oleifera* have the ability to act as cationic coagulants of natural water in reducing water turbidity. The active carbon contained in the seed coating and the protein in the *Moringa oleifera* seeds contribute to the aggregation process and thus reduce the turbidity of the water sample. Therefore, the use of *Moringa oleifera* seend can be considered as one of the alternative methods in the treatment of natural water turbidity thus reducing the dependence on existing chemicals.

Keywords: Water quality, turbidity, *Moringa oleifera*

Introduction

Continuous supply of clean water is absolutely necessary to sustain aquaculture production. Poor quality of water can cause livestock health problems which in turn will affect the quality and quantity of production. Water turbidity is one of the water quality parameter in aquaculture that should be monitored regularly. Water turbidity occurs when small particles such as fine-grained sediment, soil, organic or inorganic materials, plankton and algae are present [1]. Treatment of turbid water for fish is one of the important processes in aquaculture either before or during the process of fish culturing. Different types of materials are used in treating turbidity including usage of synthetic coagulant such as Aluminum sulfate (Alum), Polyaluminium chloride and Ferrous sulfate [2].

Problem Statement

Synthetic coagulants are able to accumulate dirt and form precipitate. This coagulant reaction is triggered when anionic deposits (negative charges) react with deposits in water (positive charges) such as dirt. Synthetic coagulants are very effective in treating water turbidity up to 90% turbidity reduction. However, some studies suggest that the continued use of synthetic coagulants will have a negative impact on fish. The use of alum for example can lower the body's immune system if it is used too much in the pond [3]. This is because the chemical content found in aluminum such as aluminum can reduce the rate of fish metabolism and fish

susceptibility to disease. Therefore, more environmentally friendly and sustainable solutions should be used as an alternative to replacing synthetic coagulants with natural coagulants.

Literature Review

Water turbidity. Water turbidity is a phenomenon in which part of the light path in the water is diverted due to the presence of insoluble particles [4]. High water turbidity readings can affect respiration, nutrition, fish breeding and limit the penetration of light into the pond. According to Meager (2007), turbidity affects the visibility of fish larvae, affects the sense of smell on food and also affects the rate in catch food. Various methods are used to measure turbidity, including by using Secchi Disk or Colorimeter. The best pond water for aquaculture is less than 50 NTU [5]. Coagulation process is usually performed to reduce turbidity in water. Coagulation is the process by which colloidal particles are agglomerated by the addition of synthetic materials and thus precipitate [2].

***Moringa oleifera*.** *Moringa oleifera* trees are widely found in Malaysia. The fruit is often used in cooking as well as in the treatment of diseases. Seeds obtained from dried fruit have the potential to be a natural coagulant in treating water quality. It is one of the environmentally friendly alternatives to maintaining water quality and therefore does not affect humans and the environment. These compounds are biodegradable in that they are safe for humans rather than synthetic or chemical compounds. The use of *Moringa oleifera* seeds as a natural coagulant has been used in the treatment of wastewater and groundwater [2], car wash wastewater [6] and wastewater from tapioca industry [7].

Methodology

***Moringa oleifera* seeds.** Mature, dried and brown *Moringa oleifera* fruit is selected from the tree around Jeli, Kelantan. The kernel portion covering the seeds is removed and only the white seed will be taken. Seeds were subsequently crushed using mortar into powder. The powders were then filtered using a 50-mesh filter to isolate the large particle. The powders were then weighed and distributed into 8 parts namely 0.5g, 1.0g, 1.5g, 2.0g, 2.5g, 3.0g, 3.5g and 4.0g.

Water sample. 3L water samples were obtained from cement pond of Fish Propagation House 2 in Politeknik Jeli Kelantan. The turbidity of the water sample is increased by mixing water sample with 1g of soil and 1g of sand. The water samples were stirred and then filtered to separate the large particle. The water samples were then divided into 9 sections each containing 300ml of water sample. Initial readings of turbidity of water samples were examined using the ELamotte Smart3 Colorometer and recorded.

***Moringa oleifera* powder testing.** 9 water samples are prepared with same amount of 300mL each. *Moringa oleifera* seed powder are divided into 8 different weight as shown in Table 1. Each sample of *Moringa oleifera* seed powder was then mixed into a water sample and stirred for 30 seconds. The water samples were then left for one day to observe the reaction of the powder to the water sample.

Table 1 : Weight of *Moringa oleifera* seed powder

SAMPEL TYPES	Weight of <i>Moringa oleifera</i> powder (g)	Water sample (mL)
CONTROL	0	300
A	0.5	300
B	1.0	300
C	1.5	300
D	2.0	300
E	2.5	300
F	3.0	300
G	3.5	300
H	4.0	300

Data collection and analysis. After one day, turbidity of each sample of water will be checked using the ELaMotte Smart3 Colorometer. Each sample reading was recorded as post-treatment. Calculations were performed to see the degree of turbidity reduction in the water sample. This test is repeated 3 times. Average reading was taken.

Results and Discussion

Based on the results, it is seen that the use of *Moringa oleifera* seed powder has a positive effect on reducing turbidity rates. From all samples A to H, sample B showed the best turbidity reduction compared to the other samples with an average of 87% reduction.

Table 2 shows the turbidity readings of the pre and post water samples as well as the turbidity reduction rates after treatment using *Moringa oleifera* seeds.

Table 2 : Turbidity reading before and after treatment

SAMPLE	Weight of <i>Moringa oleifera</i> powder (g)	Turbidity reading before treatment (FAU)	Turbidity reading after treatment (FAU)	Turbidity reduction rate (%)
CONTROL	0	1970.0 \pm 24.5	766.7 \pm 39.0	61.1
A	0.5	1419.3 \pm 167.6	306.3 \pm 11.1	78.4
B	1.0	1979.7 \pm 31.8	238.7 \pm 6.1	87.9
C	1.5	1773.0 \pm 41.7	280.0 \pm 7.2	84.2
D	2.0	1980.0 \pm 23.6	295.7 \pm 29.7	85.1
E	2.5	1940.7 \pm 30.5	373.7 \pm 55.5	80.7
F	3.0	1042.3 \pm 134.4	301.3 \pm 11.0	71.1
G	3.5	1569.0 \pm 205.0	395.0 \pm 33.1	74.8
H	4.0	1902.7 \pm 30.0	370.33 \pm 17.39	80.5

Based on the table above, it shows that all water samples showed a decrease in turbidity rate. The control water sample showed a reduction of 61.1% without any treatment due to the gravitational particle precipitation process. Water samples A to H, which are water samples treated with *Moringa oleifera* seed powder, showed a reduction of more than 70%.

The cationic water-soluble protein found in the *Moringa oleifera* seeds is a major component

contributing to the coagulation process. This protein acts just like any other synthetic coagulant which acts as a positively charged coagulant. When *Moringa oleifera* seeds powder are mixed with water samples, these proteins act by attracting the negatively charged particles present in the water to form a lump [8]. The resulting larger clumps will gravitate to the bottom and reduce turbidity in the water.

In addition to its function in treating water turbidity, *Moringa oleifera* seeds are also capable of biologically water quality as they have antimicrobial properties that can bind gram-positive and gram-negative bacterial proteins [6]. On the other hand, according to Suhartini et. al (2013) water turbidity reduction rates may be more efficient if these treatments are combined with the filtration process.

Conclusion

In conclusion, the use of natural coagulants such as *Moringa oleifera* seed has the potential to be developed as one of the methods of treatment of turbid water for aquaculture. While the best rate of turbidity reduction is only 87% compared to synthetic coagulants that can reach up to 95%, their contribution as natural coagulants and not environmental and human impacts should be considered.

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Development of Arduino Controlled Robotic Arm

Norfarida Awang^{1,a}

¹Department of Mechanical Engineering, Politeknik Sultan Mizan Zainal Abidin,
KM 8 Jalan Paka, 23000 Dungun Terengganu, Malaysia

^anorfarida@psmza.edu.my

Abstract. Robots are playing a vital role in today's industrial automation and monitoring system. As technology developed, these robots have increased their applications. Working robots that cooperate to the people makes the work less effort and uncomplicated. A robotic arm is a type of mechanical arm, usually programmable, with similar functions to a human arm. In this project, a programmable robotic arm is redesigned and implemented, and aimed to move using remote control and hand gesture from a certain distance by using wireless component. This robotic arm is based on android application control for remote operation. Inputs are sent to control the movement of the robot either to move in x-axis, y-axis or z-axis using 1Sheeld application on android smartphone. Five motors are interfaced to the microcontroller whereas one motor is used for gripper movement, while the other four motors are used at the joints of the robotic arm for movement. The android application device transmitter acts as a remote control by using hand gesture that has an advantage of adequate range, while receiver (1Sheeld) and Bluetooth device are fed to the microcontroller (Arduino) to drive DC motor via motor driver IC L298N for clockwise and anti-clockwise rotation. Remote operation is achieved by any smartphone with android upon Graphical User Interface (GUI) based touch screen operation.

Keywords: robotic arm, Arduino, 1Sheeld

Introduction

Nowadays, the field of Robotics is very interesting and developing at a very fast rate aligned with the Industry 4.0 (iR4.0). Many types of wireless robots are being developed and are put to varied applications and uses. This innovation project tried to keep on in that direction and controlled a robotic arm wirelessly through an android mobile connected to an Arduino Uno that reads the analog data of the 1Sheeld and controls the motors and using a simple mechanism of the robotic arm to move. 1Sheeld is configured shield for Arduino and acts as an interpreter of the signal received from Arduino to the Android Smartphone[1].

This robotic arm has 4 joints and the maximum degree of rotation is 300 degrees. If the angle of each joint exceeds from its maximum angle, it will severely damage the wire of the motor, the gears and the body of the joints. The range of the remote controller is 100 meter and the voltage range is between 5 volts and 25 volts. It also can grab and pickup objects. The robot moves in up, down, left or right directions and picks up objects from one place and keeps at another desired place as directed by the movements of fingers and hand [2]. The gripper of this robotic arm can lift and withstand load of 100g, if more than 100g the joint became exhausted and unable to lift the load.

Robotic arm is described by its degrees of freedom (DOF). This number typically refers to the number of single-axis rotational joints in the arm, where higher number indicates an increased flexibility in positioning a tool. This robotic arm has three DOF which is similar to the movement of human arm. The more number of DOF the more complex the robotic arm.

Some of the existing robotic arm is complicated in moving an object from a far distance because it is not a wireless robotic arm. On 2012, studied found that Bluetooth is also a platform to control robot without using the cable. The movements of the robot are controlled remotely using Bluetooth connectivity[3]. The same result had been found in earlier study [4]. Most of the robotic arm are heavy that makes them difficult to bring along anywhere. Thus, this robotic arm is a light and portable robotic arm that can be controlled wirelessly. This innovation also uses 1Sheeld as a remote to follow the hand gesture. It is operated & controlled wirelessly with the help of hand gestures rather than controlling it manually through a conventional remote controller. This robotic arm has been developed successfully as the movement of the robot can be controlled precisely.

Controlling Robotic Arm using Android

Controlling of robotic arm is done by Arduino through DC motor connected to robotic arm. When user moves hand in any left, right, forward and backward then robotic arm is move according to direction of user hand.

This robotic arm is programmed with Arduino to control the movement of each joint. Arduino is compatible with both beginners and advance level people also, thus Arduino has been preferred over other controller [5]. It is simple to get use for the persons who are beginners and are using it and it is flexible for advance level users. The Arduino will define the axes and the directions of the movement of the robotic arm. The coding for all axes are well programmed in Arduino. Figure 1 shows the programming code for the z-axis movement. If orientation sensor reaches certain point, the z-axis joint will move according to the input from the sensor. Basically, there are two values; positive value and negative value. When the orientation sensor get positive value the DC motor will rotate clockwise direction while for the negative value the DC motor will rotate in anti-clockwise direction. The declared minimum value for z-axis joint is 25° for positive value and -45° for negative value. Whenever, the input reach that value it will turn on the z-axis DC motor.

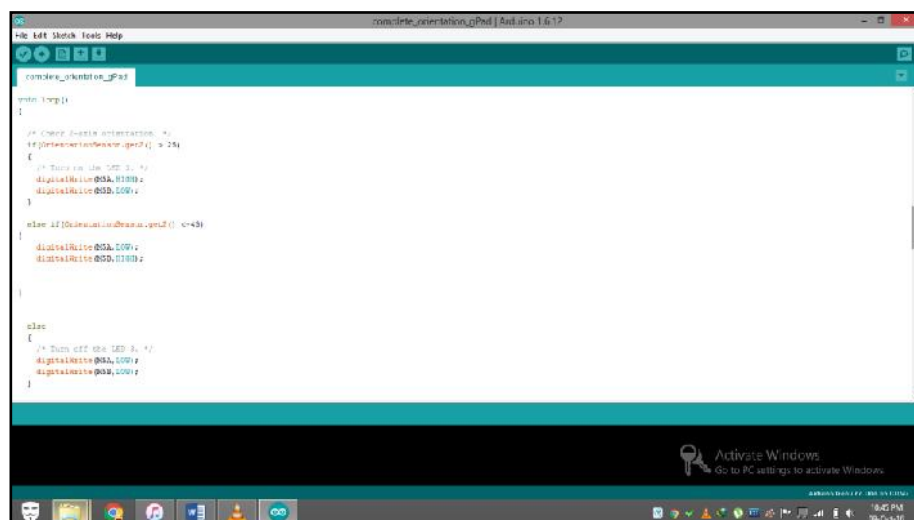


Figure 1: Programming code for z-axis

The programming in the Arduino will be shield using 1Sheeld. 1Sheeld is a new easily configured shield for Arduino as shown in Figure 2. It is a hardware shield that communicate over bluetooth to android application, to transfer data between it and smartphone. It is connected to a

mobile applications that allow the usage of all android smartphones' capabilities into Arduino programming.

1Sheeld can physically connected to Arduino board and acts as a wireless middle-man, piping data between Arduino and android smartphone via bluetooth. It also can manage the communication between 1Sheeld and smartphone. Thus, instead of buying the actual shield, 1Sheeld can be used to control the movement of the robotic arm such as left, right, up, down, rotate the gripper or grip object using phone's gyroscope. 5 volts is needed for operating 1Sheeld and synchronizing with Arduino [6].

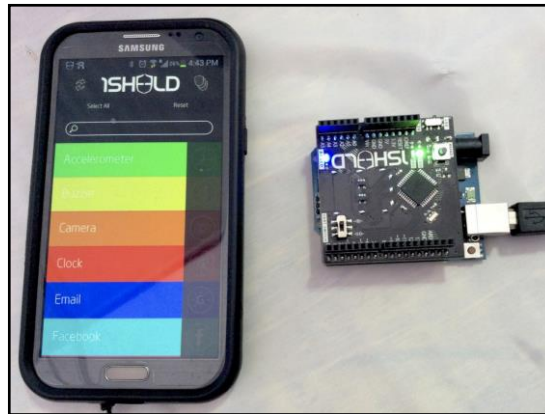


Figure 2: 1Sheeld as a shield for Arduino

Finding and Discussion

i) Bluetooth Connectivity

In order to control the robotic arm, distance will influence the bluetooth connectivity. Some experiments are carried out with different distance to see the connectivity of the bluetooth. The experiments shows that the bluetooth has connectivity for the maximum of 100 meter range. More than 100 meter distance, the bluetooth connectivity is failed, as shown in Table 1. Bluetooth connection using a smartphone is shown in Figure 3.

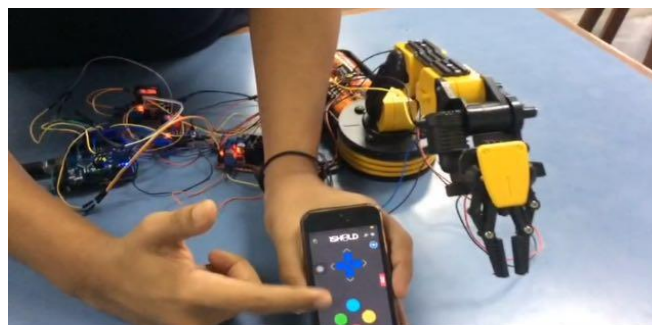


Figure 3: Bluetooth connection using a smartphone

Table 1: Distance of bluetooth connectivity reached

Distance [m]	Connectivity
25	has signal
50	has signal
75	has signal
100	has signal
125	no signal

ii) Angle of the joints

Table 2 shows the maximum degree of the robotic arm joints can rotate. Each joint rotates in different angle and axis. Joint 1 rotates 0° to 270° from left to right motion or vice versa in y-axis, joint 2 rotates 0° to 180° from front to back motion or vice versa in x-axis, joint 3 rotates 0° to 300° from up to down motion or vice versa in z1-axis, and joint 4 rotates 0° to 120° from up to down motion or vice versa in z2-axis. If the angle of each joints exceeds from its maximum angle, it will severely damage the wire of the motor, the gears and the body of the joints. It can be shown in Figure 4.

Table 2: Angle of the joints

Joint	Degree [°]
1	0-270
2	0-180
3	0-300
4	0-120

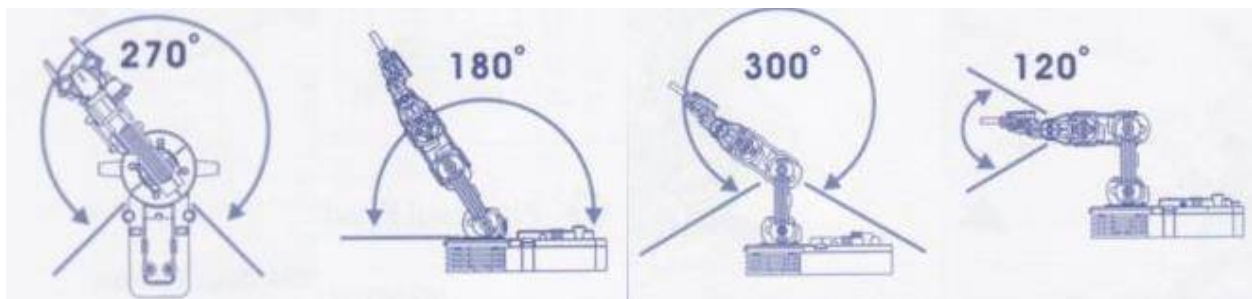


Figure 4: Four joints of the robotic arm

iii) Load can be lifted by the gripper

Gripper mechanism is connected at the end of the robotic arm for the purpose of picking and placing an object. The gripper has its own maximum capacity of load to grip. Three objects with different mass were used as load in this experiment, as shown in Table 3. The gripper can lift and withstand load of 50g and 100g. If more than 100g the joint became exhausted and unable to lift the load. The experiment is shown in Figure 5.

Table 3: Load can be lifted by the gripper

Load [gram]	Lifting ability
50	√
100	√
120	X



Figure 5: Gripper lift the load

Conclusion

This robotic arm has been developed successfully as the movement of the robotic arm can be controlled precisely. Its movement is easy to control and user friendly. It can move left, right, up, down and rotate according to the direction of the hand. This robotic arm control method is expected to overcome the problem such as placing or picking object in easy manner by using hand gesture. It also can be used in learning for subjects and classes that relate to robotics and programming. Outcome Based Education (OBE) concept can be applied in the classroom using this robotic arm. Students also can practice the concept of OBE in learning process. For future planning, it can be used for students in primary school as to facilitate the understanding of technical relationship of STEM (science, technology, engineering and mathematics). It also will introduce them to robotics and programming, so that they will actively engage in communication and collaborative skills. Thus, they will realize how great to discover the field of robotics.

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TEACHING & LEARNING (DIGITAL)

Development of Intelligent Data Structures Puzzles (i-DSP) using Armoredpenguin

Zukia Aniza Ibrahim^{1, a}, Suzana Yusof^{1, b}

¹Politeknik Sultan Mizan Zainal Abidin Terengganu, Malaysia

^azukiaaniza@gmail.com, ^bsuzanayusof1581@gmail.com

Abstract. Intelligent Data Structures Puzzle (i-DSP) is an application developed using free online resources, Crossword Puzzle Maker, Armored Penguin. The innovation were created and provided to students during lectures of Data Structures. Students' perceptions were considered through 10 items questionnaire using a 5-point Likert scale. The data was collected and analysed. The main purpose of developing i-DSP is to interest and encourage students better understanding in Data Structures courses. It is developed in an easy way and attractive using the current technology provided by Armoredpenguin. I-DSP can be teaching aids based on FUN and LEARN concept that allow online access in helping lecturers and students in this subject. This innovation mind testing implemented interactively and relax using crossword puzzle by giving clue and checking answer. QR code also implemented in this innovation to make sure easy access 24 hours to students and lecturers by using latest technology. There are six topics covers including Introduction Data Structures, List and Linked List, Stacks, Queues, Trees, Sorting and Searching. There are 10 questions that represented in crossword puzzle that automatically created by using Crossword Puzzle Maker software. The implementation of i-DSP will embrace online learning that allow high accessibility of learning materials at their own convenience. The results demonstrated that more than 90% of the students felt i-DSP crossword puzzle is an effective tools in learning that facilitate them better learning and understanding in the topic. They also felt interest, fun, enjoy and relax without strees in their classroom. In the other hand, improving their self-confident, encouraging active learning and challenging for their learning and at the same time it is easy to use and access. It can be concluded that crossword puzzles are useful aid teaching in enhancing students learning with the finding exposed majority of the students perceived that crossword puzzles can improved their learning and can release the tedium of lecture and traditional teaching methods by providing a more fun, relax and friendly classroom atmosphere. This will facilitate active learning and make the learning experience of the students more productive with the simple, creative and effective aids teaching.

Keywords: development data structures, puzzles, armored penguin

Introduction

Many people love games because of avoiding from stress in different ways such as work place, studying, homework or something else. One of the most popular games in the world for long time ago till now is crossword puzzle. Teachers, lecturers or educators know that the best educational tools are supported by trusted research. It is the best way to know if the tool in question helps students, and in what ways. Although crossword puzzles famous since many years ago, researchers still study the significant in the classroom. The conclusion mostly came with the same result that educational crossword puzzles offer a strong learning tool to all kinds of students when applied with a clear and tailored educational purpose.

Nowadays, there are many challenges for teachers, lecturers and educators in make sure their students can learn fast and easy in motivational without getting bored and depressed. Lecturers still find difficult to teach students in common way, as well as students in understanding their subjects. Therefore, games are playing a more and more important role in student's lives. Some games are too difficult for students to solve the problem in courses so there is a need for a game with a low learning

curve and still have fun. Crossword puzzle is the one game to improve mental ability, relax and still enjoyable. But the problem with traditional puzzle games is difficult to create and need some paper, a pencil, and an eraser. This makes it time consuming to set up and requires addition effort. It also need more paper and cost to make the puzzle and to prepare for the students. There is also limited accessibility by using the traditional crossword puzzle.

Most of the mankind, especially children and teenagers were very interested in games and puzzles. By engaging them in the educational world, teachers, lecturers or educators can sharpen students' critical thinking and problem solving skills. Puzzles can also be used to help reinforce skills in subject areas such as mathematics, social science, including hard core subject like data structures and database design. Crossword puzzles are very helpful with vocabulary remembering for any subject. Therefore, crossword puzzles can also be useful to polytechnic students as they try to retain keywords in a different way.

Earlier, educational crossword puzzles only came in readymade student workbooks, which meant teachers, just follow an existing design of crossword puzzle without unable to change or adapt them for the needs of their classroom. With new technology and online crossword puzzle makers, teacher, lecturers or educators can create crossword puzzles to fit their unique lesson plans and they can see how to make a crossword puzzle to better ensemble the essentials of their students.

With today's technology development, Intelligent Data Structures Puzzles(i-DSP) was created using an online crossword puzzle maker Armoredpenguin, in make sure students of Data Structures courses also not being left behind and they can learn with fun n relax situation. This technology makes an easy to the lecturers in making crossword puzzle without long time consuming with high of accessibility, availability and affordability. QR code also provided to access this innovation in the fastest and easiest way using mobile phone. An online crossword puzzle that is simple to understand and create while still being fun. The difficulty can easily be controlled by the software. This makes it suitable for all age groups. It can be choose played on paper or online but that can be an irritation to always have a pencil and eraser on hand. An online version would solve this issue and also allows for a greater variety of puzzles without wasting paper.

There are three (3) main objectives in development of Intelligent Data Structures Puzzles (i-DSP) using Armoredpenguin, as follow:

- i. To prepare interesting and effectives teaching aids in Data Structures courses
- ii. To provide an easy online crossword puzzle maker and unlimited accessibility
- iii. To know the perceptions of students regarding crossword puzzle as a teaching tool

Literature review

Crossword puzzle is one of the games that use some empty blocks to be filled in with a letter which makes a word based on the questions provided[1]. Crossword puzzle is a puzzle filled in all the blank squares with letters those form words. The words are based on the clues provided, which can be complete sentences, phrases, or words [2]. In other word, a crossword puzzle is a game that have two dimensional grid, where each space is either open or blocked off. Each open space is designed to be filled with a letter, such that contiguous letters read off either horizontally or vertically, each forms a word.

Many studies have been done showing the benefits of using crossword puzzle as a teaching tool. Using crossword puzzles have many benefits. Not only it is fun, low cost, easy way to use and design, it also can summarize and emphasize the important facts delivered during the lecture, faster than learning normally [3]. Crossword puzzle is inspiring for those interested in using a non-traditional teaching strategy in improving their learning and concept retention [4]. Moreover, research also found that, puzzle-based teaching method can affect the academic achievement of students more than IT-based and lecturing method [5].

Students loved doing crossword puzzles as a way to review the item of subject. When students identify the answers of a crossword puzzle correctly, their self-confidence would be increase during their experiences and can make a wave effect. First, entertaining study resources can increase self-motivation in students to learn and study more, at the same time can decrease the fear by other assessments and convince students of their ability to make more success [6]. Crossword puzzle also influenced childhood based on the finding in the class that using the crossword puzzle game in improving the children's numeracy development. As predicted the children's numeracy ability improves very high. They look active and can be able to mention the numbers and search for the numbers [7]. Using crossword puzzle as a teaching tool in dental materials, it can relieve the boredom of lecture and traditional teaching methods by providing a more relaxed and friendly in a classroom. This will make the learning involvement of students more active and productive [8].

Most of researcher reported that using games in the classroom is an essential learning method, which can transform a learning process into a less frightening and more enjoyable [9, 6]. Games like puzzle will add flexibility and interest to students by allowing them to adjust the ways in which they learn best in the classroom [10]. This learning method also tolerate students to work either in groups or alone, to be competitive or not, to be more creative, and to have fun learning [11]. Students consider using crossword puzzles to be a fun and helpful learning experience for them [12]. Encourage the use of crossword puzzles as a vehicle to increase the speed of learning terms in learning courses [13] while is also help students to master basic terminology [14].

Although the date of introduction crossword puzzles into the classroom have consensus, but the educational value of these puzzles looks to be widely known. Some publishers even include crossword puzzles as instructor resource material [15]. A significant in this process is an ability to adjust and modify puzzles to the related subjects being taught. By the development of technology computer and internet, this endorsed easy access to the difference online programs in creating crossword puzzles efficiently, scalability, affordability and availability.

Research Methods

I-DSP puzzles

Intelligent Data Structure Puzzles (i-DSP) using armoredpenguin is a free online crossword puzzle maker software called armoredpenguin. The steps of creating crossword puzzles are:

- i. Click to the link <http://www.armoredpenguin.com/crossword>
- ii. Enter Title, Author's name and Description of puzzles. Others are left by default
- iii. Enter word (answer) and clue (questions)
- iv. Click 'Make Puzzle' button.

Interfaces of i-DSP puzzles

Armoredpenguin crossword puzzle maker is user friendly software. The following figures show the important interfaces that provided to user in Armoredpenguin crossword puzzle maker:

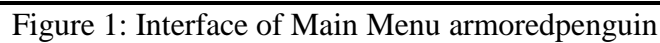
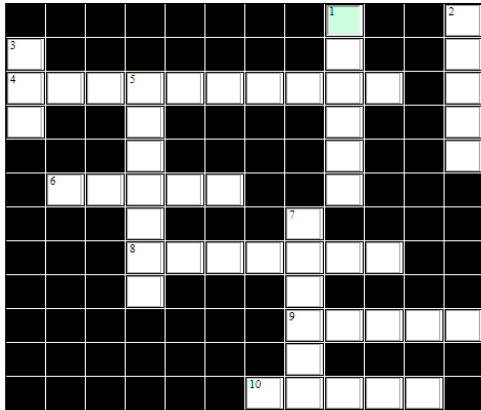


Figure 2: Interfaces in Making Crossword Puzzle Step by Step

I-DSP DATA STRUCTURES (T1 & T2)
ANIZA IBRAHIM
CHAPTER 1 & 2



Across

4. A data structure is a particular way of _____ and _____ data in a computer so that it can be used efficiently.
6. List data types are often implemented using _____.
8. A data structure is a particular way of _____ and _____ data in a computer so that it can be used efficiently.
9. The process of deletion requires an algorithm to determine whether a list is _____ or _____ before removing an item from a list.
10. Some commonly used nonlinear data like multidimensional arrays, _____ and graphs.

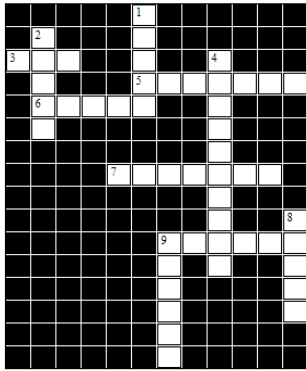
Down

1. A _____ list is a series of connected _____.
2. A _____ list is a series of connected _____.
3. The process of deletion requires an algorithm to determine whether a list is _____ or _____ before removing an item from a list.
5. Data structures are generally based on the ability of a computer to fetch and store data at any place in its memory, specified by an _____.
7. A _____ data structure traverses the data elements sequentially.

[Solve Online](#) | [Printable HTML](#) | [Printable PDF](#) | [Other puzzles by author](#)

Figure 3 : Example of I-DSP without answer button

I-DSP DATA STRUCTURES (T1 & T2)
ANIZA IBRAHIM
CHAPTER 1 & 2



Across

3. The process of deletion requires an algorithm to determine whether a list is _____ or _____ before removing an item from a list.
5. Data structures are generally based on the ability of a computer to fetch and store data at any place in its memory, specified by an _____.
6. The process of deletion requires an algorithm to determine whether a list is _____ or _____ before removing an item from a list.
7. A data structure is a particular way of _____ and _____ data in a computer so that it can be used efficiently.
9. A _____ data structure traverses the data elements sequentially.

Down

1. List data types are often implemented using _____.
2. A _____ list is a series of connected _____.
4. A data structure is a particular way of _____ and _____ data in a computer so that it can be used efficiently.
8. Some commonly used nonlinear data like multidimensional arrays, _____ and graphs.
9. A _____ list is a series of connected _____.

[Answer Key HTML](#) | [Answer Key PDF](#) | [List this puzzle for the public](#) | [Solve Online](#) | [Printable HTML](#) | [Printable PDF](#) | [Other puzzles by author](#)

Figure 4 : Example of I-DSP with answer button

I-DSP DATA STRUCTURES (T1 & T2)

ANIZA IBRAHIM

CHAPTER 1 & 2

Across

3 The process of deletion requires an algorithm to determine whether a list is _____ or _____ before removing an item from a list.

5 Data structures are generally based on the ability of a computer to fetch and store data at any place in its memory, specified by an _____.

6 The process of deletion requires an algorithm to determine whether a list is _____ or _____ before removing an item from a list.

7 A data structure is a particular way of _____ and _____ data in a computer so that it can be used efficiently.

9 A _____ data structure traverses the data _____.

Down

1 List data types are often implemented using _____.

2 A _____ list is a series of _____ connected _____.

4 A data structure is a particular way of _____ and _____ data in a computer so that it can be used efficiently.

8 Some commonly used nonlinear data like multidimensional arrays, _____ and graphs.

9 A _____ list is a series of _____ connected _____.

Figure 5 : Example answer of I-DSP

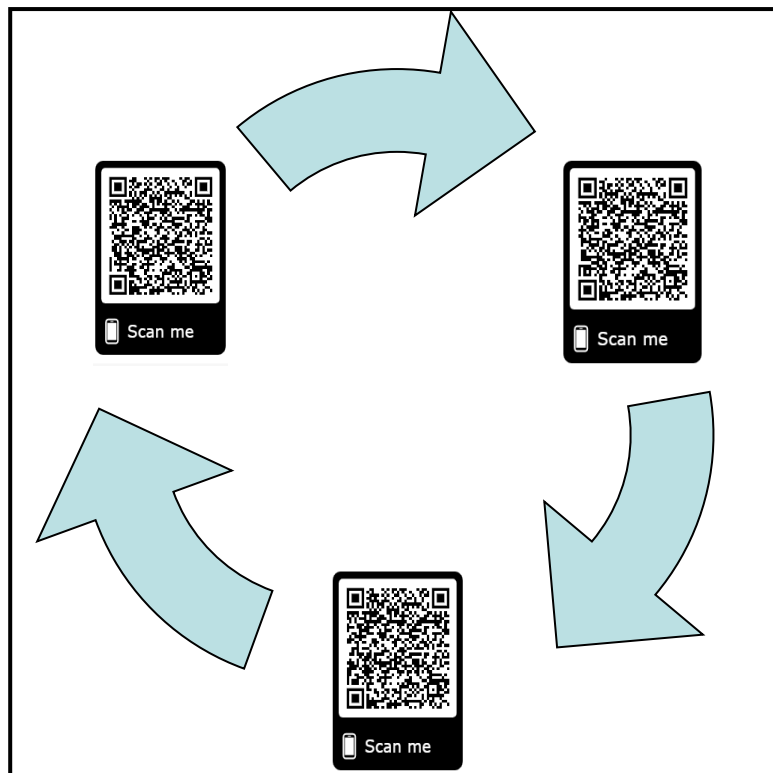


Figure 6 : I-DSP QR code for all chapters (combining 1&2, 3&4 and 5&6)

Questionnaires of student's perceptions on i-DSP crossword puzzle

The study was conducted on 1st year DDT's students taking Data Structures courses in Sultan Mizan Zainal Abidin Polytechnic. Total sample size was 70. A pilot test was conducted on 30 students to pre-validate the questionnaires given. Topic to be included in the crossword puzzle was covered all topics such as Introduction Data Structures, List and Linked List, Stacks, Queues, Trees, Sorting and Searching. A crossword puzzle was designed using free online resource Crossword Puzzle Maker, Armored Penguin and was validated by two experts from the Information Technology Department. Printed copies and online crossword puzzle were given to the students to solve. They were encouraged to solve the crossword puzzle by group to promote collaborative learning. Time given for solving the crossword was 30 minutes. At the end of the time, correct answers to the crossword puzzle were discussed. Then, the questionnaires consisting of 10 items were distributed to the students to record their perceptions of crossword puzzle as a tool to enhance active learning in Data Structures courses. The responses were recorded on a 5 point Likert Scale (1= strongly disagree to 5 = strongly agree) and expressed as a percentage.

Findings and discussions

The research result showed after using i-DSP puzzles, the classroom becomes more fun and interesting. It also improved teaching effectiveness and student can focus on subject better than before. Online Armoredpenguin crossword puzzle maker is so easy to use and fast without wasting time and paper. QR code also was provided to make sure students can access i-DSP easily anywhere wherever they are.

Findings

There are 67% of students strongly agreed that crossword puzzle enjoyed and interested learning, the rest 33% also agreed. Item of 'Fun experiences to solve crossword puzzle' shown that 65% of students strongly agreed and 35% agreed. 58% students strongly felt that the crossword puzzle is easy to use, 36% agreed, 4% neutral and 2 % disagreed. For the item of 'encourages active learning', 52% of students strongly agreed for the item and the rest 48% was agreed. 49% strongly felt using crossword puzzle improved their confident level and 51% was agreed. 'Challenging in problem solving' and 'a game with relaxing' items have similar percentage of strongly agreed with 48%. For the rest five items were considered below 45% strongly agreed, but most of them still in agree area (refer Table 4.1). For the item of 'helping in remember important terms in the topic' there are lowest percentage which 22% strongly agreed, 69% agreed, 6% neutral and 3% disagreed. The findings of this research show that more than 90% of the students agreed that using i-DSP crossword puzzle in learning can be acceptable, enjoyable, relaxing, interesting and effective tools as a teaching aids in classroom.

Table 1: Result of student's perceptions regarding i-DSP crossword puzzle as a teaching tool

No.	Item Statement	Percentage (%)				
		Strongly Disagree	Disagree	Neutral	Agree	Strongly agree
1.	Easy to access	-	3	5	48	44
2.	Easy to use	-	2	4	36	58
3.	Improved my self-confident level in problem solving	-	-	-	51	49
4	Fun experiences to solve crossword puzzle	-	-	-	35	65
5	Enjoyed and interested learning	-	-	-	33	67
6	Encourage active learning	-	-	-	48	52
7	Improved my understanding of the topic	-	1	6	61	32
8.	Challenging in problem solving	-	-	-	52	48
9.	Helped to remember important terms in the topic	-	3	6	69	22
10.	A game with relaxing approach	-	3	5	44	48

Discussions and Conclusions

It seems like compulsory way to learn using crossword puzzles in every subject or courses. A game like i-DSP using crossword puzzles is an effective tool in the learning and teaching process. Many evidence from case studies is presented, which exposes the effectiveness of this approach including as a motivational tool. This learning methodology is enjoyable and fun. It is breaks the routine of traditional lectures.

This paper proposed an alternative educational strategy using free online armoredpenguin crossword puzzle maker by combining both design and solution as student activities in the classroom. The results of the case study exposed that this method is very suitable to develop different skills related with a knowledge area. Students enjoyed and interested the activity and found it fun, encouraging active learning and challenging for their learning. They felt relax and more confident in their own ability when identified the true answers. The study also found that students thought this i-DSP is easy to use and access, improved their understanding in the topic and helped them in remembering the important term in the topic.

Based on student feedback, crossword puzzles seem to achieve a high level of acceptance as a learning aid, which is also supported by other authors [16, 11]. Educators have employed various experiential strategies in order to improve teaching effectiveness. This approach encourages several useful student skills including vocabulary, reasoning, and spelling [17]. These educational crossword puzzles allow for greater reinforcement of a concept because they have to process the meaning of it rather than just memorizing the terms behind it. I-DSP challenges students to explore past experiences, recall recently learned information, and manipulate vocabularies to find the right word. The process of filling in a i-DSP crossword puzzle encourages independence, creativity and active engagement. Students perceived that crossword puzzles enhanced their learning in Data Structures courses. Using of crossword puzzles provides a simple, creative, and effective means to incorporate active learning in the classroom [18].

Suggestions

Based on the findings of the research, it is suggested for teachers, lecturers and educators to use an Online Crossword Puzzle maker to create easy puzzles for their subject or courses. At the same time by using crossword puzzle game, it will attract the student's interest and improve their learning in the courses. It also suggested for researchers to do more study at other educational institutions.

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Using Card Game as an Active Learning Method in Job Interview Activity for Semester 4 Students in Malaysian Polytechnic: A Case Study of *Nail the Interview! (The Apprentice)*

R. A. Rayah^{1,a}, N. A. Azmi^{1,b}, W. R. W. M. Nawawi^{1,c}, N. Osman^{1,d},
N. A. Adnan^{1,e}

¹General Studies Department, Politeknik Sultan Mizan Zainal Abidin, Terengganu, Malaysia

^aadawiyah@psmza.edu.my, ^bayyuuni@psmza.edu.my, ^cwan.rosedayu@psmza.edu.my,
^dnorsaliza@psmza.edu.my, ^eaqilah@psmza.edu.my

Abstract. Successful job interview session is needed in order to secure a place as a potential worker in any companies especially ones with professional environment. English language proficient has also becoming an additional requirement to become a hired worker for many companies nowadays. However, most undergraduate students are still not be able to speak English fluently when they are in the middle of interview session because of many reasons especially lack of preparation and practice. To convey one's answer fluently in English language during an interview, active preparation and practice are very closely related. Therefore, *Nail the Interview! (The Apprentice)* is an initiative to an active learning and practicing of mock job interview which also has augmented reality (AR) characteristic embedded inside the card in which students can use their mobile phone to figure out more about the content. It is undeniable that candidate with sufficient preparation and practice has a high chance of passing a job interview. Therefore, the main objective of the research was to examine the functions of *Nail The Interview! (The Apprentice)* card game as an instrument for active learning on English language skills during a mock job interview activity among final year students at Politeknik Sultan Mizan Zainal Abidin, Malaysia. The methodology used was qualitative method using a semi-structured interview. The feedback was audio-recorded and then transcribed verbatim. Inductive content analysis was used to categorize the emerging themes from the interview. The interview consisted of eight open-ended questions and participants gave their own personal responses based on their experience. Findings indicated there are four themes of *Nail The Interview! (The Apprentice)* functions as implied by the participants.

Keywords: *Nail the Interview! (The Apprentice)*, Spoken English; Job Interview; Active Learning, Augmented Reality in ELT

Introduction

A job interview is one of the sessions need to be faced by the students after they have graduated to ensure their place at any vacant positions aspired. Meanwhile, Politeknik Sultan Mizan Zainal Abidin as one of the tertiary educational institution in Malaysia has provided its final year students the important subjects to fulfill soft skills needed in employment. Mock job interview as one of the subtopics taught has been emphasised to help students with their real job interview in future. According to [9], interview preparation activities may include mock interviews, role plays, discussion, and feedback, and are believed to be critical in preparing students for job interviews. To instil the knowledge of job interview, active learning method is used to support student-centred learning especially in a topic they need to critically master. [12] indicates that

active learning approach involved proactive element implemented on students which nurtured critical thinking skills among students. In order to implement active learning method to mock job interview session, this study intends to propose *Nail The Interview! (The Apprentice)* card game as part of activities to enhance students' verbal and non-verbal skills during a job interview.

Research Questions

What are the functions of *Nail The Interview! (The Apprentice)* card game as an instrument for active learning on English language skills during a mock job interview activity among final year (semester 4) students at PSMZA?

Problem Statement

There are many forms of interviews tailored by the employers to hire suitable candidates for their vacant positions. From individual assessment through the open, one-on-one, panel, and phone interview to the camp of group interview that can last for days which usually involve behavioural and competency-based interview. Nonetheless, many freshly graduated students do not have the necessary practice or first-hand experience on the job interview session that may lead them to fail the interview. This is supported by [3] as many students have little experience in being interviewed for positions when they begin seeking for work placements.

Most fresh graduates may produce good resumes, but some still stumble upon the job interview step. According to [3], despite possessing excellent resumes, students may fail to secure a placement if they perform poorly during pre-placement interviews. In addition, although students may prepare a very comprehensive resume, they will struggle during an interview, which results in job loss to another candidate.

Insufficient practice and experience of going to a job interview often lead to a heightened anxiety among these fresh graduates. This could exacerbate the situation if from the beginning, they are not equipped with the soft skills needed to pass the interview, which also cause them to fail the job interview. As mentioned by [24], heightened anxiety often translates into issues such as ineffective verbal or non-verbal behaviors and decreased confidence level, which can negatively impact the perception of professionalism noted by prospective employers.

Literature Review

For so many students, attending a job interview and doing well in one is very much related to their motivation and confidence. According to [20], pre-planning for interviews has been reported to improve student confidence and interview performance, and is recommended as a strategy for improving prospects of a job placement. Besides that, students could identify their strength and weakness of a job interview if they have adequate practice beforehand. As mentioned by [18], students need to develop an awareness of their personal strengths and weaknesses, in addition to an awareness of workplace opportunities. They would also have a better view on which area they have to improve, as [3] reported that trial interviews improved self-efficacy towards the pre-placement interviews for two reasons. First, it enables students to gain an understanding of the type of question they would encounter in an in-depth formal interview, and second, it affords them the opportunity to practice the articulation of answers.

Therefore, in effectively preparing students for their real job interview in future, *Nail the Interview! (The Apprentice)* card game could be one of the instruments needed to serve its purpose. According to [20], mock interviews provide students with the opportunity to practice interview techniques. Furthermore, interviewing skills more greatly influence recruiters'

decisions about hiring and perceptions of student fit, compared to students' experience [7].

As *Nail The Interview! (The Apprentice)* card game provide the students with questions they need to answer during a job interview, students have a clearer perspective on what knowledge they are required to possess. According to [20], students have reported numerous advantages by participating in mock interviews before an inter professional panel, including understanding their strengths and limitations, gaining knowledge of actual interview questions, and learning how to prepare for interviews and handle stress. Besides that, students would also have the opportunity to improve themselves in many skills they are required to do earlier during a mock job interview; verbal or non-verbal. They could be well aware of their weakness and make some strategy to overcome it. Strategies include preparing questions to ask employers, anticipation of questions from employers at interview time and spending time polishing interpersonal skills or practicing mock interviews. [6].

As to promote active learning, *nail The Interview! (The Apprentice)* card game has been designed to give students more autonomy on their own strategy, direction and improvement to fulfill the game's task after their first attempt. According to [19] in [17], the center of learning experience in the classroom should change from 'passive vessel' to 'active participant'. In addition, [11] explained the 'play' word was described as a voluntary, intrinsically motivating, and involves active cognitive and or physical engagement that allows for freedom to fail (and recover), to experiment, to fashion identities, and freedom of effort and interpretation. As also reported by [11], a game approach is explained by its structure such as dynamic visuals, interaction, rules, task, and multiple paths to goal, role, as well as the degree of player (student) control. The penalty element inside *Nail the Interview! (The Apprentice)* card game meets the element of risk, beside the element of challenge throughout its anticipated questions provided. This is in accordance to what has been reported by [5], [4], [8], and [1], in which the game has elements of challenge and risk. Meanwhile, [12] defines a game as an artificially constructed, competitive activity with a specific goal, a set of rules and constraints that is located in a specific Context. Students who are given their own chance to foster their ability accordingly, is more capable of learning things explicitly as stated by [21], the simulation and games including flash card are part of active learning approach and have potential to enhance quality of learning process.

Apart from that, *Nail The Interview! (The Apprentice)* is designed to be used by all students who are currently in their final year study or freshly graduate as job interview is also one of the topics taught in PSMZA. According to [17], it is very important to use games in learning process because it helps to achieve the curriculum objective. Besides that, [10],[17] stated that educators need to consider a few elements in games format such as the integration with existing curriculum whereby they also need to relate to the objective of the topic being taught [16] [17] and the teaching pedagogy [25][17]. As to come out with an attractive game to be played in this era, researchers are committed to integrate students with the attraction of technology while learning and instilling the knowledge. To date, mobile phones are more or less much used inside or outside the classroom as one of the means of teaching and learning. As mention by [2], the widely spreading use of mobile devices (phones, laptops), that "have had an undeniable influence of the relocation of such technologies" which resulted in the use of such technology in all teaching and learning spaces.

Thus, the augmented reality presents in *Nail the Interview! (The Apprentice)* card game is aimed to cater an optimum students' engagement in the learning process. It is supported by [13] study which stated that a game-based approach provides a uniquely effective means for learning language pragmatics. Moreover, augmented reality aims to present information that is directly registered to the physical environment [22]. Therefore, students could use the stimuli provided from their physical reality and at the same time could interact with a virtual content on their

mobile phones. Conversely, [14][17] emphasise that it is still essential for all educators to bear in mind that a game is a complement teaching aids and the traditional lecturing is still needed in class room teaching and learning session.

Based on the discussion, researches have conducted an interview session for all the participants of *Nail the Interview! (The Apprentice)* after they have finished playing the game to obtain their feedback. Methodology forms and data management are also briefly discussed in the next part of the study.

Methodology and Data Management

This study used qualitative method where semi-structured interview was conducted. The feedback were obtained from participants who involved in mock job interview using *Nail The Interview! (The Apprentice)*, who consisted of those who are currently taking Communicative English 3 subject at Politeknik Sultan Mizan Zainal Abidin, Terengganu, Malaysia. They had previously learned and fulfill the assignment for resume and cover letter subtopics in this subject.

Semi – structured Interview Protocol

In this study, researchers had developed a set of semi-structured interview based on research questions and objectives. The structure of responsive interview consists of eight (8) main Questions. All interview session are recorded and the audio received was transcribed. Among the questions asked were;

- i) What do you think of a job interview process before you play the game?
- ii) Is *Nail The Interview! (The Apprentice)* a fun and have easy instruction to play?
- iii) What is the most attractive features that you find inside this game?
- iv) Does this game improve your understanding, knowledge and skills on a job interview? If yes, how?
- v) What is your perception in attending a job interview after playing this educational game?
- vi) Has this game successfully lift up your motivation to do better in a job interview?
- vii) Do you think this game could promote a student's participation in active learning?
- viii) Do you think this game gives a helpful practice as a preparation on a job interview in English language?

Nail The Interview! (The Apprentice) Card Game and Game Instructions

The game consists of 40 cards; 20 question cards and 20 penalty cards. There are 3 star rating form provided as player's performance indicator. They can also add their own star rating form according to the number of players. The rating form is given upon starting the game in which each player will be rated by other players after answering the question on the question cards. This game can be played by 2 persons or more. Ideally, this game should be played by 3-4 persons (refer Figure 1).

The objective of the game is for the players to take turns in responding to the most anticipated job interview questions asked. One player who manages to successfully answer all the questions will be declared as 'The Apprentice'. To prepare for the game, each of the player needs to choose a nametag representing him or her. After that, a signage of player's selected company needs to be put in front of him or her. Beforehand, players are required to install the augmented reality (AR) application, *HP Reveal* into their mobile phone from *App store* or *Google Store*.

The question cards then will be shuffled and put inversely in the middle, with only the cover

facing upwards. The same goes with penalty cards, which will be stacked besides the questions card set.

To begin, the first player will pick up one question card and read the question stated. He or she has maximum 30 seconds to answer the question. If the player managed to give his or her response, other players will rate the response by awarding a maximum of five stars to the star rating form. However, if the player failed to answer the question within the time given, he or she must pick one penalty card and perform the punishment stated. No star will be awarded to fail response. Nonetheless, he or she could scan the AR code on the question card in order to get the tips and sample of answers of the question digitally displayed through his or her smartphone.

Next player will continue to pick a different question card. The game ends when all players have taken turns to answer the questions in preferably four consecutive rounds. This is because the question cards are categorized into four sections; personal background, work experience, skills or strengths, and job or company. Finally, the player with the most stars awarded wins the game and is chosen as '*The Apprentice*'.

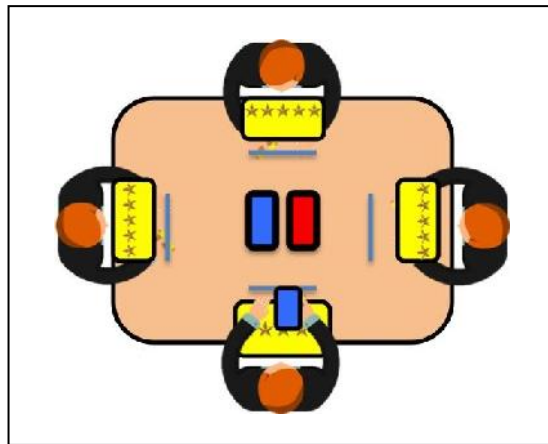


Figure 1: Illustration of players while playing *Nail the Interview! (The Apprentice)*

Results

From the interview session, this study highlighted four themes upon the interview session from the students played *Nail the Interview! (The Apprentice)* game. The first theme is the improvement of speaking skill during responding to question. Secondly, this game reminded the students or players on the attention that should be given to non-verbal aspect during a job interview such as face expression, body posture, sitting position, etc. Moreover, this game provided the content of the question anticipated during a job interview based on personal background, work experience, skills or strengths, and job or company. Lastly, it also increased students' motivation and confidence to answer job interview questions in future. (Refer Figure 2)

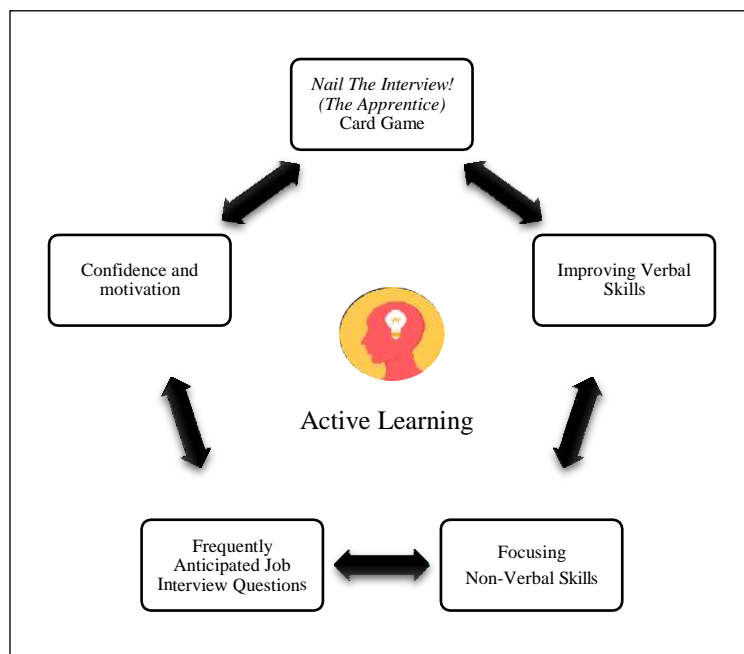


Figure 2: The themes derived from the semi-structured interview session after playing *Nail the Interview! (The Apprentice)*

Findings and Discussion

According to the themes learned in previous section, the function of *Nail the Interview! (The Apprentice)* card game can be seen in succeeding the students' job interview session by improving their confidence and speaking skills especially when it needs to be done in English language, as reported by [3]. Students normally think a job interview session is a tense session because they need to make sure everything needed is prepared. Some students see job interview session as something they want to avoid, thus hardly make any improvements in meeting their job interview requirements, as stated by [24]. Nevertheless, they still need to face a job interview in future if they want to secure a place as an employee at any professional settings. One of the statements given from the student is as follow:

"In my opinion, a job interview is a task before getting a job. But... it is so hard because some people cannot really speak directly...or give answer right away during the interview. I personally think a job interview... is a way to 'filter' the interviewee.. until companies get their potential workers. So that's why sometimes they try to test us during a job interview with difficult questions."

-Participant No. 2

As to assist with students' preparation in their future job interview, *Nail The Interview! (The Apprentice)* card game has been designed with several features and characteristics integrated with the objective of helping the candidates with practicing a job interview session. Some of them find this game is fun although it serves a formal purpose, as the researchers provide the AR feature into the game like how [2] [22] describe the feature. These are some of the students' feedback:

"At first, I thought this game will be hard to play...I have a perception that anything related to job interview gives me anxiety. However, when I play this game, it turns out that the instruction is very easy to understand and the game itself provides many fun features. I can play this game until the fourth round while still excitedly trying to answer the questions I get."

-Participant No. 1

"For me, the most attractive feature in this game is the AR. It keeps me excited about the knowledge I get throughout the game in an eye-catching way. Other than that, I also like the star rating form...we can observe and rate our peers (laughs). I think the penalty element is also helpful (in) keeping us alert about the time and have to use many strategies to come out with a suitable answer in a limited time."

-Participant No. 1 and No. 3

As expected, this game serves as a helpful instrument to practice mock job interview. It is because, the necessary knowledge and skills required are taught indirectly as the students try to answer the questions while playing the game. If the students use the AR feature integrated inside the game, they will be directed to the digital notes on job interview knowledge. Apart from that, students can also improve their skills on non-verbal as this game require them to pretend as a candidate of a job interview from specified company as supported by [18]. Thus, this game could help the students in improving their knowledge and skills on a job interview. As mention by one of the participants below:

"I think yes! *Nail The Interview! (The Apprentice)* game improves my knowledge and skills on a job interview...because there are many questions that I can practice to answer with my friend as well as using English language to answer them. In addition, the game is provided with the nametag and company sign, which gives me the vibes of a real interview. So I pay more attention to the way I sit and body language...posture. Overall, this game makes me realize in what area I need to work and focus on in attending a job interview after this."

-Participant No. 2

It is no doubt that most students feel anxious to attend a job interview. However, they need to overcome the problem by having an adequate practice on many skills required. It is true that an ample preparation is needed before someone go to a job interview so he or she can focus on the purpose of going to a job interview—to be hired. As for this card game, students could get the necessary practice needed in order to improve their perception on a job interview as suggested by [20]. Based on the interview for feedback session:

“Before this, I am so clueless...on how a job interview looks like and what I need to prepare before going to one. I also thought that a job interview is very hard...you know...since I am not that good. After playing *Nail The Interview! (The Apprentice)*, I realise that actually some of the questions are about myself, the company, and many issues around us..plus before this I am a bit shy to speak, but because I play it with friends, I need to use English to get as many stars as I can. So, yes...this game gives me the idea of what I can prepare and what I need to do. I think I am not really afraid to go to a job interview anymore (laughs).”

-Participant No. 4

From the interview session, confidence and motivation to sit for a job interview as the focal theme in the outcome of playing this game is also recorded. Students find that *Nail The Interview! (The Apprentice)* gives them the picture of what and how does a job interview looks like, so they know what to prepare as supported by [3]. Some students said they felt more confident after the first round of the game and wanted to do better in the next round so they can earn more stars from their friends. Apart from that, they also stated that they felt more motivated to do their very best in a real job interview session. Based on the feedback received from the interview:

“Yes...This game somehow improve my motivation and confidence to do better in a job interview. Because...I have a better overview on how is a job interview process is, and I know where is the area I need to improve after this. From the star rating form received, I can also analyse my performance during a job interview...so I think I am more aware of my skills level. When I look at how some of my friends who speak confidently, I think there is no problem for me to also speak like them if I put more effort and practice.”

-Participant No. 5

Students who participated in the interview session agreed that *Nail The Interview! (The Apprentice)* card game promote active learning as supported by [21] because it involves students' own verbal and non-verbal skills to be used to obtain the objectives of the game such as reading, speaking and listening. Students need to become assertive while playing this game thus they need to instill active learning at the same time. Here is a statement given by a participant of this game in this aspect:

“Actually, this game, *Nail The Interview! (The Apprentice)* really push me to be quick...to think and give my response to each question. So, I cannot just hope to get the answer from any other sources...but myself. Moreover, the setting of the game help me to feel...what it looks like to be in a job interview, so it as if I am directly in a job interview session...and need to give my best answer.”

-Participant No. 1

Many students need to be encouraged to speak English language in order to fulfill the needs of improving their verbal skills. However, students often find that a job interview especially the one

using English language is too difficult, because they are lack of platform or medium to practice the session outside classroom setting as reported by [3] and [24]. Therefore, *Nail The Interview! (The Apprentice)* game is one of the alternatives they can turn to when they are searching for an English language job interview practice aid. Below is one of the feedback gain from the interview session:

“Before this...I am afraid to talk in English because...I am afraid to be laughed at...or making silly mistakes while I am speaking (laughs). However, I realised that in future I have to attend my job interview and some of my target companies carry out the interview in English language. So, I need to practice my English language (skills) in an interview and *Nail The Interview! (The Apprentice)* is a really helpful (instrument).”

-Participant No. 6

Conclusion

A mock job interview in Malaysian context is very important for undergraduate students as they could have enough preparation and at the same time improve their self-efficacy while reducing their anxiety towards the real job interview. It is especially focal if they are going through a job interview which require them to speak in English language during the session. In particular, *Nail The Interview! (The Apprentice)* could become a great help to achieve the purpose. The card game has given positive impact and perception towards students' preparation in their future job interviews. This simulation game has also integrated the technology, active learning, and interactive skills to improve students understanding and strategies. Significantly, students could gradually gain their motivation and confidence in specific area by playing this game. In conclusion, *Nail The Interview! (The Apprentice)* card game has a great potential to be carried out as a complement teaching instrument for mock job interview. Nonetheless, some additional measurement such as quantitative method could be implemented to help the researchers and educators as a whole in sustaining and improving the game's quality to achieve its purpose.

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Padlet Application For Course Of Mathematical Computing

Husnira Hussin^{1, a}, Nik Muhammad Azif Arifin^{1, b}

¹Politeknik Sultan Mizan Zainal Abidin, 23000 Dungun Terengganu Malaysia

^ahusnira@psmza.edu.my, ^bahammar4@gmail.com,

Abstract. Mathematical Computing Course must be taken by the first semester students of Information Technology Programs at Polytechnic. Educators must be technologically skilled other than their teaching abilities including the implementation of Web 4.0 for the innovative learning techniques, the Padlet were chosen for the application in the classroom. This research aims to assess the students' interest regarding the use of Padlet application for Mathematical Computing. This request was utilized and assessed by 36 students from Diploma Information Technology (DDT) in Politeknik Sultan Mizan Zainal Abidin, Dungun, Terengganu. Researcher prepared a Padlet platform with tasks that students must carry out and submit to the platform. The assessment of the application was conducted with the questionnaires and then analyzed with the SPSS Version 23. The results of the distribution of the questionnaires found that the minimum score of overall items to assess the students' interest in using Padlet in completing assignment for Mathematical Computing subjects was average and moderate agreement by respondents. Undoubtedly, the use of IT such as Padlet as a learning tool in classroom can be an initiative aimed at increasing the efficiency and quality of teacher knowledge to enhance students with a deeper knowledge of Mathematic Computing.

Keywords: Padlet, mathematics computing, information technology, education

Introduction

The information technology or IT is growing quickly. Earlier study defines information technology as computing software and hardware solutions supporting organizations' management, operations and strategists [1]. IT also has been define as information transmission methods or systems used by humans. It is an instrument for tool-based processing, display and management of data and information. Selwyn [2] claims that incorporating IT in education by teaching classes is not a simple job. Educators must be technologically skilled other than their teaching abilities. The selection of technology-based learning aids should also depend on the sort of subjects the student wants to transmit. According to Xu and Chen [3], the approach of the digitization of information has greatly affected teaching. Traditional basic reading and writing can no longer cope with the demands in information society.

Therefore, the use of technology in education represents significant elements which must also be emphasized, as technology progresses in this age. Web 2.0 apps such as Padlet has excellent potential in education. The application Padlet is an alternative to enhancing student efficiency and efficiency in the teaching and studying phase [4]. The spur of usage education technology such as Web 2.0 is no exception for Mathematics learning. Padlet can be used to interact with one another for learning purposes [5]. In other meaning, Web 2.0 has excellent potential to promote and enhance the quality of education and education, as well as allowing for a good and smooth learning and teaching process in education. In numerous academic organizations, the extensive use of a web based interactive learning system can be seen and used, regardless of whether it is in government or private schools or universities.

Literature review

There are numerous previous studies on the use of Padlet in teaching and learning available globally and also in Malaysia context setting. Recent study by Kleinsmith [6] investigates the impacts of Padlet on the performance and participation of learners in a school of the fifth grade in Mathematics classroom. A total of six fifth grades students, two female and four males in a public middle school located in suburban South Jersey participated in this study. The findings of this research indicate that Padlet can help to enhance student's commitment and academic accomplishment in a five-year fundamental classroom in mathematics. The average weekly level for Padlet was increased to 4 out of 6 learners and the average weekly rate for 3 out of 6 student was increased. The results also indicate that the use of Padlet was satisfactory for all learners. The suggestion to use extra education techniques such as Padlet in the classroom includes implications for teaching learners in a fundamental skill setting. This study does reflect the benefit of adoption of Padlet in classroom but the sample size is too small which might not reflect the entire population. This is because sample dimensions above 30 and below 500 are appropriate for conducting research [7].

In Malaysia, research from Sulakah, Padlet application in education and learning in literature components define the impact on the literature teaching performance of the Padlet implementation [8]. 58 students with age of 16 years old students in one of the secondary school in Pontian, Johor participated in the quasi-experimental research. The result reveals that the level of student's interest in using the Padlet application is high in teaching and learning. Overall, the findings have shown that the Padlet implementation can enhance the performance of learners and indirectly appeal to learners for study of literature in classroom. The consequences of this study are that educators are in a better position in comparison with traditional teaching techniques to generate a better and more effective teaching.

Problem statement

For some students, Mathematics is a thrilling topic and a bit of fun. However, a few learners may have a difficulty in understanding and passing this course. The result from examination in June 2018 session showed that 160 students from Information Technology Program were failed in this subject. This figure is somewhat alarming, as it can trigger difficulties for learners who fail to deal with the topic and burden the department with opening extra sections to these student failures. The sample is 36 students from semester two has been selected for this survey.

There is one important element to be resolved in order to improve the passing rate among learners, namely the students' interest in studying mathematic computing. These variables of concern will have a significant effect both on their skills and on the outcomes of exams for learners studying mathematic computing. Previous studies of students in learning mathematic subject have shown that absence of interest among learners is the primary factor leading to difficulties learning mathematic [7].

These students will not feel pressured or compelled to take up the tasks when there is an interest element. This is consistent with what Odudukudu [8] says, who agrees with the need to go alongside interest and learning. The researcher thus introduced the application of Padlet, particularly those students at Politeknik Sultan Mizan Zainal Abidin, Terengganu which studied Mathematical Computing subjects while building interest in to help diploma students in Information Technology Program become more focused and interested in math subjects.

Objective

The main objective of this paper is to identify the perception of selected students at Politeknik Sultan Mizan Zainal Abidin, Terengganu groups in Mathematical Computing Course after using Padlet.

Development of Padlet Application for Mathematical Computing Course.

This course use ADDIE model to design the activities for online learners. As illustrated in Fig.1, wall of Mathematical Computing course was developed and evaluated by this model. Assessment tools included, self-assessments and discussions to evaluate the level of understanding of student towards the subject. Stressed that the use of a system for the analysis of problem and the identification of learning objectives to set a strategy to resolve problems with education, test solutions, evaluate the findings and review the programme [11]. While the literature provides a range of systematic models of instructional design, the ADDIE model is probably the most used in the similar field.

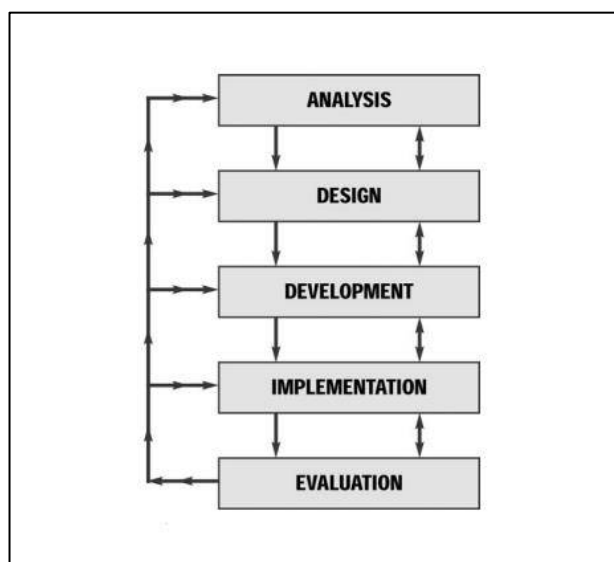


Figure 1: Process in ADDIE Model [22]

The analysis phase is the process of analyzing the application requirements to ensure the development of a more organized and systematic application. While, after the analysis process, the application design with its content is created. The application of the padlet was developed in accordance with what was observed during the analysis. In the implementation phase, the application is then used by the students. In this phase the researcher can learn more about the advantages and disadvantages of the application being used. Finally, applications are evaluated by students to ensure they are appropriate and meet the needs of students' assessments are made from questionnaires distributed to students.

Padlet which is a single student response system enables all learners to work concurrently and to work together and indicates that Padlet can be a useful teaching and learning instrument [9]. In other meaning, the use of multimedia components such as Padlet for mathematical computing can lead to an easier to comprehend, more efficient and better quality teaching atmosphere for learners, according to a research undertaken by Salleh and Azul [10]. Hussin

[11] endorsed this finding, which said that technology should be utilized to improve the student knowledge and the efficacy of the educational method as much as possible. Thus, the purpose of this study is to identify students' perceptions of the use of Padlet in Mathematical Computing learning.

The padlet is developed by providing an interactive wall in advance as shown in Fig.2. Questions that students need to answer are placed on the wall. Students will interact and answer questions found directly on the wall. They will upload the finished work as shown in Fig. 3. Lecturers can evaluate student work by rating or commenting on each of these assignments. It will make learning more fun and increase student motivation in math subjects.

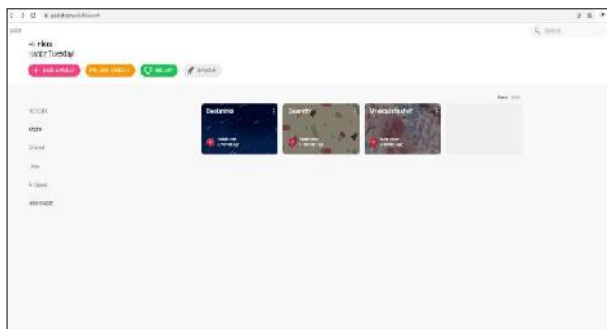


Figure 2: Interactive Wall of Padlet Students will enter the space through the links provided

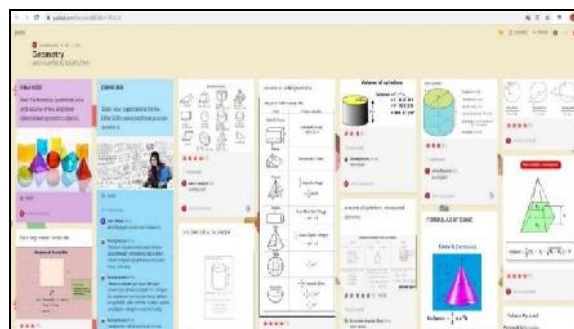


Figure 3: Interactive Wall of Padlet Used by Students

Research Methodology

This study uses quantitative field design to gather main information to answer research questions and attain research goals. The design of this study is a set of questionnaire study as a research tool. To obtain data, a set of questionnaires was distributed to the students. A five-point Likert scale as shown in Table 1 was used to indicate agreement for the use of Padlet in teaching and learning mathematic computing. The Likert Scale is defined as SD = Strongly Disagree, D = Disagree, N = Neutral, A = Agree and SA = Strongly Agree.

Table 1: 5-Point Likert Scale [20]

Choices	Scale
Strongly Disagree	1
Disagree	2
Neutral	3
Agree	4
Strongly Agree	5

Result and Discussion

Six items were used to define the perception of students in Mathematical Computing learning with Padlet. Table 2 shows the analysis of minimum score of the users that show a high interest in completing the tasks thorough Padlet. Based on a scale of 1 to 5, minimum score of less than 2 is described as low, a score of 2 to 4 is calculated on average and score of greater than 4 is calculated as high [12].

Table 2 : Result of Students' Interest in using Padlet in Teaching and Learning

No.	Items	Score
1.	Padlet application is easy to use	3.6
2.	Padlet increase your interest in math subjects	3.3
3.	The process of setting up a task is easy through the Padlet	3.5
4.	Padlet help you create self-learning	3.7
5.	Padlet enhance the understanding of a given mathematical topic	3.2
6.	Padlet application is exciting and up to date with the latest technology	3.7

The results of the survey found that item 4 and 6 showed a high minimum score related to the Padlet help create self-learning and Padlet application is exciting and up to date with the latest technology. The lowest score is from item number 5 which is related to Padlet enhance the understanding of a given mathematical topic. These results were considered as average score as suggested by Yee [12].

A minimum score of 3.6 which is considered as average score was recorded for item related to Padlet application is easy to use followed by a minimum score of 3.5 for item related to the process of setting up a task is easy through the Padlet, a minimum score of 3.3 related to the Padlet increase your interest in math subjects.

Conclusion

From the result above, researcher can conclude that the minimum score of overall items to assess the students' interest in using Padlet in teaching and learning for Mathematic Computing subjects was average and moderate agreement by respondents. In relation to adhering to the recent teaching ideas, this shows that the application of the Padlet technology in teaching can attract students to learn the Mathematical Computing.

The use Padlet in Mathematical Computing learning can give an exciting and enjoyable particularly in the completion of lecturers' tasks. Students get more passionate and active. It also offers students more room to use resources in the classroom wherever they have a link to the Internet. This software can therefore improve the performance of students throughout the nation by using the Padlet in Mathematic. This means that a generation can be produced that is not only swallowed up by technological trends but can capitalize on technological advancements for a brighter future. The result also confirmed that there is moderate agreement in using Padlet in completing assignment for Mathematical Computing subjects in Politeknik Sultan Mizan Zainal Abidin, Terengganu. For future studies, recommendations include carrying out the study with a large amount of student as respondents, as well as examining whether the amount of days used by Padlet per week affects student results.

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Flip Flap Autodesk Revit

Md Alimi Yasinan @ Jasman^{1, a} and Nur Fatihah Mihat^{1, b}

¹Kolej Komuniti Shah Alam, Aras 10, Bangunan UMNO Shah Alam,
Persiaran Damai, Seksyen 11, 40460 Shah Alam

^aalimijasman@gmail.com, ^bfatihahmihat@gmail.com

Abstract. Implementation of the curriculum-based education curriculum (OBE) The certificate of interior design has included the interior design module as the main module for College Community Shah Alam and College Community students offering interior design courses. The interior design module is one of the modules in the certificate of interior program structure, as embedded in the based education curriculum (OBE) on the certificate of interior design. Mastery of computer-aided three-dimensional design is very important for every student. It is important because without the mastery of computer-aided three-dimensional drawing, a student may have difficulty mastering other software such as Autodesk 3ds Max and I found it difficult to master the Autodesk 3ds Max software. Students now have more control over google's sketchUp software and find it difficult to master autodesk 3ds max software. This demonstrates the importance of mastering three-dimensional design using alternative software for students to ensure their complete mastery of the interior design module. As a result, as one of the instructors of the interior design certification program that teaches interior design modules, i innovated on Autodesk Revit teaching tools to help interior design students quickly master computer-aided three-dimensional drawing. Guided by the theory of emotional integration, this innovative teaching aid is called FLIP FLAP AUTODESK REVIT, which focuses on architecture and interior design.

Keywords: Computer Aided Design Autodesk Revit, Architecture, Interior Design

Introduction

Autodesk Revit Flip Flap is an innovative material and it is organized in an order that focuses on design in architecture and interior in building. Revit is software computer aided design in 3D element in brickwall, door, window, floor, roof, ceiling, slab, sanitary fitting and furniture components. In the implementation of this innovation project, I decided to use one of the sensory integration activities that is Touch Activity in the Autodesk Revit innovation materials Flip Flap. Tactile activity based on the theory of emotional integration uses procedures that incorporate the sensation and sensitivity of touch into procedures such as clay games, drawing, touch or movements of hands and fingers on paper or cardboard and painting with fingers. So I chose hand movements on Autodesk Revit based cards to build this innovative material

Statement of problems

- Students master only the google sketchUp software compared to 3ds max and there is no alternative software for 3D design for the interior design project 3.
- Students spend a lot of time preparing their projects in 3D using sketchUp.
- Students take some time to prepare some photorealistic 3D views when using the sketch-up software, but have time to complete it within a month.

The need to integrate sensory activities in improving the student's cognitive intelligence in the mastery of the field.

Cognitive abilities are mental tools used by the brain to learn, regulate, process, interpret and function properly. Without cognitive skills, we cannot function at all. When an individual has a sensory integration problem, the root problem is a weak cognitive ability because sensory integration uses certain cognitive skills to function properly. Thus the tactile activity is applied in the Autodesk Revit Flip Flap innovation material as an effort to improve students' cognitive abilities in remembering step in basic 3D design using autodesk revit processes as a whole.

Setting goals

- a) Improve the ability to master individual computer aided design in 3D.
- b) students can quickly develop hand-ons skills of study programs using the innovative FLIP FLAP AUTODESK REVIT material.
- c) Teachers will be able to diversify their teaching and learning methods with the use of interesting teaching materials that students can touch during the teaching period established by the Jabatan Pengajian Politeknik & Kolej Komuniti

Establish the goals of the innovation project

The goal of this innovation project is the 3rd semester students Kolej Komuniti Shah Alam

Materials used:

- a) Print screen Autodesk Revit
- d) laminated plastic
- b) Mountain Board.
- e) Scissors
- c) Screw
- f) Ink printer

Expenses

- a) A4 Paper 100gm –RM 10.00
 - d) laminated plastic-RM 20.00
 - b) Mountain Board-RM 6.00
 - e) Scissors-RM 3.00
 - c) Screw-RM 2.00
 - f) Ink printer-RM 60.00
- Total – RM 101.00

Problems / problems that innovation can face

- a. The problem of lack of control by students can be overcome with use Autodesk Revit flip flap that can be considered a game from students not realizing that they are doing reading exercises using the theory of emotional integration.
- b. There is a new teaching aid in the Autodesk Revit camp given the urgent need to resort to teaching aids of Computer Aided Design 3D module.
- c. Helps reduce the cost of buying expensive teaching aids given the low construction cost of the FLIP FLAP AUTODESK REVIT material

Summary

The construction of these innovative materials indirectly transforms the tradition of learning of students from reading a book to a form of hand movement using the same but dual functionality. In addition to creating a practical, portable and lightweight material, this Flip Flap Autodesk Revit innovation can help reduce the cost of buying expensive teaching aids by using low-cost materials.

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Implementation of e-Flip as Substitution of Conventionally Printed Notes in Lifelong Learning for Food Handler Training Course

Ahmad Rasa'arim Razzali^{1, a}, Tan Kang Yee^{1, b}, Adilen @ Lucia Suil^{1, c}

¹ Politeknik METrO Kuantan, Kuantan Pahang, Malaysia

^arasaarimmetro@gmail.com, ^bkangyee@pmku.edu.my, ^cadilen@pmku.edu.my

Abstract. Lifelong learning (LLL) enables Malaysians to improve and meet the latest skills required by the industries that are currently beyond the workforce through reskilling and up-skilling opportunities. One of the most important and necessary skill in food business is Food Handler Training Course which was introduced by the Ministry of Health Malaysia. It is one of the compulsory courses for all food handlers that stated in Food Hygiene Regulation 2009 (Regulation 30). Hence, the trainees or participants will obtain Food Handler Card which was endorsed and issued by the local authority under the Ministry of Housing and Local Government. The world has recently introduced the Industrial Revolution 4.0 which is expected to change people's lifestyle, work and communication. In order to cope with the Industrial revolution 4.0, the implementation of e-Flip Notes via QR code was introduced to substitute the printed notes in the structural digital learning. Therefore, this study will examine the trainees' perception of e-flip notes approach in facilitating the Food Handler Training Course and impact of e-flip notes to the Course Coordinator. This combined strategy was aimed to improve the training quality, learning efficiency and increase the institution's income. There were 209 trainees were taking part in the survey. Online questionnaire was used to understand the trainees' perceptions, while Visual Stream Mapping (VSM) was used to study the outcome of e-flip to the Course Coordinator. Results showed that the implementation of e-Flip Notes via QR Code has enhanced the trainees' learning effectiveness and interest. By using e-Flip Notes it enable the trainee to access the notes instantly on any device once they registered for the course. Meanwhile, the VSM method shows increased the institution's income as it helps reduce notes preparation time, printing costs and supports the Go Green campaign through reducing paper usage.

Keywords: e-Flip notes, Food Handler Training Course, Lifelong Learning, QR code, Visual Stream Mapping

Introduction

Malaysia Education Blueprint 2015-2025 had emphasized on the lifelong learning as one of the core elements for Malaysian Education System [1]. Lifelong learning will become a way of life for all Malaysians. There will be high quality formal, non-formal and informal programs in a wide range of disciplines and topics to support both professional and personal development. Department of Polytechnics and Community College had set a Key Performance Indicator (KPI) for each Polytechnic in Malaysia to implement Lifelong Learning Courses. This study is closely linked to the function of the department as a Food Handling Training School (FHTS) accredited by the Ministry of Health (MOH) since February 06, 2014 and has conducted Food Handling Training Courses (FHTC) to all food handlers in the local community, especially to the people who are directly involved in the preparation of food, touching the food or the surface of the food and handling packaged or unopened food and utensils. Thus, there is a high use of A4 paper and a long workforce was required in preparing the notes each time before starting the FHTC. Printed or photocopies notes sometimes does not provide a good quality notes where the notes provided manually are colorless, unclear and less attractive. This led to some participants being confused by the examples provided by the speakers during the course. The purpose of this study is to examine the effectiveness of e-Flip Notes through QR codes and the trainees' perception on the e-flip notes approach in facilitating the Food Handler Training Course. Visual Stream Mapping (VSM) was used in this study to identify the effectiveness of e-Flip notes in eliminating waste, improving training quality and providing better training cost management. Whereas, online questionnaires were used to collect trainees' perceptions about e-Flip notes approach.

Literature Review

The e-flip note is an interactive, HTML5 online publication that has the look and feel of a real, page-turning publication (complete with page-turning sound effects, page shadows and more). Flipbooks are currently used to replace conventional digital PDFs and paper-based documents such as reports, presentations, magazines, catalogues, brochures, books and more. A digital flipbook looks and feels exactly like a printed publication with pages that can be flipped and turned - without the cost of printing. Flipbooks popularly can be used and shared via several methods such as via a link, embedded on the website, or in an email signature. There are various advantages of using flipbooks, where it can allow teacher to have extra time in discussion with students and students will be able to do group study with their friend to solve problems at outside the classroom [2]. Other studies also show that flipped learning using smart-based flipped was found to have improved self-directed learning ability compare to the traditional ICT-based method [3].

According to Siti Zuraidah Md Osman [4], the shift from traditional classroom to flipped classroom has had a positive impact on students' perception and achievement. In addition, some students used the video not only as a reference before the class but also as a review tool before their assessment. Jamaludin and Osman [5] stated that this new learning environment helped lecturers to achieve their learning outcomes and make teaching and learning more engaging, active and student-centered. Therefore by choosing appropriate learning approaches, Malaysian Polytechnic institutions lecturer and student could think globally by teaching locally to meet students' needs of learning.

The Ministry of Health (MOH) launched the Food Handler Training Program (FHTP) in 1996 by recognizing private institutions to conduct basic courses in hygiene and food handling. The objective of the program is to provide exposure and awareness to all food operators on the aspects of food hygiene and safety, operator control and food premises, and to reduce the incidence of food poisoning nationwide [6].

The Continuing Education and Training Unit, in the METrO Polytechnic Kuantan (PMKu) is responsible to conduct Lifelong Learning Courses for the community. The main course that offers is Food Handler Training Program via Food Handler Training School (FHTS). Which been accredited by MOH in February 2014.

Methodology

This study has used two research methods, where online questionnaire was used to understand the trainees' perceptions, while Visual Stream Mapping (VSM) was used to analyze the process of conducting the FHTC. The questionnaire-based survey was comprised of two sections. Where, the first section included general information or demographic profile such as gender, age, races and education level. The second section was titled "Feedback on e-Flip note of the course". This part was designed to understand the trainees' perceptions on the specific section. There are six questions to be answered by the participants in the form of "Yes or No" to identify their perceptions of e-Flip PKPM. A total of 209 trainees took part to answer the questionnaire during Food Handling Course in Polytechnic METrO Kuantan. Quantitative data from the respondents was collected through online survey and analyzed using Microsoft Excel and presented in the form of percentages. VSM is defined as a powerful tool that guides in improvements but also highlights communication and transactional mismatches, inefficiencies in process [7]. Value stream is the collection of value added and non-value added activities that provide graphical view of the elements in a process which customer is willing to pay. VSM is defined as "the simple process of directly observing the flows of information and materials as they now occur, summarizing them visually, and then envisioning a future state with much better performance"[8]. As for qualitative data, data were collected through observing the time taken for each process in real time and was analyzed using VSM current mapping and VSM future mapping.

Results and Discussion

Trainees' perception on the PKPM e-Flip notes

There is significant results show in Figure 1, where the trainee's perception on e-Flip notes with more than 85% respondents agreeing "Yes" for questions 1 to 6 and only less than 11% respondents disagree. This finding provides the impression that the e-Flip note that has been developed is indeed applicable to participants in the course implementation process and thus creates an interesting and effective note.

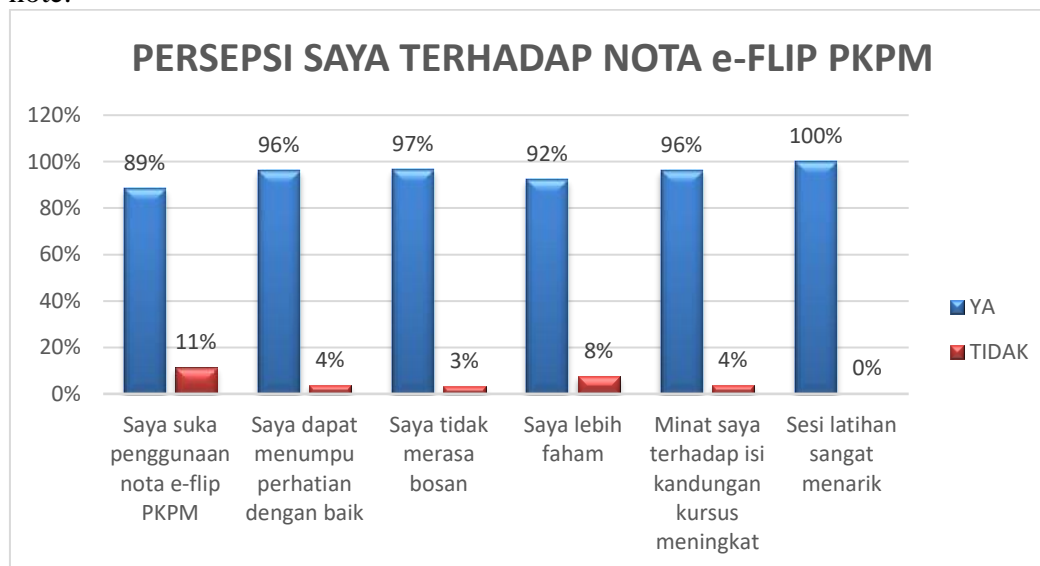


Figure 1: Percentage of Respondents' Perceptions to e-Flip Notes

Level of suitability of e-Flip Note to Participants

Figure 2 show that majority of the respondents agree that e-Flip notes are best used for the course, where more than 85% of respondents respond with a resounding "Yes" and only a few respond to "No". This shows that e-Flip note has no barriers to be used in the FHTC even though participants are come from different backgrounds, races and educational levels.

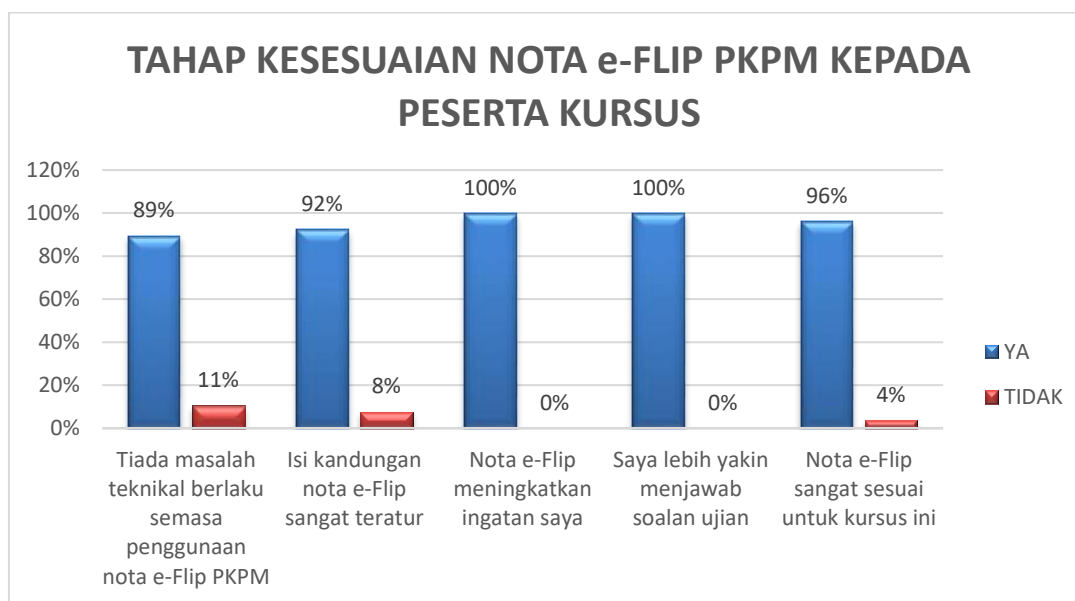


Figure 2: Percentage of Suitability Level of e-Flip Note to Participants

Level of Usefulness of e-Flip Note to Participants

Refer to Figure 3 below, shows that the majority of respondents agree that e-Flip notes can be used for the course where more than 90% of respondents respond with a resent "Yes" and only a few respond "No". This demonstrates that e-Flip usability is simple, concise, compact and does not require a large amount of data space in participants' mobile phones.

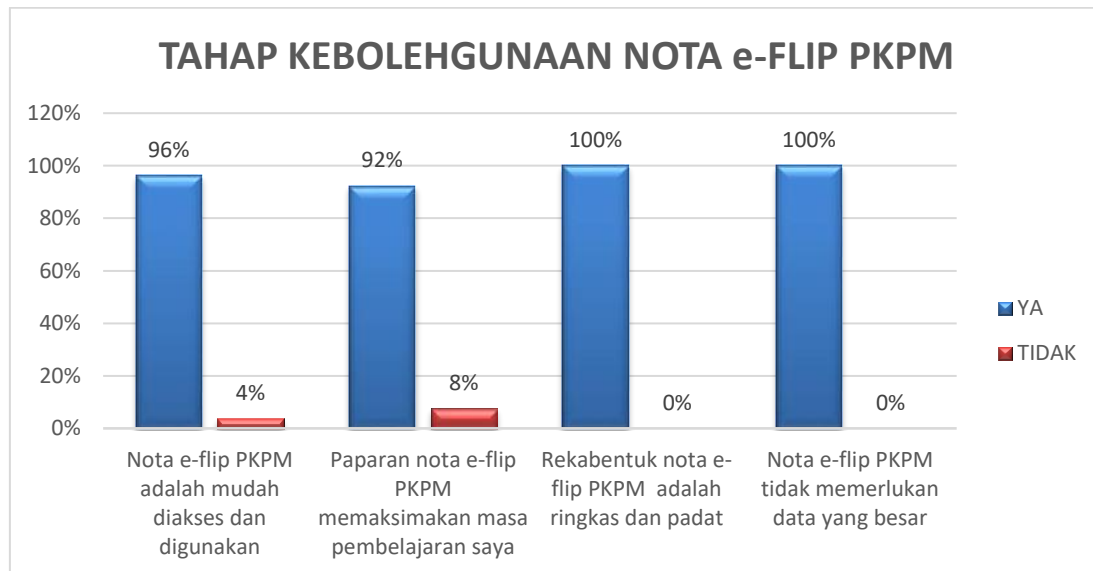


Figure 3: Percentage of Usefulness Level of e-Flip Note to Participants

Generally, the questionnaire that has been carried out has reached its intended objective. Based on Figure 4 below, the average percentage indicates that the majority of respondents of more than 90% agree that e-Flip can be used in these course and only less than 5% disagree with the use of e-Flip. It can be concluded that e-Flip note is very suitable, easy to use, and attractive and indirectly helps to enhance the knowledge of participants in providing them as food operators recognized by the Ministry of Health Malaysia.

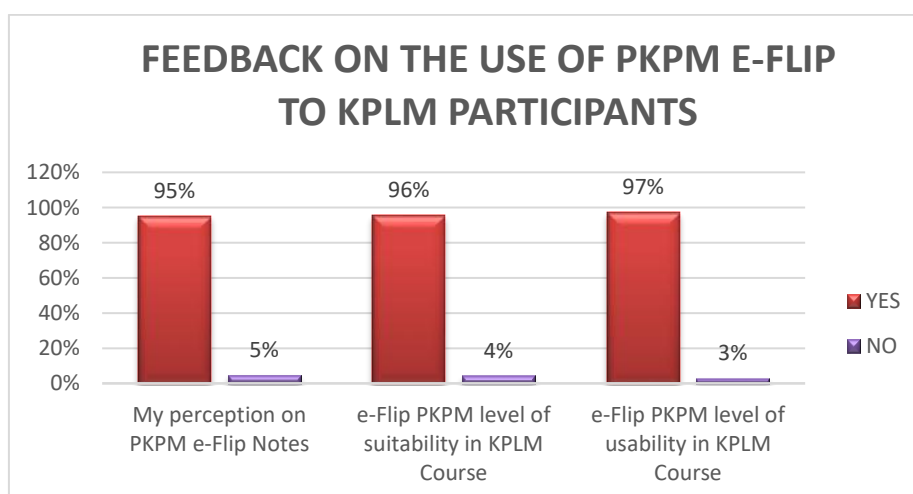


Figure 4: Percentage of Average Response to the Use of e-Flip Notes

Future State Analysis

After analyzing the current state of FHTC using Kaizen method, improvement areas have been identified which will lead to reduce lead time as shown in Figure 6. To synchronize the Takt time with the cycle time the layout has to be changed, some activities should be eliminated which will not add value to the process by implementing Kaizens. The overall production lead time can be reduced from 312 minutes to 12 minutes. In addition, 5 hours or RM26.45 (RM5.29 x 5 hours) of labor costs are saved and two rims of A4 paper or RM24 are saved for each FTHC course series by applying PKPM e-Flip Notes.

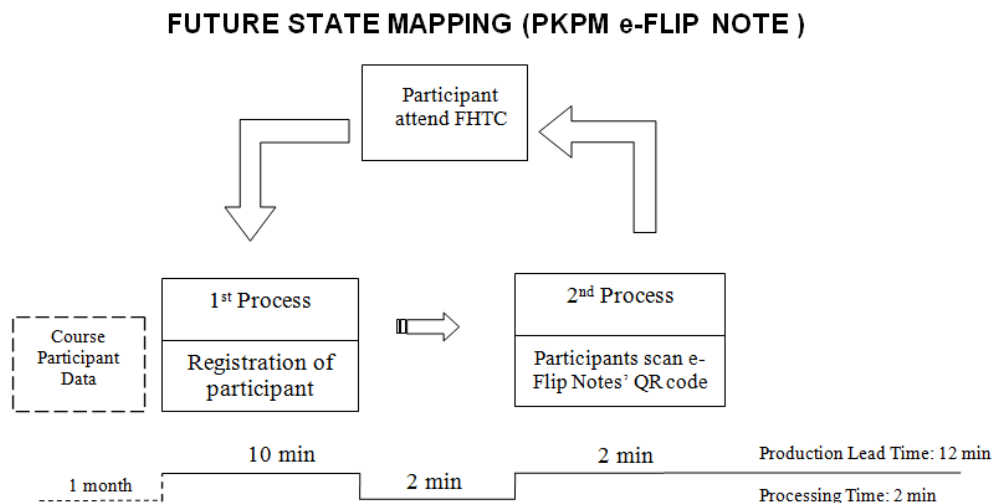


Figure 6: Future State Map for FHTC's e-Flip Note Preparation

Summary

It is proven that e-Flip Note saves the use of A4 paper, working hours and employee wages for providing Food Operator Training Course notes to course participants. From January to June this year, the uses of A4 paper have been saved about thirty-two (32) rims or RM384.00 for the 16 series of FHTC. Where, each course used 2 rims of A4 paper (RM12 per-rim). The invention of e-Flip Note shows a significant reduction in labor time. Prior to using the e-Flip Note, the time taken to prepare the notes for each series of courses (30 participants) was 312 minutes (5 hours 12 minutes), while the time was reduced and it took only 12 minutes for the PKPM e-Flip note to be available. The reduction of time is 300 minutes (5 hours).

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Developing of Smart DCC3132 ExamPREP using Andromo

Nor Afzan Ariffin^{1, a}

¹Politeknik Sultan Mizan Zainal Abidin, KM 8 Jalan Paka, 23000 Dungun Terengganu, Malaysia

^anorafzanariffin@gmail.com

Abstract. Smart DCC3132 ExamPREP is an android based teaching aids tool developed for the Statistics (DCC3132) course using Andromo. This innovation is specifically designed to facilitate students to better prepare for final exams and to overcome the problem of discrepancies between the Continuous Assessment (CA) and the Final Exam (FE) scores. The development of this innovation is in line with the development of technology in today's education that requires more creative and innovative teaching techniques. The innovation of this android application comes with lecture notes, a collection of final exam questions along with a complete solution and topic distribution in the final exam questions. This innovation has been used by students taking the Statistics (DCC3132) courses at the *Politeknik Sultan Mizan Zainal Abidin* (PSMZA). By using this innovation, it has helped students achieve good results in final exams and at the same time reduce the difference scores between the Continuous Assessment (CA) and the Final Exam (FE). This innovation has proven that the use of attractive teaching aids will have a positive impact on a student's learning process.

Keywords: *DCC3132, Statistics, Android, Andromo*

Introduction

The Statistics Course (DCC3132) is a core course offered by the Department of Civil Engineering and is required by the third semester students of the Diploma in Civil Engineering in polytechnics. The Statistics course (DCC3132) introduces students to problem-solving thinking. This course focuses on the theory concepts that can be applied in engineering. Grade scores for this course are 50% of Continuous Assessment (CA) and 50% of Final Exams (FE). These innovations are generally developed with a focus on improving students' performance in their final exams while reducing the difference between continuous assessment and final exams. This innovation is an android application in smartphones.

The rapid development of technology in the field of information technology has had a positive impact on all aspects of life including education. The impact can be clearly seen with the emergence of new teaching tools. Looking back at the development of the teaching tools, starting with the traditional black board method, followed by the use of the white board and then the Over Head Projector (OHP), then Liquid-Crystal Display (LCD) and the latest interventions between information technology and internet applications in mobile learning (M-Leaning).

The application of mobile learning (M-Leaning) in the learning process makes it easy for students to access the references they need especially for the exam. The Smart DCC3132 ExamPREP is innovation developed around the concept of mobile learning which part of e-Learning and distance learning. Therefore, the ability of a learning experience to be present wherever students are is an advantage of mobile learning.

Problem Statement

The current scenario in the achievement of the Civil Engineering Diploma (DKA) students for the Statistics (DCC3132) course at the Polytechnic Sultan Mizan Zainal Abidin (PSMZA) is a poor result in their Final Examination (FE) paper scores. This situation creates a high disparity in their achievement of the Continuous Assessment (CA) scores compared to the Final Exam (FE) paper scores, thus affecting their overall scores for the course. Based on the results of the PSMZA exam

results analysis for DKA3S1 students for the December 2017 session of the DCC3132 course, only 17.2% of all students in that class managed to achieve a difference in scores between the Continuous Assessment (CA) and Final Exam (FE) of less than 30%. Such a situation would affect the Key Performance Indicator (KPI) set by the Department of Civil Engineering, which targets 50% of the number of students in a given class to score points between the Continuous Assessment (CA) and the Final Examination (FE) less than 30%. This relatively low achievement may be due to several factors, namely the conventional teaching and learning patterns that are practiced in the classroom. Previous classroom sessions only used lecture notes provided by the course lecturers as a reference for learning and the use of non-exhaustive final exam questions. However, there are some who contribute to the problem. These are:

- 1.1.1 Students often do not take notes to lectures. This will affect students' learning patterns. Students should copy notes provided by the lecturers during the teaching & learning session and this will disrupt the student's focus on teaching from the lecturer.
- 1.1.2 Notes copied from the whiteboard are not copied as perfectly as those provided by the lecturers in the lecture. This results in misleading and contradictory student references.
- 1.1.3 Most students also do not carry a complete collection of past final exam questions during a practice session in the classroom.
- 1.1.4 Students often take a long time to find references and notes they have made. Indirectly it is a waste of time.

Objectives

The objectives of this innovation study are outlined in a number of ways in assessing the effectiveness of:

- 1.2.1 Assisting lecturers in the interest of students to prepare more thoroughly before taking the final exam for the Statistics course (DCC3132).
- 1.2.2 Use the latest in Information & Telecommunication Technology to develop an innovative Teaching aids in the form of more attractive and accessible student applications.
- 1.2.3 Implementing the concept of mobile learning, students can review each topic in the Statistics (DCC3132) course by using this android application anytime and anywhere even offline.
- 1.2.4 Enhancing student achievement in the final exam for the Statistics course (DCC3132) further bridges the gap between the Continuous Assessment (CA) and Final Exam (FE).

Scope of the Study

The study is based on the scope of the following research:

- 1.3.1. The study sample involved students taking the Statistics (DCC3132) course for the December 2017 and June 2018 sessions only.
- 1.3.2. Comparison of the score difference between the Continuous Assessment (CA) and Final Examination (FE) for the two semesters.
- 1.3.3. Comparing the percentage of CLO achievement for the two semesters.

Limitations of the Study

Two samples were used in this study. The control sample was a student from the December 2017 session and the target sample was from the student session of June 2018. This was because the study was conducted with a sample limitation for students taking Statistics (DCC3132) courses only. Observations were made based on examination results from the Polytechnic Information Management System (SPMP).

Literature Review

Today, many academic researchers are exploring the potential of mobile technologies and applications to support learning. The rapid development of information and communication technologies has affected almost every aspect of life including education. Mobile phones play an important role in the lives of students as a means of communicating and have attracted young people (Hamdan et al., 2012). Advances in technology have also changed the way humans learn (Naismith et al., 2004). The process of learning and teaching today is no longer confined to the classroom, but can happen anywhere and anytime.

In Malaysia, mobile learning is relatively new in terms of implementation. Mobile learning is a new concept implemented in the learning process. Kukulska-Hulme & Traxler (2005), emphasized the ability to facilitate the learning process without being tied to the physical location of the learning process. In addition, according to Triantafillou et al., (2006), their study of tests conducted through mobile devices in education found that assessments made through mobile learning tests were more effective and efficient because they were more time-consuming than paper-based tests and a pencil.

Mohd Fadli (2014) stated that the use of mobile learning method can be a new alternative to polytechnic learning and teaching process. In addition, smartphones are becoming cheaper and affordable for students. Thus, Android-based smartphones have become a much-needed communication tool for most people, especially students. Android applications are an open source for mobile operating systems supported by Google Corporation, a world-leading search engine company. Thus, students can take the opportunity to use a variety of free and accessible Android applications for application in their learning (Hamdan et al., 2012).

Methodology

This study utilizes the validity of the examination results achieved through the i-Exam in the Polytechnic Information Management System (SPMP). The data of this study were analyzed using Microsoft Excel software by comparing the two samples.

Design and Study Instruments

This study is a form of observation using descriptive methods and the instrument used is data obtained from i-Exam in the Polytechnic Information Management System (SPMP).

Innovation Implementation Methods

The application was developed in mid-December 2017 and is fully operational in the June 2018 semester for students to take this course. Smart DCC3132 ExamPREP android application is an application that can operate on smartphones or gadgets that use the Android operating system. Android was originally developed by Android Inc. was subsequently purchased by Google. Android has a large community in developing and writing applications for functionality development. Smart DCC3132 ExamPREP was built using the Andromo applications. Andromo is one of the free platforms used to build android applications without the need for programming. With the use of Andromo, updating the android application developed can be made easier and faster.

The application building process starts with opening an Andromo account to get a platform for online applications. The platform is then designed according to the application requirements. Then materials to be uploaded to the application platform are provided, including lecture notes, a collection of past final exam questions along with a complete solution and distribution of topics in final exam questions. All of these materials are available in PDF format and then uploaded to the Andromo platform. When done, Andromo will generate the file in APK format to develop this Smart DCC3132 ExamPREP application. Files in APK format are files that are required to build or download applications in the Android operating system on a smartphone.



Figure 1: Smart DCC3132 ExamPREP icon on smartphone display.

Once the Smart DCC3132 ExamPREP application is developed, it can be freely shared with all Malaysian Polytechnic students who enroll in Statistics (DCC3132) courses by downloading it from the Play Store (Google Play). The icons in Figure 1 above will be displayed on the smartphone once the download process is complete. In addition, this application can also be downloaded by students via QR code as shown in Figure 2 below. Students only need to scan this QR code using the QR Scanner app that can be downloaded to their smartphone from the Android Play Store software.



Figure 2: QR code for Smart DCC3132 ExamPREP application.

The Smart DCC3132 ExamPREP application is a user-friendly application that is very easy to use. This Android application can be downloaded on many types of smartphones that use the Android operating system. By downloading this app into their respective smartphones, students can easily access all the menus and links inside it. The application comes with lecture notes, a collection of past final exam questions along with a complete solution and topic distribution in the final exam questions. Figure 3 shows examples of menus and links found in this application.

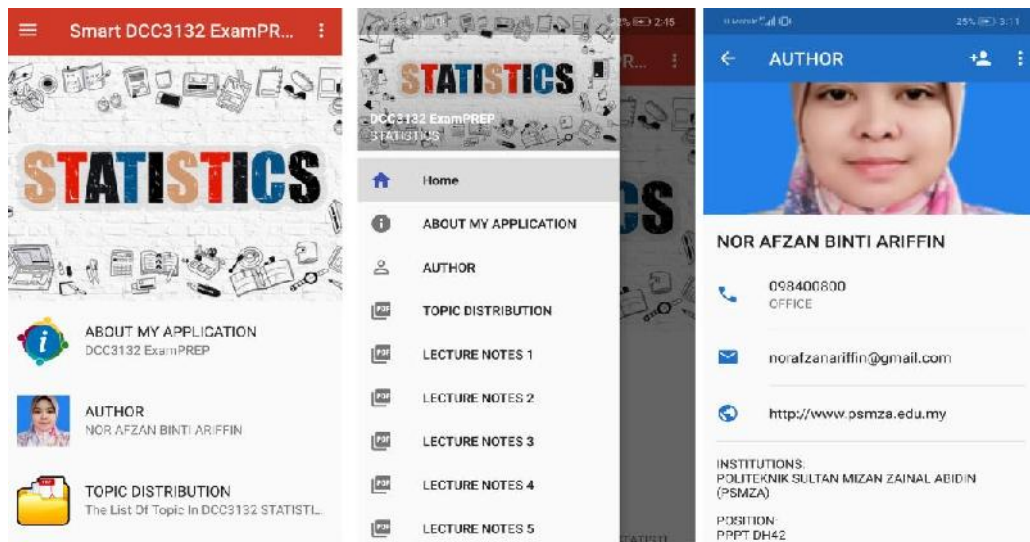


Figure 3: A view of the Smart DCC3132 ExamPREP on a smartphone.

To see the effectiveness of using the Smart DCC3132 ExamPREP application, student achievement in the final exams for the December 2017 semester was compared to the June 2018. The difference between the Continuous Assessment (CA) and the Final Exam (FE) students' scores for the two semesters later analyzed to measure the effectiveness of this application.

Analysis and Discussion

After the Smart DCC3132 ExamPREP is used by the students for the final examination of the June 2018 session, the impact can be evaluated based on the final exam results for that semester. Figure 4 shows the percentage of difference scores below 30% for the Continuous Assessment (CA) and Final Exams (FE) for the December 2017 and June 2018 semesters.

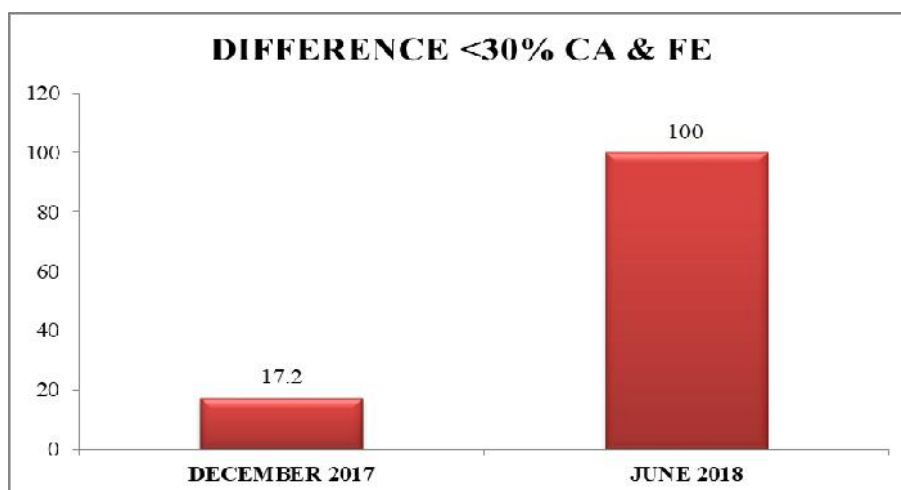


Figure 4: Percentage of students who achieved the difference between the Continuous Assessment (CA) and Final Exam (FE) scores of less than 30%. (Source: PSMZA Exam Unit, 2018)

Referring to the graph in Figure 4, the percentage of students who achieved the difference of Continuous Assessment (CA) scores and Final Exams (FE) less than 30% in the December 2017 semester of 17.2% increased drastically to 100% in the June 2018. Increased student achievement percentage of 82.8% was successfully recorded. This situation indicates that students' use of the Smart DCC3132 ExamPREP application when preparing for the June 2018 end-of-year exam successfully reduced significant differences between their Referring to the graph in Figure 4, the

percentage of students who achieved the difference of Continuous Assessment (CA) scores and their Final Exams (FE) paper scores. This also means that their achievement in the end-of-semester exams has also increased. In line with the increase in student achievement in the final exams, students' mastery of Course Learning Outcome (CLO) for this course has also been successfully increased for the two CLO involved in the final exams, CLO1 and CLO2. This can be seen through the bar chart shown in Figure 5 and Figure 6 below.

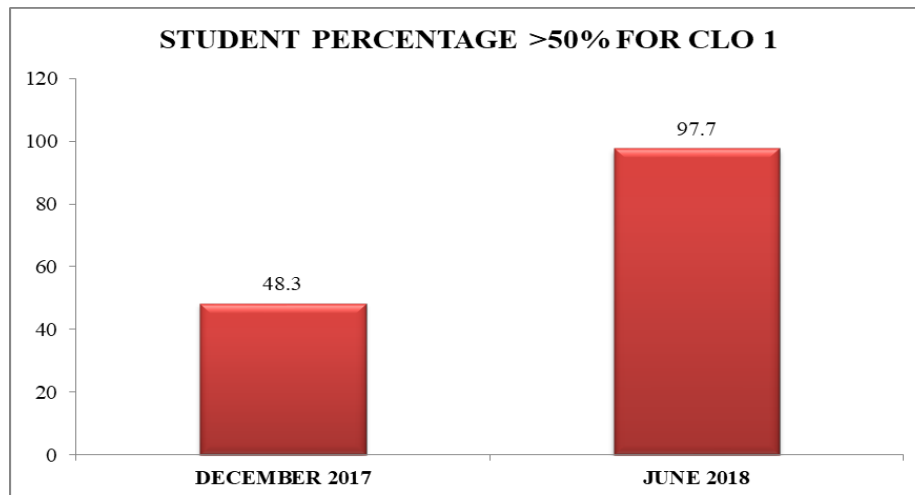


Figure 5: Percentage of students who achieved more than 50% results in CLO1.
(Source: PSMZA Exam Unit, 2018)

Based on the graph in Figure 5 above, the percentage of student achievement in CLO1 increased from 48.3% in the December 2017 semester to 97.7% in the June 2018. This percentage increase was in line with the increase in student achievement in the final examination papers as it is known of student achievement in CLO depending on their achievement in the final examination and ongoing assessment. The same is true of the percentage of student achievement in CLO2 as shown in Figure 6 below.

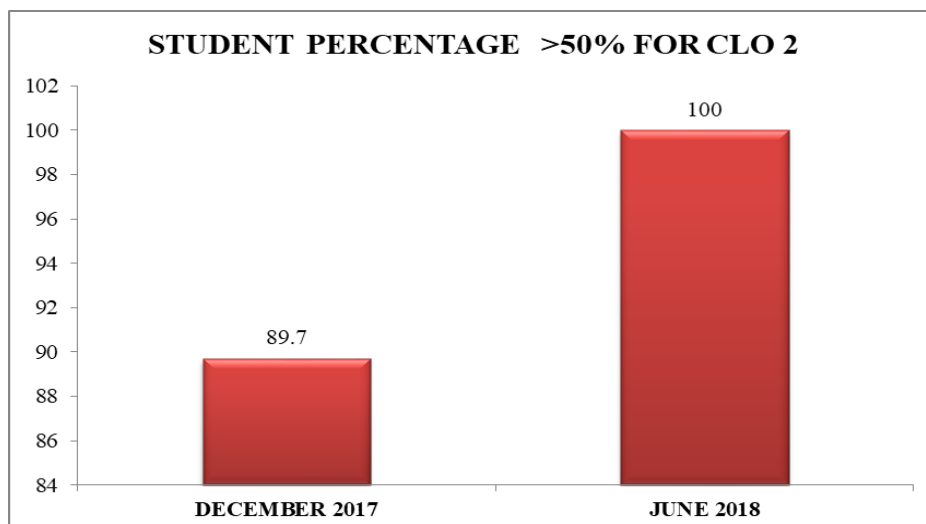


Figure 6: Percentage of students who achieved more than 50% results in CLO2.
(Source: PSMZA Exam Unit, 2018)

A 10.3% increase in student achievement in CLO2 went from 89.7% in the December 2017 semester to 100% in the June 2018. As a result, this explained the effectiveness of the Smart DCC3132 ExamPREP application in helping students answer the final exam questions.

Summary

After assessing the impact of the Smart DCC3132 ExamPREP innovation, it can be concluded that this application has improved student achievement in the final exam for the June 2018 session. The small difference between student achievement in Continuous Assessment (CA) and Final Exams (FE) is crucial to ensuring student quality. It is hoped that this innovation will further enhance its use and enhance its ability to benefit from students taking the course in the future.

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Development of Adaptive Learning Web With Multimedia Representation of Learning Style Using PHP and MySQL

Jeffri Amran Ibrahim^{1, a}, Nor Rulmaisura Mohamad^{2, b}

¹Jabatan Teknologi Maklumat Dan Komunikasi
Politeknik Besut Terengganu, Malaysia

²Jabatan Pengajian Am
Politeknik Besut Terengganu, Malaysia

^ajeffriamran@gmail.com, ^bmysura85@gmail.com

Abstract. The adaptive learning hypermedia approach is derived from a study conducted on hypermedia and user modeling. An adaptive learning site that functions as a prototype of the online tutorial system for the subject of Digital System has been successfully designed. Learning content is presented digitally and consists of materials, learning tools, and navigation methods that are presented in a multimedia manner based on a student's learning style profile. Experimental methods have been used in this study where designated websites i.e. adaptive site or static site need to be accessed by sample of students during the learning session. The effectiveness of learning sessions was measured through two dependent variables, namely satisfaction level and level of domination. The results showed that the level of satisfaction and level of adaptive group's domination was much higher than the static group. This shows that the adaptive learning website is better than the static website and has further improved the effectiveness of the learning process.

Keywords: Learning Hypermedia, adaptive learning site, Static Learning Page, Learning style profile

Background of the problem

E-learning has now been viewed as the ideal learning mode to improve the quality of teaching and learning. The weaknesses of the traditional way of teaching methods have been listed by [1] Damodharan, V. S. and Rengarajan, V. (2013) as below:

- (a) The communication is one-way communication.
- (b) Responses and feedbacks from the students are not taken into account in the teaching and learning process.
- (c) The materials presented are only based on the lecturers' notes and textbooks.
- (d) Teaching and learning will only focus on "install and play" methods rather than practical aspects.
- (e) Lecturer's handwriting determines the outcome of teaching and learning.
- (f) Insufficient interactions between instructors and students in the classroom.
- (g) More emphasis is given to the theoretical concepts only without emphasizing on real-life, practical aspects and current situations.
- (h) Learning from memorizing but not understanding.
- (i) Exam-Oriented instead of the outcomes.

With the emergence of Internet technology, the development of e-learning has become increasingly significant and has attracted researchers from various fields to make various research on it. [2] Shivhare, M. and Tuteja, S. (2011) argued that the advantages of such software are to enrich the presentation of texts, improve the quality of the presentation and keep the audience's attention. It can be used, operated and modified quickly and easily. However, they both argued that the use of this multimedia still has some constraints as follow:

- (a) it is not interactive if it is only a one-way communication and no feedback
- (b) complex to build and need longer time
- (c) involves expensive costs

[3] Somyurek, S. (2015) has stated that one of the major criticisms of the traditional web-based learning environment is the inability of the current system to meet different user needs and recommendations. This is because according to [4] Milićević et al. (2011) most common e-learning systems display educational content and materials in the same way for all students, allowing them to choose their own learning route which is not necessarily the most effective in terms of existing knowledge or will. The weaknesses of the e-learning system or the traditional hypermedia are as follow:

- (a) Most hypermedia naturally is chaotic
- (b) The problem arises is due to the storage and retrieval of large data
- (c) Confusion: When a user accesses information, he can easily get confuse in view of the broad scope of information
- (d) Cognitive Overhead: To remain oriented, the level of user engagement should be somewhat high, leading to an increase in cognitive overload.

All the hypermedia constraints that have been described have attracted researchers to find alternative methods through numerous studies. [5] Paramythis, A., & Reisinger, SL (2004) stated that awareness is increasingly culminating on the potential benefits of adaptation in e-learning and has been driven primarily by the awareness of the ideal individual learning (ie, learning is matched to individual needs and priorities) cannot be achieved especially on a large scale using a traditional approach. [6] Carabaneau et al (2006) also expressed the same opinion about individual learning. These three have also outlined the use of adaptive learning environment stating that the learning environment is considered adaptive if it is able to monitor user activity, interpreting based on a specific domain model, inferring user requirements and recommendations based on the activities that are interpreted, as appropriate to represent the relevant model and ultimately act on the existing knowledge and course material on users to facilitate the dynamic learning process. [7] Al-Azawei, A. and Badli, A. (2014) argued that the adaptive learning environment can play a role in promoting and improving learning performance. The two of them further argued that the targets that could be achieved through adaptive learning environments were to increase the assimilation of learning content, reduce forgiveness, motivate students, provide students with flexible options to develop autonomic learning strategies, guide students for optimum routes, address cognitive load issues, reducing learning costs and improving the 'usability' of the system.

These reasons have actually created a need for adaptive learning systems built on a clearer conceptual framework to facilitate understanding of the concept of adaptive learning system and thereby promoting its use in daily teaching and learning situations to meet the needs of students with a moderate level of academic achievement, the ability to handle a minimum computerized learning system, suitable for individual projects, and can be developed by individuals with moderate programming skills.

Aim of research

The purpose of this study is to identify the effect of matching between multimedia presentations and learning styles in the development of adaptive web sites to the level of satisfaction and the level of domination of electrical engineering students. The aim of this study is to find a mechanism for realizing the development of adaptive websites where their multimedia offerings are matched according to the user's learning style profile. This adaptive website serves as a prototype of online tutorial system for sample students who have attended the Digital System subject. Its development aims to strengthen existing knowledge through self-learning without the presence of the instructors.

Conceptual framework of study

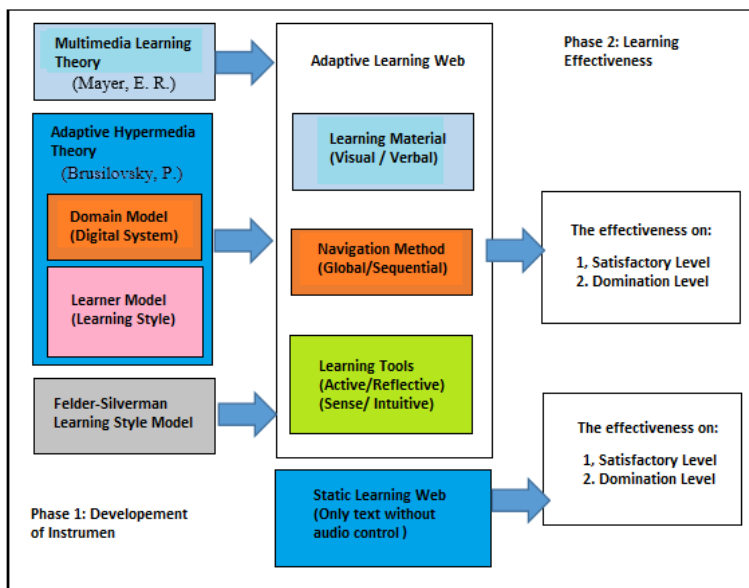


Figure 1: Conceptual Framework of Study

Figure 1 shows the conceptual framework of the study. This conceptual framework is based on the statement and work of Brusilovsky, P. which stated that the adaptive hypermedia system is constructed from two models which are domain model and student model. These two main topics in the subject of the Digital System and Felder-Silverman Learning Style Models were chosen as the domain model and student model for this study. The initial profile of a student for adaptive sites is derived from an index of learning styles founded by Richard M. Felder and Barbara A. Solomon.

Description of the Felder-Silverman Learning Style Model has also provided the material recommendations and learning strategies that should be used by students during the learning session. This enables multimedia presentations on developed web pages to match individual learning style profiles. Given the adaptive web site developed from learning materials, navigational methods, and multimedia learning tools, the Multimedia Learning Theory should also be incorporated into the web site development for this study.

This theory is based on the work of Richard E. Mayer and other research fellow on multimedia learning cognitive theory. Based on these theories, a recommendation on multimedia presentations (consisting of learning materials and strategies) has been designed. The three theories found in the conceptual framework of this study have facilitated the understanding of the concept on adaptive learning sites and thus enabled the project for this study to be suitable as an individual project and also suitable to be used by the target groups namely electrical or electronic engineering students at certificate or diploma level in the polytechnics of the Ministry of Education Malaysia.

Technology of adaptation

The concept of adaptation or personalization is a very important issue in the investigation of the education system. It can be divided into two main concepts of adaptive and adaptability.

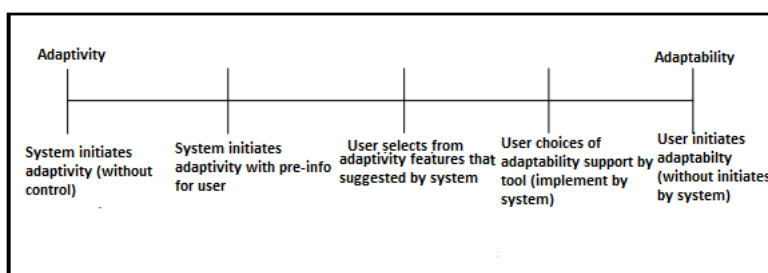


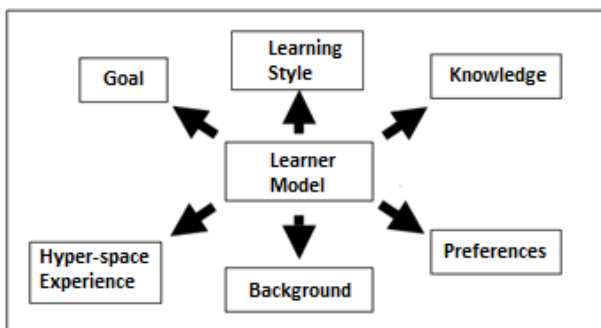
Figure 2: Adaptive and Adaptable Concept Spectrum

Both concepts can be represented by a spectrum by Patel and Kinshuk (in [8] Santally, MI & Senteni, A., 2004) as in Figure 2. The adaptable concept is to refer to a system that allows users to change certain system parameters and adapt it according to their behaviour.

The adaptive refers to the system that is adapted to the user based on the system assumption about the user's requirements automatically. From the spectrum in Figure 2, it can be concluded that this spectrum is a diagram showing the system's transition paradigm in stages from the full system-operated to full-user operation.

In the field of education in parallel with the transition of the educational system from a teacher-based learning system to a student-based learning system, a study on personalization technology has been studied by many researchers. The following description will explain more about the absorption of personalization technology in the field of education.

[9] Mulwa, C., et al. (2012) stated that personalized learning is a form of learning that takes place in a learning environment tailored specifically to individual student. In a brief policy issued by IITE (2014), personalized learning is a personal methodology, in which teaching and learning are focused on the needs and abilities of individual student in the classroom supervised by teachers. Based on a quote from the Internet, the US National Academy of Science (2012) has defined personalized learning as learning where instruction is tailored to individual student needs.



Personalized learning approaches are various modules that students can master on their own degree to computer programs designed to match how they present content that matches a student's personality. Figure 3 shows clearly the characteristics that make up the difference between one individual to another. These features are targets, backgrounds, learning styles, knowledge and recommendations.

Figure 3: Model on generated students that make up individual differences
(Magoulas, G., 2003)

[10]

Adaptive hypermedia

After the definition of the term hypermedia is discussed clearly in the previous description, the next description will discuss about the adaptive hypermedia that has been summarized by many of the leading and up-to-date researcher figures from the Internet.

The Web-based Adaptive Learning Environment (A-WBLEs) provides a mechanism for the identification of instructions (e.g., content, interfaces, strategies, and ratings) for students, based on their differences [11] (Inan, F. A., et al., 2010). Shi, L. et al. (2013) argued that Adaptive Education Hypermedia is a combination of AHS and Intelligent Tutoring System (ITS), with the aim of removing the "one size for all" mentality, involving student interaction and also enabling the e-learning system to adapt to the specific needs of students' differences in the context provided, and thus provide a personal learning experience for each student. Adaptive e-learning has also been defined by [12] Shi, L., et al. (2013) as a process whereby certain learning content is disseminated to students in a particular method at an appropriate time based on the needs, knowledge, recommendations, and other features of the student. [9] Mulwa, C., et al. (2012) have expressed that enhanced adaptive learning technology has attracted a significant interest in the hope of supporting individualized learning tailored to the unique scope, priorities, and existing knowledge of the students.

[10] Talhi, S. & Djoudi, M. (2011) further argued that due to differences in knowledge background, learning styles and recommendations, individual students can take very different approaches to learning. Therefore, the Adaptive Education Hypermedia System has been developed to offer personal learning content to students to improve the quality of their learning. [11] Conlan, O. (2011) further argued that the Adaptive Hypermedia System is useful in any situation where the

system can be used by people with different goals and knowledge and where hyper-space is relatively large. The Adaptive Hypermedia System will try to overcome this problem by using certain knowledge about the user to adapt to the information and links presented to the user in the form of a user model.

[12] Mulwa, C., et al. (2012) argued that the Adaptive Hypermedia System (SHA) should be able to meet three criteria: it should be a hypertext or hypermedia system; it needs to have a user model; and he should be able to adapt the hypermedia using this model. Many SHAs have exceeded the basic criteria stated by adding multiple models (e.g. model content, navigational models, presentation models, devices and so on models). SHA was found to be useful in engaging students further in the learning experience.

Research methodology

Before this study can be carried out at selected institutions, researchers need to have the authority of the institution's superior to conduct research at their institution. For this study, researchers have obtained a letter of authorization to carry out research from the Planning and Research Division of the Ministry of Higher Education (now the Ministry of Education). The letter of permission to conduct a study at the relevant polytechnic was sent first to the director of three polytechnics. Truths have covered two stages of study: pioneering studies and learning situations via the real web.

After obtaining permission from the top three polytechnics concerned, finally Kota Bharu Polytechnic, Sultanah Bahiyah Polytechnic and Sultan Mizan Zainal Abidin Polytechnic were selected as the locations of the study. The heads of the Department of Electrical Engineering from the selected polytechnics were responsible for determining the number of students to be involved in the study. The population of the study was the second semester students at the certificate / diploma level of the Department of Electrical Engineering at the three polytechnics involved. A total of 275 students from Kota Bharu Polytechnic, Sultanah Bahiyah Polytechnic, and Sultan Mizan Zainal Abidin Polytechnic have been sampled. Samples were randomly divided into two groups: static groups and adaptive groups through circumscribed user guides between static and adaptive. The number of student samples is entirely dependent on the number of students allowed by the heads of the Department of Electrical Engineering from the polytechnics involved. The location of the study is in a computer lab that has internet connection at the polytechnics involved.

The main instrument of this study is i-Digiweb's learning site consisting of adaptive sites and static learning sites designed to be used as experimental sites and control sites tested on student samples.

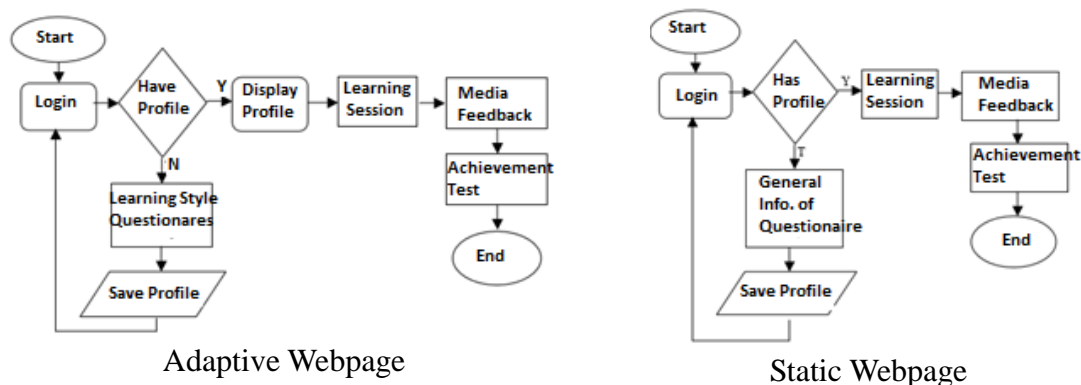


Figure 4: i-Digiweb Learning Site Learning Session Flow Chart

Generally, data collection methods were carried out by media exposure where students must learn the two main topics provided and then, they need to respond to multimedia presentations that have been used as learning media. They also need to answer two mastery tests on the topics they have learned. Figure 4 above shows a flowchart for learning situations for adaptive learning sites and static learning sites. The learning session for this study was conducted in two stages of learning by title i.e flip-flops and counters. Learning duration is two and a half hours. The data collection process for this study involved four methods:

- Analysis of learning styles: the learning style profile practiced by each sample was determined through an online questionnaire filled by students in the early stages of the study. Determination of material forms, navigation methods, and learning tools displayed on web-based adaptation learning environments.
- Top-Line Feedback on Learning Environment: The feedback on the media used during the learning session was used to measure the level of satisfaction of the samples. It was then analyzed by using a statistical description produced by U-Mann-Whitney, a free sample test that was given when a normalized test was carried out, and it was found that the data distribution was abnormal.
- Observation of students' behaviour during learning sessions: Data such as learning periods, and periods of post-test responses can be collected online with the tracking mechanisms of the study site. In addition, observation of the samples' behaviour and learning situation has also been taken into account in ensuring the validity of data and the real-world web-based learning environment.
- Learning Effects: Post test scores that have been answered by students were used to measure the level of academic mastery of the students. The level of satisfaction of the students was also measured from the students' feedback to the media that they also had throughout the learning session. Both have been stored in the database for quantitative analysis.

Adaptive Page Design Mechanism

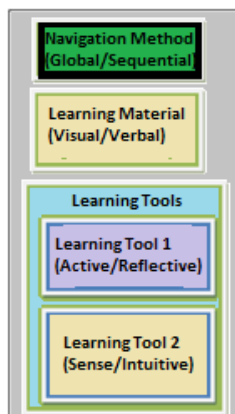


Figure 5 shows the basic structure of the mechanism for adaptive learning sites. The basic structure of the mechanism for adaptive learning sites consists of three basic elements, namely navigation, learning materials, and learning tools. It also shows the dimensions of the learning style represented by all three basic elements of this mechanism.

Examples of display for each learning element in Figure 5 are given in Figure 6 to Figure 9 as below:

← **Figure 5: Mechanism of Adaptive Webpage**

Example of learning element presentation

Navigation Methods	
Global	Sequential
<p>“Previous” and “Next” Buttons</p>	
Tree Menu	

Figure 6: Example of learning element presentation for navigation methods

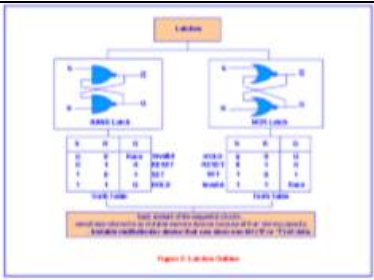
Learning Materials	
Visual	Verbal
 <p>Visual: Figure and Animation</p>	<p>Text and Audio Control</p>

Figure 7: Example of learning element presentation for learning materials


Learning Tool 1	
Active	Reflective
 <p>Comprehension Question</p>	<p>Note Taking Tool</p>

Figure 8: Example of learning element presentation for Learning Tool 1


Learning Tool 2	
Sense	Intuitive
 <p>Interactive Exercise</p>	<p>Key Terms</p>

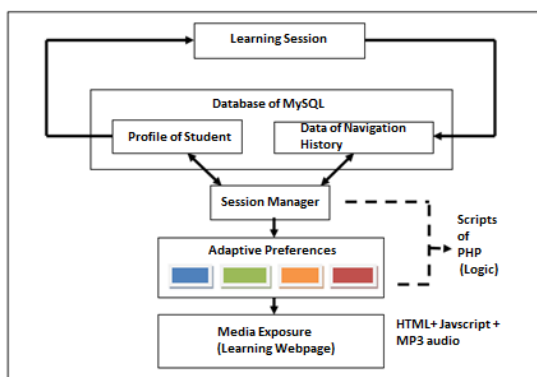
Figure 9: Example of learning element presentation for Learning Tool 2**Figure 10: System mechanism build diagram of adaptive learning web**

Figure 10 shows the system mechanism build diagram for i-Digiweb adaptive learning website. When a user logs in, the session will be initiated thus the specific data for the user will be saved.

This session will encapsulate the current state of the user consisting of the current learning styles profile, current content site, and current experience. Every user interaction with a learning environment, for example the latest media selections, feedback made, and tools used will be recorded in the MySQL database. The pkldata.php file is used to enable the learning site to be connected to the database.

Every time a lesson ends, session managers will analyze the web browsing data and compare it with the user profile and update it if needed. This means that user profiles are regularly defined and synchronized with user behavior/ behaviour. If the user profile update process takes effect, any changes will be reverted to the user session. Session manager for adaptive learning site consists of 9 different file procedures namely dftsesi.php file and eight other files which each of it representing each dimension of learning style ie sessionakt.php, sesiref.php, sesisen.php, sessionintv. php, sesivis.php, sesiver.php, sesisek.php, and sesiglo.php. This dftsesi.php file will be included with the learning site file ie lmpbsek.php and lmpbglo.php through the instructions placed at the top of the learning site file. It functions to list a student's learning style profile as a learning session variable for use throughout the learning session. It is also to enable the system to store users' information through the learning sessions using adaptive learning sites. The information is the username, the date of browsing the learning site, and the start of the learning session.

The user profile of the updated adaptive learning site will be used to determine the recommended media and tools for the user. Adaptive recommendations that represent user-created options will shape the media experience generated by logical-shaped PHP scripts. This media experience consists of HTML-formatted text and interactivity by using Javascript, Flash animations, stationary diagrams, and audio-shaped audio.

The session manager's concept is also used for static learning sites where this dftsesisttk.php file will be included with a learning sites file through a command that serves to list a student's learning style profile as a learning session variable for use throughout the learning session. It is also to enable the system to store users' information through learning sessions using adaptive learning sites. The information is the username, the date of browsing the learning site, and the start of the learning session into the logsttk table for a database called databases. The sesisttk.php file included in the lmpbsttk.php file also serves to store the lmpbsttk.php browsing information in the style table for the database. It is also used for storing student name information, browsing page dates, learning topics, and start-up pages lmpbsttk.php learning pages. This information was stored in a table of records for a database called a table.

From the description provided, it is generally concluded that to enable the tracking mechanism to be implemented in a learning site, the researchers must have a good session management program. To sum up, it is proven that it requires a relatively high level of programming knowledge in order to design an adaptive learning system. However, the related information is available mainly through the internet and all the reference books have been realized.

Findings

The next description will describe the results of the U Mann-Whitney free sample test that was conducted on two groups of student samples ie adaptive page students and static page students after the filtering process is performed. After the screening process, among the sample students, a total of 57 students had participated in the learning session through the adaptive site while a total of 59 others had followed the static page.

Table 1: Data Analysis for Part A Learning Site

Part A					
Satisfactory Level	No. of Sample	Min	z	p	Conclusion
Adaptive Web (AW)	57	65.98	-2.44	0.02	AW > SW z = - 2.44, p < 0.05.
Static Web (SW)	59	51.27			
Domination Level	No. of Sample	Min	z	p	Conclusion
Adaptive Web (AW)	57	66.07	-2.39	0.02	AW > SW z = - 2.39, p < 0.05.
Static Web	59	51.19			

(SLW)					
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Table 2: Data Analysis for Part B Learning Site

Part B					
Satisfactory Level	No. of Sample	Min	z	p	Conclusion
Adaptive Web (AW)	57	64.72	-2.03	0.04	AW > SW z = - 2.03, p < 0.05.
Static Web (SW)	59	52.49			
Domination Level	No. of Sample	Min	z	p	Conclusion
Adaptive Web (AW)	57	66.07	-2.09	0.04	AW > SW z = - 2.09, p < 0.05.
Static Web (SW)	59	51.19			

The results of the analysis in Table 1 and Table 2 above clearly showed that both the level of satisfaction and the level of domination of the adaptive sites are higher than the static site as it is a significant result since the value of z is negative and p is lower than 0.05.

Discussion and conclusion

The results of the analysis on the data generated by the study show that both levels of satisfaction and the level of domination of adaptive site students are consistently higher compared to the level of satisfaction and the level of domination of static students on both sections of the learning topics that they have followed. Both of these comparison results are also significant. The findings of this study have also been reinforced by the arguments that provide interactive learning situations where multimedia presentation formats are matched to individual learning styles require a flexible environment, easily managed and implemented by adaptive hypermedia techniques. Currently, the number of studies that test the role of media recommendations in the e-learning environment is still limited. However, issues, areas, proposals, and direction of research have been presented so that they can be used as a guide for future research. Therefore, the upcoming research results are hoped to provide a more attractive, ease of adaptive learning environment and a more effective learning experience.

Finally, as a conclusion, though without the knowledge of high programming, and the cheaper cost of adaptive learning sites, the materials, learning tools, and navigation methods matched by a student's learning style and presented in the form of interactive multimedia have been successfully developed and it is proven to be able to increase the level of satisfaction and level of domination for a better student compared to the conventional learning sites based on multimedia presentations in texts and diagrams.

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EZ Pop Notes The Breakthrough Of Education Style

Nurul Aseaking Binti Ismail^{1,a}, Aznida Wati Binti Abdul Ghani^{1,b}

¹Department of Commerce, Politeknik Hulu Terengganu, Terengganu, Malaysia.

^aaseaking@pht.edu.my, ^baznida@pht.edu.my

Abstract. The challenge in education world recently requires the teachers and educators to learn and expert in mainstream technologies of applications. It is a great advancement in education system especially in teaching and learning process where the new technologies able to fit the need of the education world nowadays. With the creation of Ez Pop Notes which using the Quick Response (QR) code can be a tool to harness the excitement of technology which in line with the Outcome Based Learning. EZ Pop Notes encourage the students to learn on their own or independent studies in order to reduce class room dependability to the teachers in class. QR codes for EZ Pop Notes are one of great arsenal for the educators teachings tools where teachers or educators only have to give the QR code to enable the students to download related notes and data for their courses.

Keywords: QR Code, EZ Pop Notes, Technology

Introduction

The study is aimed at implementing a new medium in the implementation of the learning process where the tool used to read QR Code is called QR Code Scanner. Generally, this tool is not a separate device, but is available in the form of apps such as smartphones like Android or iPhone. The main purpose of the QR Code is to make it easy for smartphone users to access information in two simple steps: simply enter the QR code and open the pre-encoded display notes.

Problem Statements

This study was conducted based on the presence of electrical problems in the classroom which led to learning disruption. This caused the lecturers to have to postpone their lectures. Therefore, to overcome this problem, new learning methods are introduced to facilitate the learning process. In addition, it is also to attract students to master the subject in the learning process

Objective of the study

This study was conducted with the aim of assessing the potential and usefulness of EZ Pop Notes as a new method of delivering teaching and learning that is simple and accessible to students and lecturers.

Literature Research

Barcodes are not so foreign to some of our society. Almost all products sold in supermarkets, stores, books, hardware and thousands more have barcodes. Barcodes are a collection of optical data that can only be read by scanners specially created for that purpose. The barcode has black and white lines. The white space between the straight black lines is the distance to which the data is stored.

Barcodes have now evolved and evolved into 2-dimensional shapes. Its data are now known by square geometry, points, hexagon, and other forms of geometry. This 2-dimensional barcode is better known as the QR (Quick Response) code. QR codes are far more sophisticated than previous barcodes. This is because it is able to store all types and forms of data such as numeric data, alphabet data, and Japanese written data such as Kanji, Kana, and Hiragana. In addition it is also capable of storing data in the form of binary symbols. Moreover, this QR code also holds data horizontally and vertically, up to a very small size and QR code image size compared to the previous barcode.

The QR code is also defective as it can fix up to 30% error even though some of the QR codes are corrupted or dirty and the data remains stored in and read-only. QR codes can be used using smartphones that have QR code reader apps, GPRS or Wi-Fi or 3G internet access to connect the smartphone to the destination portal / website. The use of QR code technology is now widespread. In Japan, QR codes are used for sandwich products to store food nutrition data and allergic information from the sandwich. The QR code is also placed on the bus's attention to know what buses are waiting for by making connections to the CCTV on each street with an internet connection on the mobile.



Figure 1 (a) : Form of Data Storage on QR Code



Figure 1 (b) : Form of Data Storage on Old Model Barcode

QR code is made up of functional patterns for easy reading and data areas where data is stored. The structure of the QR Code can be seen in Figure 2.

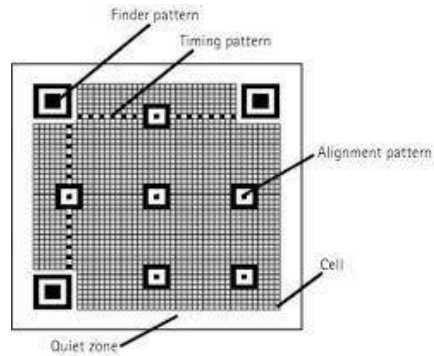


Figure 2 : QR code structure

Research methodology

The study was conducted on the observation of student achievement results in the final examination of the subject of DPB3013 Principles of Management. The study sample included Diploma Accounting students 01 December 2017 Session (before EZ Pop Notes application) and Diploma Students in Accounting Semester 01 Session June 2018 (after application of EZ Pop Notes).

Product development

The preparation of EZ Pop Notes is intended to enhance the structure of the existing teaching notes in a more accessible, simple and engaging form for students. The steps to set up EZ Pop Notes are really easy. Lecturers will only need to provide complete teaching notes and save them in Microsoft PowerPoint, Microsoft Excel, Microsoft Word, and PDF File and so on before uploading the files online using the Google Drive application. Files that have been uploaded to Google Drive will have a shareable link. These links will be copied to websites that can provide free QR codes for internet links. The QR code can be downloaded in JPEG format and comes as a QR code with uploaded notes. In order for this QR code to be scanned by the user, the user's smartphone needs to have an application that can read the QR code.

Findings

The research objective is to evaluate the effectiveness of EZ Pop Notes towards the students' achievements. The results of the findings are shown in Figure 3 below. The figure below shows the comparisons of final exam results for the DP3013 Principles of Management courses for the December 2017 and June 2018 Sessions. The students from December 2017 Session undergo a regular or normal teaching and learning process, meanwhile students from June 2018, the EZ Pop Notes were applied throughout the teaching and learning process. Findings show that there has been a significant improvement in student achievement through final grade grades with the number of students receiving grade A and grade A - increasing from 3 to 10 students while the number of students failing decreased from 4 students to 0.

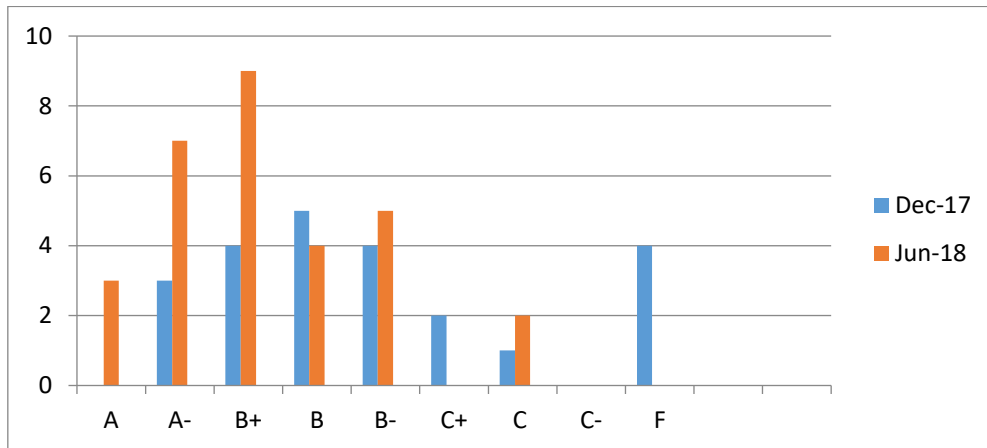


Figure 3 : Comparison of Student Achievements by Grade and Study Session

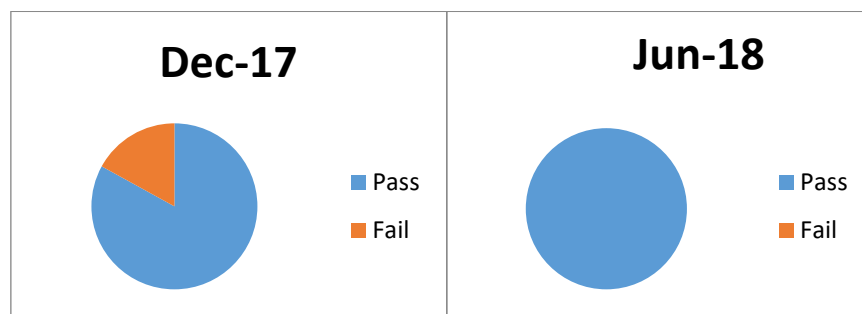


Figure 4: Comparison of Student Achievement and Failure

Figure 5 shows comparison between student achievement by grade for the two study sessions. It is clearly stated that the performance of students from June 2018 session is significantly better than students of December 2017 session. It can be highlight by looking at the increase in the percentage of students who received grade A which are below than 10 and more than 30 for session December 2017 and June 2018 respectively.

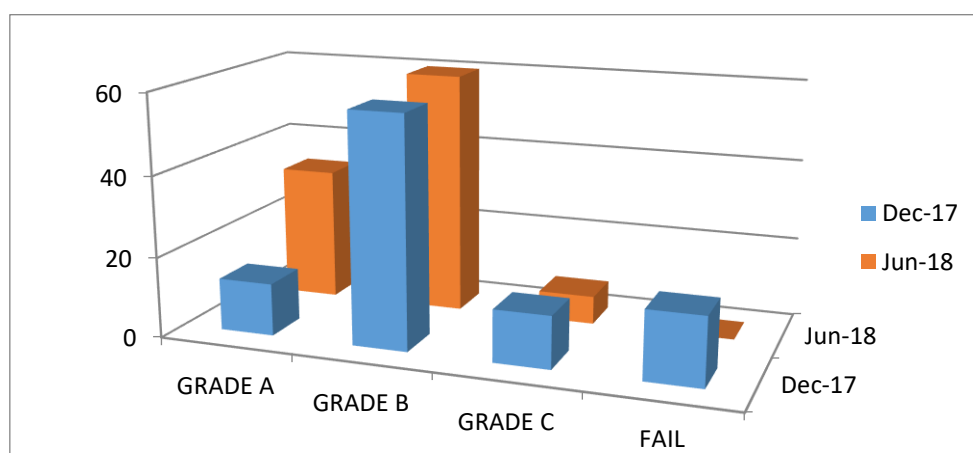


Figure 5 : Comparison of Student Achievements by Grade Group

In terms of potential uses, the findings of the study are shown in table 1. It is found that EZ Pop Notes has the potential to be practical, easy to reach, engaging students and consistent with current technology in education. In addition, it strives to reduce of paper usage and the potential for improving student understanding.

Table 1 : Respondents' Views from the Open Question

Insights	R 01	R 02	R 03	R 04	R 05	R 06	R 07	R 08	R 09	R 10	R 11	R 12	R 13	R 14	R 15	Total
Practical for use	√	√			√	√	√					√	√	√		8
Easy to reach	√		√			√	√		√						√	6
Supports paper saving	√									√					√	3
Attract students		√			√			√					√			4
Consistent with technology				√	√									√	√	4
Effective in use									√							1
Increased understanding									√		√			√		3
Saves time										√						1

Discussion and Summary

As for conclusion, this study clearly shows that students who are utilized the EZ Pop Notes achieved better examination results compared to students who did not use the application in their learning process. In addition, based on the observations and findings, students are ready to accept the new ways of teaching and learning. The benefits of EZ Pop Notes in an easy-to-use form which applicable to the young generations nowadays. EZ Pop Notes provided include PDP materials for Management (Management) courses which is not only focusing to DPB3013 - Principles of Management (DTA5053- Principles of Management) courses in Polytechnic Malaysia, but can also be is also used in the delivery of other courses related to management too. The EZ Pop Notes will be updated from time to time according to recent sylybus of the courses. The researchers hope that this brief study will help all stakeholders, students and faculty, in furthering their efforts to attract and apply new methods in the teaching and learning process.

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Lecturer's Perception On The Use Of Ez-Tax Plan In Income Tax Planning

Moriza Fikri^{1,a}, Wan Mustaffa Wan Yusoff^{1,b}, and Afandi Fikri^{1,c}

¹Department of Commerce and Department of Hospitality,
Politeknik Hulu Terengganu, Terengganu, Malaysia

^amoriza@pht.edu.my, ^bwan_mustaffa@pht.edu.my, ^cafandi@pht.edu.my

Abstract. Taxation is a major source of the Malaysian economy. These revenues are used in producing earning as well as financing administrative expenses of the country. Hence, individuals earning annual income from the country are obliged to pay taxes to the authorities. To ensure tax payments are made within the stipulated time, tax planning has to be made to ease the process. Therefore, eZ- Tax Plan computing system has been introduced to ease taxpayers in calculating and planning their taxes for the year. This study used to be carried out to study the perception of lecturers at Politeknik Tuanku Sultanah Bahiyah (PTSB) on eZ-Tax Plan system. The objectives of this study are to investigate the effectiveness, efficiency and use of the system by individual taxpayers. This study was conducted using questionnaires to obtain the data, involving 162 lectures from Department of Mechanical Engineering, Department of Electrical Engineering, Department of Civil Engineering, Department of Mathematical Science and Computer, Department of General Studies and Department of Commerce. Findings revealed that the respondents agreed with the effectiveness, efficiency, and availability of eZ-Tax Plan system to ease taxpayers in calculating and planning their taxes for the year.

Keywords: eZ-Tax Plan, Individual Taxpayers, Tax Calculation and Income Tax Planning.

Introduction

Taxation is economically beneficial as a country's source of income. Revenues collected are used in governing and financing administrative expenditure of the country. Efforts have been performed through by The Inland Revenue Board of Malaysia (IRBM) to increase government revenue through taxation. In 2006, IRBM introduced the e-Filing System that allows taxpayers to quickly and efficiently submitting their income tax forms (BNCP) to the IRB [13] [14]. Taxpayers are always positive about their responsibilities and reflect on consideration of tax evasion as a serious crime [15]. Meanwhile, they are additionally working on tax planning which is legal and aimed to minimize tax liability in the long run and reduce the maximum rate imposed on net income [19].

Problem Statement

A good tax planning is intently associated with tax knowledge. A taxpayer's level of knowledge is positively related with their attitude toward taxation [10]. Every year, as the national budget is announced, several changes to the tax system are also announced by the government. These changes will cause taxpayers to be much less aware of the latest tax system as the number of individuals who would like to examine extra about tax is very low. They also stated that taxation is a lifelong burden since the unpaid tax debt of the deceased will be claimed by the government through inheritance [2]. This is mainly caused by the improper tax planning. In addition, findings from previous studies also stated that the e-Filing system by IRBM does no longer show a significant relationship between the Unified Theory of Acceptance and Use of Technology and the need of using the e-Filing system [1]. Therefore, a new system called "eZ-Tax Plan" has been introduced as an alternative to the e-Filing System. It is a simple application that helps taxpayers to understand, calculate and plan their income taxes.

Conceptual Framework

There are two (2) models that can be used for this study. The first one is a model presented by [20], who's stated that it is a combination of several previous researchers, namely [9], [11], and [12]. The second model is the Unified Theory of Acceptance and Use of Technology (UTAUT) developed by [21]. Generally, both models possess the same function. Researchers [16] found out that there is no significant effect on all UTAUT factors with the need of using the e-Filing system. Therefore, the first model is selected because there are only 3 variables to be investigated in this study, as shown as in Figure 1. Independent variables for this study include system effectiveness, system efficiency, and system availability while eZ-Tax Plan System in tax planning is the dependent variable.

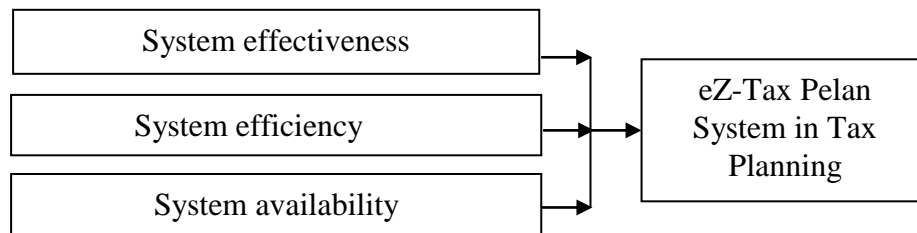


Figure 1: Conceptual Framework for "eZ-Tax Plan"

Purpose And Objectives Of The Study

Generally, the purpose of this study is to study the lecturer's perception of the application of "eZ-Tax Plan" as a method of tax planning. Specifically, the objectives of this study are:

- (a) to discover the effectiveness of the 'eZ-Tax Plan' system.
- (b) to identify the efficiency of the 'eZ-Tax Plan' system.
- (c) to ascertain the availability of the 'eZ-Tax Plan' system.

Methodology

The study was carried out via the usage of questionnaires because this method was greater appropriate for the study objectives. This study involved a number of lecturers at Polytechnic Tuanku Sultanah Bahiyah (PTSB) who have been briefed on the use of the eZ-Tax Plan. A total of 162 lecturers were selected as respondents by [17] and the questionnaires were distributed. Data collection was done the use of a survey performed by previous researchers [20] and subsequently modified according to the objectives of this study. The questionnaires were comprised of two sections, Part 1 (the information about respondents' personalities) and SECTION 2 (system characteristic). The data has been analyzed using SPSS software (Statistical Package for the Social Sciences). A pilot study of 20 respondents was conducted to determine the validity and reliability of the instrument. Cronbach's alpha for the questionnaire used to be $\alpha = 0.861$.

Result

The distribution of respondents in this study can be observed by departments of Civil Engineering, Electrical Engineering, Mechanical Engineering, Mathematical Science and Computer, Commerce, and General Studies. The total of respondents were 162 staffs while 60.5% were female and 30.5% were male. Most of PTSB academic staffs earned a monthly income over RM5,000 and the percentage was 63.6%.

The findings of this study showed that 94% of respondents agreed that eZ Tax Plan system is effective in providing tax planning to the users (Table 1). Majority of the respondents (98.1%) also agreed that the system provides the latest information to the consumers.

Table 1: Percentage of Agrees in eZ-Tax Plan effectiveness

Item	Frequency	Percentage
Assist in tax calculation	154	95.1
Easy to learn	145	89.5
Easy to understand	145	89.5
Provides latest information	159	98.1
Easy to use	154	95.1
Assisting in tax planning effectively	154	95.1
Average		94

After conducting the correlation analysis, it can be seen that there is a significant relationship between the effectiveness variable of the eZ-Tax Plan system for tax planning and assist in tax calculation, easy to understand, easy to learn and easy to use items except for the latest system item (Table 2).

Table 2: Correlation analysis for effectiveness

		Assisting in tax planning effectively
Assist in tax calculation	Pearson Correlation	1.000**
	Sig. (2-tailed)	.000
Easy to understand	Pearson Correlation	.666**
	Sig. (2-tailed)	.000
Easy to learn	Pearson Correlation	.666**
	Sig. (2-tailed)	.000
Latest system	Pearson Correlation	-.031
	Sig. (2-tailed)	.692
Easy to use	Pearson Correlation	.606**
	Sig. (2-tailed)	.000

**. Correlation is significant at the 0.01 level (2-tailed).

Besides, from the data analysis of this study, we can see that 94% of respondents agreed that the eZ Tax Plan System is efficient (Table 3). Apart from that, most the respondents also agreed that this system can assist in tax planning efficiently (98.1%).

Table 3: Percentage of Agrees in eZ-Tax Plan Efficiency

Item	Frequency	Percentage
Easy to obtain information	153	94.4
The resulting information has no error	151	93.2
Fast information processing	147	90.7
Assisting in tax planning efficiently	159	98.1
Average		94

Based on the correlation analysis, there is a significant relationship between the efficiency variable of eZ-Tax Plan in tax planning and easy to obtain information from the system. However, the other variables showed no significant relationship with the efficiency of the system in tax planning (Table 4)

Table 4: Correlation analysis for Efficiency

		Assisting in tax planning efficiently
Easy to obtain information	Pearson Correlation	.566**
	Sig. (2-tailed)	.000
The resulting information has no error	Pearson Correlation	-.037
	Sig. (2-tailed)	.640
Fast information processing	Pearson Correlation	-.044
	Sig. (2-tailed)	.579

**, Correlation is significant at the 0.01 level (2-tailed).

This study revealed that 83% of the respondents agreed that eZ-Tax Plan system is available to the users and able to provide its service (Table 5). Based on their perspectives, this system is not a troublesome.

Table 5: Percentage of Agrees for System Availability

Item	Frequency	Percentage
The system has no problem	157	96.9
The system is not easily disturbed	138	85.2
The system rarely shut down	108	66.7
Available all the time	153	94.4
User-friendly	139	85.8
Easy-to-understand manual	151	93.2
Average		87.0

In the availability aspect, correlation analysis showed that there is a significant relationship between the effectiveness of the system in tax planning and the system has no problem, not easily disturbed, user-friendly and easy-to-understand manual. However, there are no significant relationship observed between the system rarely shut down as well as available all the time with the effectiveness of the system in tax planning (Table 6).

Table 6: Correlation analysis for Availability

		Assisting in tax planning effectively
The system has no problem	Pearson Correlation	.783**
	Sig. (2-tailed)	.000
The system is not easily disturbed	Pearson Correlation	.306**
	Sig. (2-tailed)	.000
The system rarely shut down	Pearson Correlation	.141
	Sig. (2-tailed)	.073
Available all the time	Pearson Correlation	-.055
	Sig. (2-tailed)	.485
User-friendly	Pearson Correlation	.560**
	Sig. (2-tailed)	.000
Easy-to-understand manual	Pearson Correlation	.844**
	Sig. (2-tailed)	.000

**, Correlation is significant at the 0.01 level (2-tailed).

Overall, correlation analysis can provide an interpretation of the correlation values for the variables studied [8]. The highest variables associated with this system in tax planning were effectiveness ($r = 0.889$) followed by availability ($r = 0.652$) and efficiency ($r = 0.454$) (Table 7).

Table 7: Correlation analysis between variables

		Assisting in tax planning effectively
EFFECTIVENESS	Pearson Correlation	.889**
	Sig. (2-tailed)	.000
EFFICIENCY	Pearson Correlation	.454**
	Sig. (2-tailed)	.000
AVAILABILITY	Pearson Correlation	.652**
	Sig. (2-tailed)	.000

** . Correlation is significant at the 0.01 level (2-tailed).

Discussion And Implications

Results from this study proved that eZ-Tax Plan system is effective in serving consumers and enhancing productivity as well as performance expectancy of consumers by helping them to calculate and plan their taxes. In addition, the new system has a high degree of effort expectancy which makes this system is easy to be learned, understood and used. The results of this study are in line with the previous study by [20], [4], [3] and [14]. The use of this alternative system will enhance the use of existing systems such as the e-Filing system provided by the IRBM and subsequently will increase the country's revenue. eZ-Tax Plan system is a system that is truly efficient to use as the outputs are easy to be obtained and processed. Such criteria are proved to have successfully carried out tasks according to the user's needs [20] and the effort expectancy on initial use is very important [21]. Hence, this system tries to solve the complexity and problems complained by the users regarding the e-Filing system [16].

Apart from that, the results of this study also proved that system availability should be paid more attention than system efficiency. This is contrary to the results of a previous study by [20]. However, this is in line with studies conducted by [18], [5] and [6]. Users believe (no risk) that the system is not problematic, not easily interrupted, user friendly and easy to use. This element of trust is very important for agencies that provide online services so that it can receive a positive response in terms of its use [7]. Therefore, the IRBM needs to reduce risk acceptance to encourage more taxpayers to use this e-filing system [18]. Overall, this study shows that in the early stages of eZ-Tax Plan system, the three criteria of the system which are effectiveness, efficiency, and availability should be taken into consideration. The respondents not only find this system is very helpful in tax calculations but also they are very satisfied with its easy-to-use manual.

Conclusion And Recommendations

In conclusion, the findings from this study showed that the users of eZ-Tax Plan are very satisfied with the system's criteria and there is a significant relationship between the variables which are the effectiveness, efficiency and availability of the system with the use of this system in tax planning. This system allows taxpayers to obtain the latest information on tax payments so that strategies can be planned to fulfill their responsibilities to the country. In future, the same study can be implemented by using different variables.

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Development of “MyKingdom” Game as a Tool in Teaching Vocabulary to Polytechnic Students

Najmi Wahidi Ab. Wahab^{1,A}, Nor Rulmaisura Mohamad^B

¹Politeknik Besut, Lot 7222 Kampung Raja, 22200 Besut, Terengganu, Malaysia

^anajmi78@gmail.com, ^b mysura85@gmail.com

Abstract. Teaching English can be bored and dull, with limited students’ engagement and this led students to lost focus during the class sessions. To improve students’ engagement and create more interactive elements in teaching English, an interactive game called “MyKingdom” was created by using Role Playing Game (RPG) development tool called RPG Maker MV. By using “MyKingdom”, students must face several tasks that need to be solved and when they are solving the problems or also known as quest, students will learn about Vocabulary, which they need to master and it will be a key to explore another level or world. For this innovation project, a Need Analysis is done by using a qualitative method among 2 lecturers and 8 students. Quantitative method is also used in collecting data among 30 respondents. The findings from the questionnaires showed that this innovation project is able to improve students’ learning satisfaction, learning outcome and reduce students’ cognitive load in learning English and also it can be used either inside or outside the classroom. In conclusion, learning English will not be boring anymore because of the game interactivity, challenges and multimedia elements used in this game will be able to motivate the students to explore by themselves and at the same time, learn English in a fun way to accomplish the game.

Keywords: MyKingdom, interactive game, RPG Maker MV, Quest, vocabulary, cognitive load

Introduction

Vocabulary teaching and learning is a continuous challenge for English teachers as well as students because generally, there has been minimal focus on vocabulary teaching in the ESL classroom. However, some of the higher institutions nowadays have realize that one of the methods that can help students to learn new vocabulary is by using an interactive game. This is because, the best way to improve students’ vocabulary is by showing the students more pictures or actions. This will enable them to develop their vocabulary as well as enjoy to play the game.

Background of the study

For a large majority of learners, the ultimate goal of studying is to be able to communicate in a new language. As what David A. Wilkins [13] stated that you can say very little with grammar, but you can say almost anything with words’. Additionally, Deller and Hocking as cite in [1] also stated that if you spend most of your time studying grammar, your English would not improve very much. You will see more improvement if you learn more words and expressions. So, understanding English is much influenced by vocabulary.

The second issue is the students are not very interested to learn English because they do not understand and afraid to speak. They are afraid to speak because they lack of vocabulary and grammar. Therefore, to deal with this matter, the way of learning should be changed and lecturers can promote independent learning by engaging the students with the game. This is because, the nature of game is fun [1] and interactive, and when it is combined with some multimedia elements, it will be the best tool to be used in improving students’ vocabulary [1][2] and make learning process more interesting [3] [15] and motivating [2].

However creating a game is not simple, because there are a lot of game characteristics that need to be defined such as competition, challenge, exploration, fantasy, interaction, outcomes, people and rules [4]. So, the need of engine tool for creating games must be seriously identified and the complexity of using the tool also should be considered to ensure the development process will be run smoothly and achieve the target. A game design model based on Attention, Relevance, Confidence and Satisfaction (ARCS) was selected because it provides methodological guidance corresponding to the demand and motivation of learn [5] [7][8][9][10]. To improve satisfaction factor, some functions designed in the game system encourage and support learners' success and reinforce positive feelings, and the fair treatment makes playing the game an enjoyable experience [12].

Significance of the study

Through industrial input, alumni and job specification requirements, English is a must. Although employment rate for Polytechnic students is still high which is 97% in 2018, with current economic situation and total graduates from all higher educational providers, the market will be more competitive in years ahead. So, the need to strengthen students' mastery in English language is a must.

However, majority of our students are still lack of confident in speaking and lack of skills in writing. They didn't know how to write properly and used a proper vocabulary. So, the rationale for this innovation are to:

- 1) Produce interactive digital games tailored for vocabulary enrichment for the students
- 2) Expose the right way to use the exact word in sentences
- 3) Improve students' satisfaction in learning english
- 4) Improve students' learning outcome
- 5) Reduce students' cognitive load during memorizing english vocabulary by using multimedia elements.

Methodology

Research Instruments

Research instruments in this study focus on finding scales values to determine learning satisfaction, learning outcome and cognitive loads. Stokes' finding method [1] [6] was adapted for determine learning satisfaction by using 14 question and followed by five-point Likert scales. To identify learning outcomes, a set of question was carried out by using google classroom and student need to take pre test and post test. This set of questions consisted 40 question with total score 120 points.

To measure cognitive loads, NASA Task Load Index (NASA-TLX) methods have been choose which involve of six scales such as mental demand, physical demand, temporal demand, effort and frustration level. Each scales involved five questions. NASA-TLX was proved valid as identifying tool to measure cognitive load [14].

Method of Implementation

My Kingdom was developed by using RPG Maker MV. Minimum requirement for developing this game is 4Gb RAM, Graphic Card, Intel Core 2 Duo Processors, 1GB storage and Windows OS 7 (32 or 64 bit) and android studio to produce .apk file to ensure this game can be played on android mobile platform.

So, the students can have more options to play this game during in their classroom or anywhere they like. No internet connection is needed to play this game. For prototype, this game have three quests or levels which the students need to solve. Every level will have their own obstacles and the students will need to find a clue, person, signboard, weapon or none player character (NPC) to solve a problem and reach their destination.

So, when they need a clue, they will be given a word which will help them to solve or get help from NPC and also to get some money to buy a weapon to defense themselves. There are at least 20 specific words that the students need to earn for each stage. Therefore, the higher stage or level they develop, the more words can be used.

After they have finished playing the game, a set of question will be given to the students to find out how this game will help the students to improve them in memorizing the word. The questions will be uploaded by using google classroom platform to make it easier for the lecturers to see the results.

Impacts on the teaching and learning

Through the interview the reality is, both of the lecturer still use conventional method in teaching and learning session although a few activities in the class implement student centered learning but it still cannot make the student feel motivated and improve their focus in the class. From interview also, there are no multimedia elements been used in the class. There are no intractivity which student can review and repeat the part of they have been learn.

To make more interaction between student and the application, this game was included with interface for interactivity. NPC also have been used to add more real life situation and more conversation which can be use to improve student vocabulary. This application is totally a game like other RPG games in the market so, the interface and the objective can easily be understand by the student without lengthly manual or sophisticated instruction to use.

Effectiveness

This innovation have a good potential to be implemented as tool for lecturer to improve their students satisfaction, learning outcome and reduce students cognitive load. Based on questionnaire which distributed among 30 students in PBT, the result as shown below:

Table 1: Students' feedback on the satisfaction of digital games (MyKingdom)

	<i>Strongly Disagree</i>	<i>Disagree</i>	<i>Neutral</i>	<i>Agree</i>	<i>Strongly Agree</i>
Section 1 : Student Satisfaction					
1. I am able to access MyKingdom with my computer or mobile platform easily.	-	-	-	2 (7%)	28 (93%)
2. All resources I need are in the game without need to install any other software	-	-	-	9 (30%)	21 (70%)
3. I am pleased with the game for finishing all task need to be done by me..	-	-	-	10 (33%)	20 (67%)
4. My technology knowledge level is sufficient for learning using MyKingdom.	-	-	2 (7%)	10 (33%)	18 (60%)

5. <i>I am feeling somewhat connected to the Polytechnic setting by taking a class that places emphasis on learning through the digital game.</i>	2 (7%)	11 (36%)	17 (57%)
6. <i>I am satisfied with the degree of contact I have with my lecturer when working through the digital game platform.</i>	2 (7%)	11 (36%)	17 (57%)
7. <i>I would prefer to take more of my classes through the digital game platform.</i>	2 (7%)	11 (36%)	17 (57%)
8. <i>Participating in the digital game platform has allowed me more flexibility in my daily activities.</i>	2 (7%)	11 (36%)	17 (57%)
9. <i>I would prefer more of the course materials in my traditional face-to-face classes to be in the digital game platform.</i>		8 (27%)	22 (73%)
10. <i>I believe that working in the digital game platform enables me to play a more active role in the learning process.</i>		10 (33%)	20 (67%)
11. <i>I find the digital game learning platform to be useful in helping me in memorizing vocabulary.</i>	2 (7%)	11 (36%)	17 (57%)
12. <i>The digital game learning platform is providing me with vocabulary that I can use in other courses.</i>	2 (7%)	11 (36%)	17 (57%)
13. <i>I believe that the game learning platform is good for me to learn English.</i>	2 (7%)	11 (36%)	17 (57%)

Table 2: Students' feedback on the cognitive loads of digital games (MyKingdom)

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Section 2 : Cognitive Load					
1. <i>Mental Demand</i> Mental and perceptual activity was required (e.g. thinking, deciding, calculating, remembering, looking, searching, etc.)			-	2 (7%)	28 (93%)
2. <i>Physical Demand</i> Much physical activity was required (e.g. pushing, pulling, turning, controlling, activating, etc.). The task was demanding, slow, strenuous, and laborious.	9 (30%)	21 (70%)	-	-	-
3. <i>Temporal Demand</i> Much time pressure I felt due to the rate or pace at which the tasks or task	10 (33%)	20 (67%)	-	-	-

elements occurred. The pace was slow and frantic.						
4. <i>Effort</i>	I had to work mentally and physically hard to accomplish my level of performance.	10 (33%)	18 (60%)	2 (7%)	-	-
5. <i>Frustration Level</i>	I felt insecure, discouraged, irritated, stressed and annoyed during the task	18 (60%)	12 (40%)	-	-	-
6. <i>Performance</i>	I was unsuccessful in accomplishing the goals of the task set by the experimenter. I was not satisfied with my performance in accomplishing these goals	20 (67%)	10 (33%)	-	-	-

Student Satisfaction

In Section 1, from the table 1, it focus student feedback on satisfaction using MyKingdom. Item number 1,2,3,9 and 10 all student agree that MyKingdom can be used and access easily, can complete the task given, likely want all the course material converted into digital game and feel their role to complete the task. This finding show that MyKingdom as a digital game can make the students complete the task by themselves without direct guide from the lecturer. 93% of the students agreed that this game is very helpful for them to memorize vocabulary.

Cognitive Load

Heavy cognitive load will make learning session not successful and stressful. Base on Section Two, MyKingdom proved to be low cognitive load. Mental demand is still needed in solving the task, but student didn't feel to pressure, stress, annoyed, irritated during completing the task. Almost 100% student success to complete all the task give by using MyKingdom.

Recommendations

Although MyKingdom have many potential to be a tool for learning english vocabulary, it has a few work need to be review and done. The first thing is , MyKingdom need to add more level. Each level must have 10 to 15 unqiue words or new word to be memorize by students. MyKingdom currently did not support IOS platform but, with newer version of RPG Maker MV , using MyKingdom on IOS platform is possible.

It will be nice if MyKingdom also support network player. It not only Play Role Game or RPG but also can be collaborative games. Majority of actor in the games is template actor and some of them create from character generator provided by RPG Maker MV. It will be more real if the artwork and actor more locally look alike and the environment also indicate local culture and place.

We hope through MyKingdom innovation, it will be open a lot of new digital game development which specially design to help the student to learn english and reduce cognitive load to memorize word.

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Usability And User Satisfaction Of Mobile Apps Measurement Super Smart Notes

Normala Rahmat, PhD^{1, a}, Azwa Hasnan^{2, b} and Herdawati Ahmad^{3, c}

¹ Department of Electrical Engineering, Polytechnic Sultan Azlan Shah, 35950 Behrang, Malaysia

^anormala.rahmat@psas.edu.my, ^bazwa.hasnan@psas.edu.my, ^cherdawati.ahmad@psas.edu.my

Abstract. A mobile apps has been proven to be making learning more interactive and in-dependency for anyone who wants to learn in anytime and anywhere. Although there is a great deal of research done on mobile apps development, but there is no yet research done on mobile apps development use to help students understand the basic concepts of measurement. In this study, we developed a Measurement Super Smart Notes with the main objective is intended to help students remember important facts about fundamental measurement quickly and easily. Usability and user's satisfaction also have conducted to evaluate the success of Measurement Super Smart Notes in regard to the learning objectives. A total of 79 student's semester 1 of the Department of Electrical Engineering was asked to complete a questionnaire adapted from the Post-Study System Usability Questionnaire (PSSUQ). This study uses descriptive methods to evaluate the perceptions of users on the usability of the developed mobile apps. The results of this study found that apps users are satisfied with applications developed with a mean score higher than 3.33. In conclusion, the development of this mobile application has been successfully developed and potentially implemented in teaching and learning for Measurement Courses throughout Polytechnic Malaysia.

Keywords: Mobile Apps, Measurement, Teaching and Learning

Introduction

In line with the development of the industrial era 4.0, current Electrical Engineering syllabus in Polytechnic Malaysia required implementation Outcome-Based Learning (OBE) in the teaching and learning process where non-face-to-face hours increase. A traditional teaching and learning method alone is not relevant anymore and the current well-established methodology is mobile learning. Mobile learning now facilitated by the availability of smartphones enables the sharing and accessing of learning materials among students and its effectiveness has been proven in the western world [1].

Meanwhile, research by Barhoumi (2015) regarding integration between conventional learning method and discussion via WhatsApp (70/30) show students achievement is increased and had a more positive attitude toward exploring information and finding learning-related solutions rather than groups of students who only followed conventional learning method. The study by Atan & Shahbodin (2018) also found that student's level to be an independent learner and their focus on learning increase after they experienced mobile learning in a formal classroom setting. And also research by [4] shown that mobile learning and mobile applications (mobile apps) through smartphones are suitable in the engineering education field.

But engineering educator faces a problem where students hardly understand the electrical subject because the theories, concepts, and calculation in the subject content is abstract that involved complex cognitive activities, so delivery method including presenting contents subject material must be change [5][6]. Based on previous empirical study findings conducted by Yusof et al. (2016), example-based learning based on constructivist theory is the appropriate approaches to reduce cognitive load extraneous in learning electrical subjects. Meanwhile, a study conducted by Trifonova & Ronchetti (2003) found that mobile apps are suitable for constructivist learning. So to overcome the issues and to take the capability of mobile apps as proven by empirical study that make learning more interactive and independent of anyone who wants to learn anytime and anywhere, the design of mobile apps must be linked with appropriate learning theories and pedagogical method and refer to the Models of Human Memory that also focuses on students' need to improved learner outcomes [8][9][10].

This is because, there is a discrepancy in the findings regarding the impact of using mobile technology on student learning achievement; some have shown positive effects as studies by [11] [4] and [12] and there are studies that have shown negative effects as studies [13]. Therefore, the implementation of mobile learning requires careful planning and must take into account the needs of the students and the manner in which they are implemented.

Although there is a great deal of research done on mobile application development in polytechnic such as Islamic Education Mobile Apps in .JAR format by Aliff Nawati, Mohd Isa Hamzah, & Surina Akmal Abd Sattai, (2014), Mobile Apps of Science, Technology and Engineering in Islam in .APK format (M-ISTech) by [15], but there is no yet research done on mobile apps development use to help students understand the basic concepts of measurement. In this study, we developed a Measurement Super Smart Notes with the main objective is intended to help students remember important facts about fundamental measurement quickly and easily. Usability and user's satisfaction also have conducted to evaluate the success of Measurement Super Smart Notes in regard to the learning objectives.

Objective

The objective of this study was to design and develop a mobile apps for Measurement courses used by polytechnic students across Malaysia. This study is important to assess the suitability and usability of the Measurement teaching and learning process. After the mobile apps was completely designed and develop, the researcher conduct a usability study where respondent are students from Electrical Engineering Semester 1.

Methodology

The development of Mobile Apps Measurement Super Smart Notes process was mainly grounded on ADDIE Instructional Design Framework consisting of five phases namely analysis, design, development, implementation and evaluation. The selection of the ADDIE instructional design model is because it is the superior model underlying the other instructional system design models .

Analysis Phase

Analysis phase is the first stage in the process of development mobile apps Measurement Super Smart Notes. According to the Continuous Quality Improvement (CQI) Report, June 2017 - Dec 2018 Session for Measurement (DEE1013) courses, Course Learning Outcome (CLO) involving the theory and calculation aspects of the cognitive level is at a level that still requires improvement in terms of teaching and learning preparation techniques more interesting and effective. This is because based on achievement on Quiz 1, Quiz 2 and Theory Test have shown students had difficulty remembering facts that led them to fail to answer questions that measure based on the CLO.

For June 2017 Session, as shown in Table 1.0, a total of 112 students out of a total of 195 students were unable to answer the Quiz 1 that measuring CLO 1 that is remembering and understanding the basic concepts of measurement. A further 88 students were unable to answer the questions that measuring CLO 2 that is applying the concept and formulas to the topics studied. Meanwhile, for Quiz 2, 74 students were unable to mastering CLO1 and 70 students were not able to achieve CLO2. For the Theory Test, 87 students were unable to mastering CLO1 and 94 students were not able to achieve CLO2.

Table 1.0: Measurement Course Continuous Assessment Result Session June 2017

CONTINUOUS ASSESSMENT RESULTS								
PROGRAM	TOTAL STUDENT	QUIZ 1		QUIZ 2		THEORY TEST		SESSION
		CLO1 < 5m	CLO2 <10m	CLO1 <5m	CLO2 <10m	CLO1 <14m	CLO2 < 36m	JUNE 2017
DTK 1A	21	17	8	6	3	2	9	
DTK 1B	31	3	5	4	5	9	7	
DEP 1A	23	12	6	1	2	9	6	
DEP 1B	20	12	18	6	12	6	12	
DET 1A	35	29	16	29	8	21	17	
DET 1B	31	18	20	18	22	18	26	
DET 1C	34	21	15	10	18	22	17	

Meanwhile, for December 2017 Session as shown in Table 1.1, a total of 33 students out of a total of 41 students were unable to answer the Quiz 1 that measuring CLO 1 that is remembering and understanding the basic concepts of measurement. A further 21 students were unable to answer the questions that measuring CLO 2 that is applying the concept and formulas to the topics studied. Meanwhile, for Quiz 2, 14 students were unable to mastering CLO1 and 8 students were not able to achieve CLO2. For the Theory Test, 17 students were unable to mastering CLO1 and 27 students were not able to achieve CLO2.

Table 1.1: Measurement Continuous Assessment Result Session December 2017

CONTINUOUS ASSESSMENT RESULTS								
PROGRAM	TOTAL STUDENT	QUIZ 1		QUIZ 2		THEORY TEST		SESSION
		CLO1	CLO2	CLO1	CLO2	CLO1	CLO2	
		< 5m	<10m	<5m	<10m	<14m	< 36m	
DET 1A	19	17	2	13	4	6	13	DEC 2017
DET 1B	22	16	19	1	4	11	14	

For June 2018 Session, as shown in Table 1.2, a total of 104 students out of a total of 137 students were unable to answer the Quiz 1 that measuring CLO 1 that is remembering and understanding the basic concepts of measurement. A further 64 students were unable to answer the questions that measuring CLO 2 that is applying the concept and formulas to the topics studied. Meanwhile, for Quiz 2, 32 students were unable to mastering CLO1 and 12 students were not able to achieve CLO2. For the Theory Test, 57 students were unable to mastering CLO1 and 37 students were not able to achieve CLO2.

Table 1.2: Measurement Continuous Assessment Result Session June 2018

CONTINUOUS ASSESSMENT RESULTS							
PROGRAM	TOTAL STUDENT	QUIZ 1		QUIZ 2		THEORY TEST	
		CLO1 < 5m	CLO2 <10m	CLO1 <5m	CLO2 <10m	CLO1 <14m	CLO2 < 36m
DTK 1A	21	19	7	7	0	3	5
DTK 1B	21	16	11	1	5	12	9
DEP 1A	18	9	10	7	6	9	2
DEP 1B	21	11	9	4	1	9	3
DET 1A	28	27	5	3	0	6	6
DET 1B	27	21	21	9	0	17	11
DET 1C	1	1	1	1	0	1	1

JUNE 2018

Meanwhile, for December 2018 Session as shown in Table 1.3, a total of 6 students out of a total of 48 students were unable to answer the Quiz 1 that measuring CLO 1 that is remembering and understanding the basic concepts of measurement. A further 19 students were unable to answer the questions that measuring CLO 2 that is applying the concept and formulas to the topics studied. Meanwhile, for Quiz 2, 10 students were unable to mastering CLO1 and 29 students were not able to achieve CLO2. For the Theory Test, 11 students were unable to mastering CLO1 and 25 students were not able to achieve CLO2.

Table 1.3: Measurement Continuous Assessment Result Session December 2018

CONTINUOUS ASSESSMENT RESULTS							
PROGRAM	TOTAL STUDENT	QUIZ 1		QUIZ 2		THEORY TEST	
		CLO1 < 5m	CLO2 <10m	CLO1 <5m	CLO2 <10m	CLO1 <14m	CLO2 < 36m
DET 1A	22	2	10	5	12	6	15
DET 1B	26	4	9	5	17	5	10

DIS
2018

Design Phase

Design phase is the second phase that transferring the information gathering from the analysis phase that required improvement in terms of teaching and learning techniques more interactive and effective that support non-face to face learning activities. Mobile apps Measurement Super Smart Notes design process taking into account the engineering design involves complex cognitive activities by applying the approach of Cognitive Load Theory and Models of Human Memory (Sweller, 1988; Atkinson & Shiffrin, 1971). Cognitive Load Theory and Models of Human Memory are closely linked to raising the level of cognitive involving working memory and long term memory where the visual information presented should be integrated with the scheme in the preexisting long-term memory to complete the development of mental models in working memory and reduce the cognitive load.

By taking into account the limitation of working memory which is 15 seconds to 30 seconds [19] and integration with minimalism learning theory, the notes are organized in a simple, concise and interesting way with the application of multimedia elements followed by a working example for each formulae contained in each topic without changing the original contents so that students can better understand the concepts and apply the formulae during problem solving activities. The use of appropriate text, colors and images and interesting buttons, a variety of presentation techniques, opportunities to repeat all the information learned and memory test questions are also provided to enhance students' memory of a given topic.

This mobile apps design also integrate the exercise activities in quiz form to sustain the information we receive into long-term memory. By integrating the behaviorism learning theory, each student's response to a given exercise question will be given feedback in the form of a symbol and the amount of marks obtained. To make this exercise activity more interesting, the arrangement of the exercise questions will shuffle each time the activity is repeated. By taking the online capability of the mobile features, this apps mobile design also have a link to google forms as a social interaction element so students can interact with lecturer in terms of feedback, suggestion or questions. This interactions process also can contribute in constructing information during the development of mental models (Yusoff & Romli, 2018) and to make sure objective learning using mobile apps achieved (Klimova, 2019)

Development Phase

The development phase is the third phase which involves the process of translating activities were justified in the analysis and design phase. The development of mobile apps Measurement Super Smart Notes involved offline and online capability of the mobile features using Adobe Cloud Animate CC 2017 Platform Android, Socrative and Google Form. A selection of Platform Android because the most popular smartphones operational system nowadays seems to be Android (Klimova & Poulava, 2015).

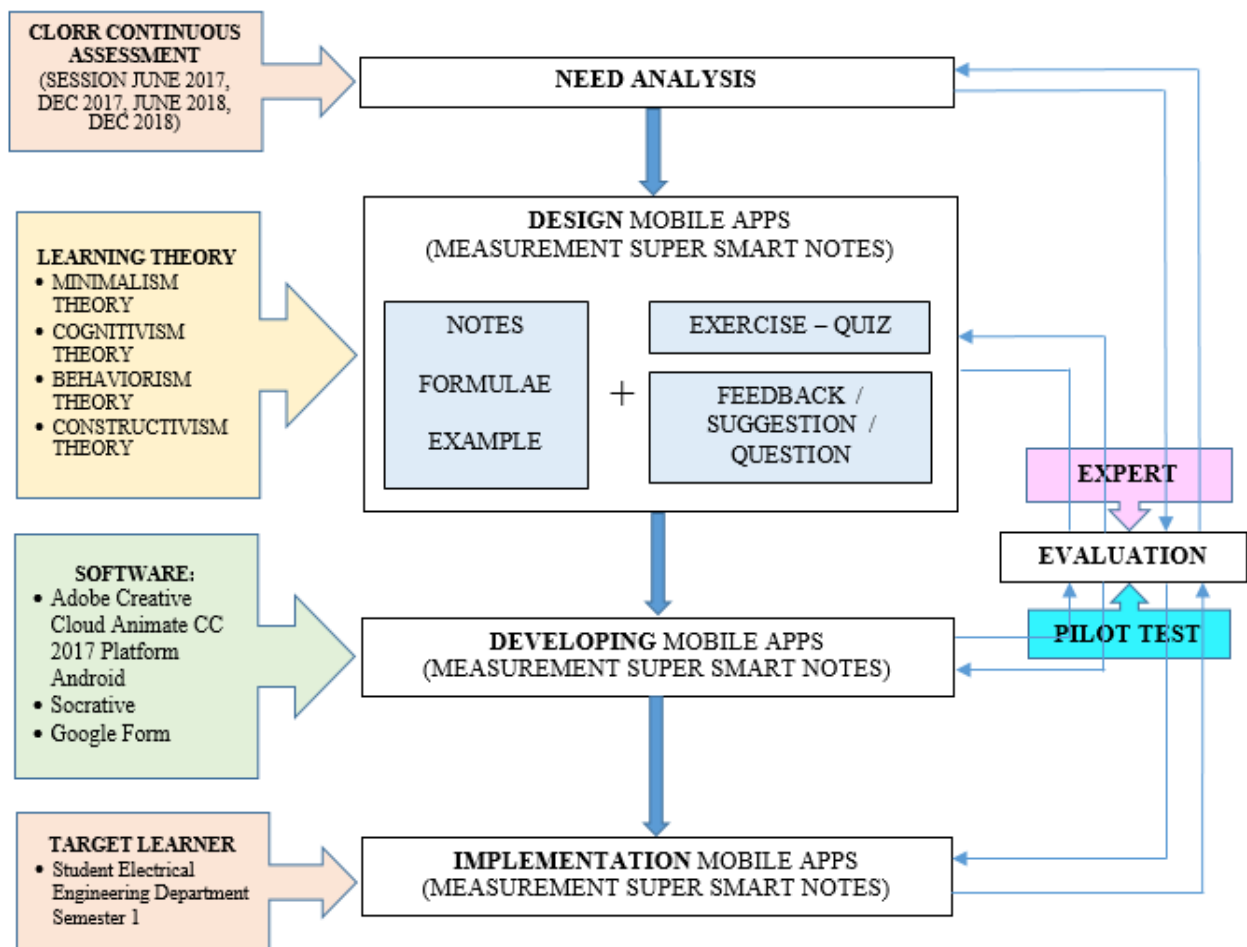


Figure 1.0: Development Process of Mobile Apps Measurement Super Smart Notes Based on ADDIE MODEL (Gagne, Wager, Golas & Keller, 2005)

Implementation and Evaluation

Usability and user satisfaction study was conducted once the design and development process completed. The usability and user satisfaction questionnaire, which was adapted from Post-Study System Usability Questionnaire (PSSUQ) was used to obtain feedback from the students. Originally, PSSUQ is a research instrument that was developed for use in scenario based usability evaluation at IBM. The modified version of this questionnaire for this study consists of 24 items, which were divided into six construct namely design/layout, functionality, ease to use, learnability, satisfaction and outcome/future use.

Result and Discussion

Cronbach alpha for usability and user satisfaction was .921, indicating that overall the scales had acceptable reliability as shown on Table 2.0.

Table 2.0: Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.939	.941	24

Table 2.1: Mean Score Interpretation Scale (Pallant, 2007)

Mean Value	Mean Score Interpretation
0.00-1.66	Low Level
1.67 – 3.33	Middle Level
3.33 – 5.00	High Level

Table 2.2: Usability and User Satisfaction Mean Score

No. Item	Item	Mean	Standard Deviation
DESIGN/LAYOUT			
1	This application is user-friendly	4.34	0.597
2	The interface of this application is simple	4.28	0.733
3	Information is presented in simple and attractive styles.	4.38	0.647
4	The content of the application software meets the needs of the students	4.46	0.616
FUNCTIONALITY			
5	This application displays information immediately	4.43	0.570
6	The application provides the knowledge user need quickly	4.30	0.585
7	Users are free to explore information	4.25	0.669
8	Users can change any sub topic at any time	4.37	0.664

EASY TO USE			
9	Application through mobile is easy to use	4.44	0.675
10	This application can be used without the help of others	4.38	0.666
11	This application takes a short time to master	4.14	0.711
12	This application can be used at any time	4.62	0.488
13	The information presented is easy to understand	4.28	0.715
LEARNABILITY			
14	This app reinforces the user's existing knowledge	4.28	0.659
15	This application is related to polytechnic learning	4.46	0.573
16	This application is perfect for learning	4.52	0.596
17	This application enhances the effectiveness of the teaching and learning process	4.38	0.562
SATISFACTION			
18	Learning to use this application is fun	4.19	0.681
19	The information provided is clear and concise	4.27	0.655
20	An email address is provided to enable users to provide feedback and suggestions	4.19	0.769
OUTCOME/FUTURE USE			
21	This application improves the user's skills on the basics of measurement	4.32	0.589
22	This application is perfect for future study references	4.37	0.603
23	This application is also suitable for reference in the work environment	4.03	0.800
24	Based on my current experience in using this application, I will use it more often	4.23	0.639

Overall outcome of the questionnaire show that users are satisfied with the Measurement Super Smart Notes mobile app for the six criteria assessed, layout or design, functionality, usability, learnability, satisfaction and future results or usage with mean score values being above and beyond 3.33 the mean value of the layout or design mean score is 4.37, the functionality is 4.34, ease to use is 4.37, learnability is 4.41, the satisfaction is 4.22 and outcome or future use is 4.24. This shows that the Measurement Super Smart Notes mobile app meets the needs of the learning and teaching process and meets the target group of mobile phone users. This is in line with the results of a study by Aliff Nawi et al. (2014) and Yusoff & Romli (2018) stated that users will be more motivated when the application used meets their needs in terms of content, attractive and easy-to-use display.

Conclusion

An undeniable electrical subject is one of the tough subject faced by students in the engineering field because it involves complex cognitive activities. A combination of effective learning strategies and pedagogical methods through the application of mobile apps will able to make learning more interactive and independent of anyone who wants to learn anytime and anywhere as required in Outcome-Based Learning (OBE). Therefore, this study intended to design and develop a mobile apps Measurement Super Smart Notes that consider reducing issues cognitive load to help students understand the basic concepts of measurement. The results of this study found that apps users are satisfied with applications developed with a mean score higher than 3.33 that shown this mobile app successful becomes mobile and interactive learning tools.

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Development of An Interactive Teaching Tool in Teaching Interview Skills

Nor Rulmaisura Mohamad^{1, a}, Wan Atikah Wan Hassan^{2, b}
Mohd Faeiz Ekram Mohd Jasmani^{2, c}

¹Politeknik Besut, Lot 7222 Kampung Raja, 22200 Besut, Terengganu, Malaysia

²Politeknik Sultan Haji Ahmad Shah, 25350 Semambu, Kuantan, Pahang, Malaysia

^amysura85@gmail.com, ^bwnatikah@polisas.edu.my, ^cfaeiz@polisas.edu.my

Abstract. *'Interview Ready'* is an interactive teaching tool which is developed specifically for teaching Communicative English 3 (DUE5012). This course is offered to the students in semester 4 or Semester 5 at Politeknik Sultan Haji Ahmad Shah. The students are taught about how to search for a job advertisement, write cover letter, resume, and the skills on how to attend the interview session. This teaching tool is developed by using iSpring that can change the PowerPoint file into Flash. *'Interview Ready'* that is produced has been uploaded by the lecturers teaching DUE5012 into CIDOS LMS 2.5 platform to be accessed by the students. The Need Analysis for this innovation project is done by using a qualitative method among 10 lecturers and 15 students. Apart from that, quantitative method is also used in collecting data among 60 respondents. As a result, the findings from the questionnaires showed that this innovation project is able to help the students in their learning process because it can also be used inside and outside of the classroom at anywhere and anytime. As the conclusion, students can revise the topic for Job Hunting chapter easily while they can also take part in simple and interactive quizzes provided in the tool to enhance their understanding about the topic.

Keywords: Interview Ready, interactive teaching tool, CIDOS, iSpring, Flash, innovation

Introduction

English language is widely used as it is the second language in Malaysia. As the second language, English has been taught in schools from primary to tertiary level. Not only younger learners are taught the English Language, but they have been taught the language extensively all the way to tertiary levels or in higher institutions [1]. However, speaking the language has always been a problem especially when the students need to attend and answer the interview questions in English.

The employment interview seems to be a prevalent device used by organizations and a popular topic of study among the researchers. It continues to be a popular selection technique to assess candidates for employment [2]. The mastery of the writing cover letter, resume, dressing code, and the skills on how to tackle the questions asked by the interviewers should be exposed to the students effectively since they need to be well-prepared for the real interview after they have graduated from the institution. Thus, the exposure on the interview skills to semester 4 or 5 students is very crucial due to the fact that it will help them a lot to improve their skills in dealing with the real job interview after they have graduated. This exposure will then guarantee the job offer for the Polytechnic students and will be able to put polytechnic graduates as the same level as the other higher institutions in Malaysia.

In Malaysian Polytechnic Education System, students need to take English for Communicative Purposes for three semesters to get a Diploma. Since the courses focus on Communicative English, most of the assessments test on the students' speaking ability. As for Communicative English 3 (DUE5012), the students need to do one academic presentation about graphs and charts (30%) and attend a mock-job interview (20%) which carries a total of 50 percent of the continuous assessment marks.

Most of the students can score to get high mark for their graph and chart presentation since it is done by group. In contrast, when it comes to the mock-job interview, students seem to have many problems in handling it regardless in terms of the cover letter writing, resume writing, the dressing code, or even they do not know how they should answer the questions asked by the panels. Therefore, in brief, skills in mastering the interview skills are highly required among Polytechnic students since they are graded individually and it will also help the students to be well-prepared for the real job interview. Therefore, this study focuses on understanding the experiences of students and lecturers in dealing with job interviews and suggests the best way to solve the problem faced by the students. This study is conducted at Politeknik Sultan Haji Ahmad Shah (POLISAS), Kuantan, Pahang.

Significance of the study

In Malaysia, English is considered as a second language and it is used at any levels starting from the kindergarden. Due to the reason, the emphasis to learn English language has been the most priority at all Polytechnics in Malaysia. However, the ability to communicate in English has become a major problem to the Polytechnic students especially when they need to attend any job interview.

The basic skills in writing resume, cover letter, and how to answer the interviews questions need to be taught effectively since the students have to be ready and well-prepared in order to attend the job interview. Therefore, the skills and knowledge on it should be exposed to the students in semester four or five because it can help the students to fix and improve their interview skills. This step will ensure the graduates from Polytechnics to be able to compete with the other high level institutions in Malaysia in order to seek for a job and at the same time, to produce the Polytechnic graduates which are very competitive and entitle to be at the same level with the other higher institutions.

However, most of the students claimed that they do not know how to write the resume, cover letter or even do not know about the dressing code or how to answer the interview questions if they were called to attend an interview session. Therefore, the rationale of this innovation project is as the following:

- 1) To produce an interactive teaching tool to be used by the lecturers and the students in the teaching and learning process.
- 2) To expose the students with the skills on how to write resume and cover letter correctly.
- 3) To show examples of good and bad answers during the job interview and the do's and the don't's while attending an interview session.

Methodology

Background Information of the Respondents

In this study, the respondents were the students from various diploma programmes studying in Politeknik Sultan Haji Ahmad Shah (POLISAS), Kuantan, Pahang. The participants involved in this study consist of 60 students from semester four and semester five, who were enrolled in DUE5012 course in POLISAS. There were 30 students from semester 4 and 30 students from semester 5 Communicative English 3 classes. The number of male students involved in this study is 16 and female students are 44. Most of the students involved in this study were from the age range of 19 to 23 years old.

Students who study DUE5012 have been exposed to oral presentation skills twice i.e. when they were in semester one (DUE1012) and again, in semester three (DUE3012) since both of the subjects are also a pre-requisite course for DUE5012 course. DUE5012 course is the final course in the English Syllabus at all Polytechnics in Malaysia. In general, majority of POLISAS students were from low English proficiency (LEP) background since the entry requirements for polytechnic do not require students to pass SPM English nor do they have to sit for the MUET test.

Research Instrument

This study is carried out by using qualitative method for the need analysis and quantitative method for data analysis. The research instrument for this study is using 2 types of data collection which are:

Interview

In regards with a previous study done on the logic of small samples in interview-based qualitative research [3], the interview is carried out with 15 students and 10 lecturers involved in teaching and learning of the course. The type of interview chosen is face to face interview and the questions are such follow:

For the lecturers:

1. *What do you think of the conventional teaching that is talk and chalk?*
2. *What do you think will make teaching and learning interesting for the students?*
3. *Do you think you will be able to teach better with the use of technology such as interactive lesson?*
4. *Do you think your students are independent learners?*
5. *What do you think is the best medium/method for you to teach about Job Interview Skills?*

For the students:

1. *What do you think of the conventional teaching that is talk and chalk?*
2. *What do you think will make teaching and learning interesting for the students?*
3. *Do you think you will be able to learn better with the use of technology such as interactive lesson?*
4. *Do you think you are an independent learner?*
5. *What do you think is the best medium/ method for you to learn about Job Interview Skills?*

Questionnaires

A set of questionnaire on the effectiveness of this interactive teaching tool is developed and distributed to 60 students enrolled in DUE5012 course at POLISAS. There were 10 items constructed in order to find out the effectiveness of the tool in facilitating the students to understand in details about the skills on how to attend a job interview. There were 5 items constructed on the content in the tool and another 5 items on the students' perceptions towards the use of the tool.

Method of Implementation for The Innovation

'Interview Ready' is an interactive teaching tool which is developed specifically for teaching Communicative English 3 (DUE5012). This course is offered to the students in semester 4 or Semester 5 at Politeknik Sultan Haji Ahmad Shah and other polytechnics in Malaysia. In this course, students will be taught on how to search for a job advertisement, write cover letter, resume, and the skills on how to attend the interview session. Apart from that, students will be exposed with the preparations on how to attend an interview session such as from the aspect of attire and the good as well as bad answers to answer the interview questions.

This interactive teaching tool is produced to help the lecturers and students in the teaching and learning process on the skills on how to attend an interview session effectively. This is because, with the help of this tool, the students will be able to understand and be more interested to learn the interview skills since this tool is developed using iSpring which is very interactive, user-friendly and visualised.

Besides, this interactive teaching tool can also be used independently by the students to learn about interview skills without being facilitated or monitored by the lecturers. This tool also comes with PREV and NEXT buttons to help students in learning or revising their lesson at anytime or anywhere. They can also use this tool by depending on their own situation such as they can repeat any part in the tool that they have not mastered.

This web tool 'Interview Ready' is created by using iSpring software, that can change the PowerPoint slides into Flash file. This software can be used with any version of PowerPoint 2000 / XP / 2003/2007. The animation effects, videos, audios and many more elements that can be used to enhance the teaching and learning process. The iSpring software also can provide sections for QuizMaker that can enable the lecturers to develop Quizzes, questions and interactive exercises. 'Interview Ready' that is developed has been uploaded by the lecturers into CIDOS LMS 2.5 platform to be accessed by the students. CIDOS stands for Curriculum Information Document Online System (CIDOS) that has been developed by the Ministry of Education Malaysia as the digital platform for the students and lecturers at Polytechnics [4].

Impacts on the teaching and learning

Based on the interview sessions conducted among 10 English lecturers from General Studies Department, POLISAS, who were involved in teaching interview skills, they depend solely to the lectures inside the classroom without demanding the students to download extra notes or using the online tools. Most of the lecturers only use the modules as their main source to teach. This is the reason why there are less exposure in terms of the visualised version of the interview skills taught to the students.

Apart from that, there were also few lecturers who used the videos downloaded from the *Youtube* to teach about the interview skills. The use of videos in teaching is more interesting compared to the traditional way of teaching which is teacher-centered and module-based. However, the use of *Youtube* videos seem to be inappropriate because majority of the videos available are out of the Malaysia context, where it can make the students to be more confuse and cannot foresee or imagine the real interview that they will experience later. Therefore, to solve the problem, this interactive teaching tool is developed to make sure the teaching and learning processes will be more attractive and effective. With the help of this tool, there are many benefits that the lecturers and the students can gain. For example, the students can repeat the part that they do not understand many times until they can really understand about that and they can also do the exercises provided in the tool to enhance better understanding on the topic.

As the main purpose of the development of this tool is make it interactive, so there are many navigation buttons provided to help the lecturers and the students to choose the input or the exercises that they want. With the help of these navigation buttons, the students can re-play or repeat any of the content that they still do not understand in this tool. For example, it is easier for the students to revise about the topic and they can also do the Quizzes to better understand about the job interview topic. They can use this tool in their class or they can also use it outside of the class, at anywhere and anytime.

In conclusion, with the development of this tool, the teaching and learning processes will not be boring anymore and instead, it can be done attractively and effectively. The teaching and learning processes also will be more student-centered and at the same time, it can reduce the lecturers' teaching load and promote independent learning among Polytechnic students. The following data is collected based on the Need Analysis interview among 10 lecturers and 15 students who are involved in 'Communicative English 3' course about the use of this interactive teaching tool.

Need Analysis

An interview session was carried out to analyse both perceptions from the lecturers and the students towards the teaching and learning of DUE5012 subject from the topic of job interview. 10 lecturers and 15 students were randomly chosen as the respondents. There are 5 open-ended questions and their responses were transcribed immediately during the interview.

The following interview questions were constructed to get students' feedback on the teaching and learning of job interview. 15 students from DEP5A class were randomly selected for the interview. To sum up, based on the respondents' feedback, majority of students felt that:

1. The conventional way of teaching and learning is boring and uninteresting.

2. Students prefer to have more interesting classroom activities and also more use videos in class.
3. Students felt that they can learn better with the use of interactive lecture.
4. They are independent learners.

Data Analysis and Discussion

The development of this tool has given a huge impact to the lecturers teaching DUE5012 Communicative English 3, General Studies Department, Politeknik Sultan Haji Ahmad Shah, Kuantan, Pahang especially to the students. The results of the questionnaires on the effectiveness of this 'Interview Ready' towards 60 students as the respondents are as below:

Table 1: Students' feedback on the effectiveness of Interview Ready

	<i>Strongly Disagree</i>	<i>Disagree</i>	<i>Neutral</i>	<i>Agree</i>	<i>Strongly Agree</i>
Section 1 : On Learning Job Interview Skills					
1. I believe that learning job interview skills are important for me to get a job.	-	-	-	10 (17%)	50 (83%)
2. I am able to prepare proper resume after using this web tool.	-	-	-	24 (40%)	36 (60%)
3. I am able to prepare proper cover letter after using this web tool.	-	-	-	24 (40%)	36 (60%)
4. I know the suitable dressing code for a job interview after using this web tool.	-	-	2 (3%)	22 (37%)	36 (60%)
5. I know the best way to answer interview questions after using this web tool.	-	-	-	26 (43%)	34 (57%)
Section 2 : On Interactive Teaching Tool					
6. I can easily understand the content of the tool.	-	-	-	24 (40%)	36 (60%)
7. I think that the navigation buttons provided are user friendly.	-	-	-	26 (43%)	34 (57%)
8. I believe that learning from the visuals make it easy for me to understand the lesson better.	-	-	-	24 (40%)	36 (60%)
9. I can use the web tool without the help of my English teacher.	-	-	6 (10%)	24 (40%)	30 (50%)
10. I find that the interactive teaching tool is practical and convenient for students to use.	-	-	-	18 (30%)	42 (70%)

Table 1 shows the students' feedback on the effectiveness of the innovation project which is 'Interview Ready'. 5 Questions in Section 1 are related with the aspects on learning Job Interview Skills and followed by the Section 2 which is on the students' perceptions towards the interactive teaching tool. According to the data analysis, there were 50 (83%) students strongly agreed and 10 (17%) students agreed with the statement that it is very vital for them to learn about job interview skills in order for them to get a job. There are 36 (60%) students strongly agreed and 24 (40%) students agreed that they are able to write resume and cover letter after they have used this tool. After the students have been exposed with this tool, there were 36 (60%) students strongly agreed, 22 (37%) students agreed that they know about the suitable dressing code to attend a job interview after using this web tool. There were also 34 (57%) students strongly agreed and 26 (43%) students agreed that they know the best way to answer interview questions after using this web tool. Overall conclusion based on the students' feedback in Section 1 shows that the students believed that learning job interview skills such as preparing a proper resume, writing cover letter and knowing the suitable

dress code and the best way to answer the interview questions can be learned effectively by using the Interactive Teaching Tool – Interview Ready. Besides, students also felt that they can learn better with the use of interactive lecture.

As for the second section which is on the students' perceptions towards the web tool as the interactive teaching tool, 36 (60%) students strongly agreed and 24 (40%) students agreed that it is easier for them to understand the content of the tool and the visuals used help them to have a better understand towards the topic. There were 34 (57%) students strongly agreed and 26 (43%) students agreed that the navigation buttons provided in the tool are user friendly. There were 30 (50%) students strongly agreed and 24 (40%) students agreed that they can use the web tool without the help of their English lecturers. Only 6 (10%) students chose neutral. There were 42 (70%) students strongly agreed and 18 (30%) students agreed that this interactive teaching tool is practical and convenient for them to use. Overall conclusion based on the students' feedback in Section 2 shows that most of the students agreed that the Interactive Teaching Tool – Interview Ready is very practical and convenient for them to use so that they can use it independently. It shows that students studying at polytechnic is already matured and can manage their own learning time.

Conclusion and Recommendations

In order to further enhance the use of this interactive teaching tool, 'Interview Ready' can also be developed as the Android/ Android Tool, whereby the students can download it through Google Play and can be used by using their smartphones. Therefore, the students will be more interested to study and learn about interview skills independently, even without the help of the English lecturers, and it can be accessed at anytime and anywhere.

Hence, the students will be more advanced with the use of information technology and it is aligned with the demands of Ministry of Education to equip the Polytechnic graduates with future-proof skill sets by harnessing their humanistic, technological and data analytics competencies in embracing the 4IR. Therefore, it is hoped that the development of this interactive teaching tool can benefit most of the English lecturers teaching DUE5012 and also, Polytechnic students who enrolled in DUE5012 'Communicative English 3' course.

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Problems In Learning Mathematics? Fret Not! EZMATH@IPGKS3.0 To The Rescue: An Innovation To Help Year 2 Pupils In Malaysia

Norsarihan bin Ahmad, PhD^{1, a}, and Hu Laey Nee, PhD^{2, b}

^{1&2} Institute of Teacher Education Sarawak Campus,

98009 Miri Sarawak, Malaysia

^anorsarihan.a@ipgm.edu.my.com, ^bhulaeynee@ipgm.edu.com.my

Abstract. The implementation of 21st Century Learning in all school subjects has indirectly helped students in the aspects of communication, collaboration, critical thinking, creativity, skills and values in their learning. However, the understanding of Mathematical concept and skills are questionable due to the fact that the use of text book limits students understanding. Thus, to ensure effective and better understanding of teaching and learning using Mathematics text book, multimedia application approach is used. EzMath@IPGKS3.0 has integrated several multimedia software and applications to help teachers, students and parents in the teaching and learning of Mathematics Year 2. This intervention case study explores the innovation in the form of EzMath@IPGKS3.0 developed by Institute of Teacher Education Sarawak campus team. The instruments used in this study are interviews, observations, questionnaires, and EzMath@IPGKS3.0 in the classroom. The objective of this study is to explore the ability of EzMath@IPGKS3.0 in supporting teaching and learning of Mathematics in Year 2 Primary schools. Results of this study found that teachers using EzMath@IPGKS3.0 were able to help their pupils in Mathematics skills such as calculation, understanding and mastering Mathematical concepts. In addition, teachers were able to use EzMath@IPGKS3.0 as a platform of teaching Mathematics in the classroom. Thus, the usage of EzMath@IPGKS3.0 has changed the traditional classroom style to a more realistic learning style. EzMath@IPGKS3.0 supports the changes of learning because it could be used anytime and anywhere. This innovation transforms teaching and learning concept and further supports parents in helping their children. Now, WE can be Superhero.

Keywords: Problems, Mathematics, [EzMath@IPGKS3.0](#), Innovation, Year 2

Introduction

The implementation of 21st century learning in the teaching and learning in all schools under the Ministry of Education, Malaysia has indirectly promotes major impacts and exploration in teaching and learning. Schools have move towards quality teaching and learning by implementing 21st century approaches namely communication, collaboration, critical tinkling, creativity, moral values and ethics. However, in reality, there are many complaints and dissatisfaction towards the teaching and learning especially in Mathematics. These complaints and dissatisfaction claiming that Mathematics is too difficult and boring due to difficult and abstract because it involves too many calculation procedures. Thus, to make teaching and learning more effective and interesting, the aspect of pupils' skills and interest in Mathematics should be improved. Within this context, the multimedia approach is used to assist in the teaching and learning of Mathematics.

The transformation of teaching and learning from conventional to the current approach by combining skills, multimedia and technology helps in transforming teaching and learning towards 21st century learning (Ahmad Malie, 2018). The current development of Information Technology (IT) in all sectors especially in Education has brought a *Tsunami* of changes in the current education system. Thus, the creation of innovation which integrates IT, digital multimedia and Augmented Reality (AR) in teaching and learning Mathematics especially in Primary schools could bring benefits in culturalizing digital innovation through Education initiatives.

Statement of Problem

The Text Book Division, Ministry of Education has effectively prepared quality and informative texts books for all subjects in Primary and Secondary schools. The content of the text books are updated occasionally to meet the demand and improve quality in education. In addition, Mathematics text book has been improved in terms of quality so that pupils are able to master Mathematical concepts and skills. However, level 1 pupils' learning standard and mastery are different because there are pupils who have difficulties in understanding the content due to abstract and static learning content (Mohamad Nurizwan Jumiran, 2014)

The use of uninteractive text book reduces learning interest and ability in understanding Mathematical skills. Primary school pupils are only able to understand the concept but unable to comprehend abstract texts in the text book (Fatimah Salleh, 2009; Nurr Azreen Abdul Karim dan Mohamad Zailani Haji Jaya, 2013; Hartini Ismail dan Siti Mistima Maat, 2016). Even though there are many existing approaches and strategies used in teaching Mathematics in the classroom, the lack of learning support materials still occurs. Furthermore, some teaching materials need high cost, difficult to produce and takes a lot of time to be completed (Kamarul Azmi Jasmi, Mohd Faez Ilias, Ab. Halim Tamuri dan Mohd Izham Mohd Hamzah, 2011)

Therefore, EzMath@IPGKS team has successfully developed an innovation in teaching Mathematics for Year 1 pupils. This innovation helps improve pupils' mastery of Mathematical skills and concept by making the content of the text book 'alive'. This innovation applies an *Multisensory* and *Augmented Reality* technique which allows pupils to use their sensory. At the same time, making learning as fun and meaningful. Teachers, pupils and parents can fully utilise this innovation to teach or learn anywhere and anytime because this innovation was created to make teaching and learning of Mathematics easy, interesting and meaningful.

This innovation is in tandem with the Government's policy in 21st century learning and thinking through mastery of IT and digital information. This innovation supports many stakeholders in helping level 1 pupils who have difficulties in learning Mathematics. EzMath@IPGKS3.0 focuses on Year 2 Mathematics content because at this moment the market for Year 2 references are limited to static media and lack virtual support. The main catch of this innovation is that it is developed free for all users.

Objectives

Research objectives for this study is to explore the:

- a. diversity of teaching strategy used by teachers in using EzMath@IPGKS3.0
- b. mastery of Mathematics skills among pupils in using EzMath@IPGKS3.0

Research questions are as the following:

- a. How does the use of EzMath@IPGKS3.0 diversify the teaching strategies?
- b. Does EzMath@IPGKS3.0 helps pupils in the mastery of Mathematics?

Literature Review

Every pupil has their own differences in potential and self-development. Individual self-development is based on the maturity level and the experiences that they have encountered (Zainudin Abu Bakar, 2014). Thus, pupils learning should be seen as dynamic and student-centred. Even though there is “*No Child Left Behind*” and “*Education for all*” concept has been highlighted, yet not all teaching and learning of Mathematics could fulfill all the mentioned concept. Several teachers faced challenging tasks in identifying different level of pupils learning in the classroom. In addition, pupils also have difficulties in understanding some dynamic learning content through the use of static media (Mohamad Nurizwan Jumiran, 2014)

Pupils’ difficulties in learning Mathematics can be attributed to their difficulties in understanding ideas and concepts of Mathematics in the abstract forms (Harizon Suffian, 2014). Pupils who learn independently also face the same challenging situations of understanding and mastering the concept. Therefore, teachers need to be productive and dynamic in preparing realistic teaching process and at the same time promote user-friendly learning content. However, certain Mathematical concepts is difficult to be taught due to its’ limitations of finding suitable audio visual aids (AVA). Pupils could be equipped with suitable platform in assisting them in preparing interesting and effective teaching materials.

Traditional teaching strategy which is based on text books as source of learning and references is still being the norm among teachers (Norsyaidah Seliaman, 2017). Thus, the use of text book among pupils in the classroom has made learning to be passive and eventually pupils lost interest in Mathematics. It is undeniable that text book is a great source of information for pupils but the effectiveness of text book also depend on teacher’s creativity in exploring and utilizing it. In addition, Year 2 Mathematics syllabus also highlight the use of 21st century approach in teaching and learning. Therefore, latest technology usage in teaching and learning should be applied to the teaching and learning of Mathematics. Quizzes such as Kahoot and Quizizz could be integrated in the teaching and learning of Year 2 Mathematics as one of the ways to evaluate pupils’ performance in Classroom Based Evaluation or known as *Pentaksiran Bilik Darjah (PBD)*. Other technology such as *Augmented Reality* is popular in the Western country but in Malaysia, it is still left behind.

The use of *Augmented Reality (AR)* via *Arzoom* and *Quiver* application encouraged teachers to be more IT savvy where teachers can use variety of resources and information in the classroom. The use of technology in teaching and learning process could create a ‘lively’ teaching and learning session to attract pupils’ interest. This is in tandem with the objective of School Transformation 2025 or popularly known as *Transformasi Sekolah 2025 (TS25)*. In addition, the use of technology in teaching and learning could promote fun and conducive atmosphere of learning because pupils are able to explore learning content based on their learning capacity (Zamri Mohamad & Nur Aisyah Mohamad Noor, 2011).

EzMath@IPGKS3.0 is an innovation which consists of interesting multimedia application to help develop understanding on the concept and skills in the subject of Mathematics Year 2. Pupils could explore, understand and master the concept in Mathematics using multimedia. The use of videos, pictures and smartphones could help learners learn effectively (Ngu Hang Ling, 2017; Sivakumar, 2014; dan Ferreira, Moreira, Pereira & Durão, 2015). EzMath@IPGKS3.0 can be used in the classroom as a tool in the teaching and learning process to make learning content ‘alive’. The current text book consists of volumes 1 and volumes 2. All pages of the text book in volumes 1 and 2 can be scanned. The use of EzMath@IPGKS3.0 could help pupils’ understanding and also help parents in finding interesting way of helping their children in learning Mathematics.

EzMath@IPGKS3.0 consists of introduction, content and exercises in Mathematics text book volumes 1 and 2. Volumes 1 consists of 127 pages and volumes 2 consists of 100 pages. This innovation can help in the implementation of teaching and learning. EzMath@IPGKS3.0 could make all the content in the text book alive and it make it easier of users to use text book and technology effectively. Thus, meaningful learning could occur when all information or new materials have significant relation in individual cognitive structure (Noriati A. Rashid, Boon Pong Ying, & Sharifah Fakhriah Syed Ahmad, 2017).

EzMath@IPGKS3.0 could give clear descriptions to pupils through audio visual stimulus. Noriati A. Rashid *et al.* (2017) stated that variety of stimulus could help enhance and help the masteru of learning content. The content could be repeated and it could help learners to repeat the process of learning. EzMath@IPGKS3.0 also involve teaching and learning through fun learning approach. Fun learning approach gives positive impact towards teaching and learning (Jelia Kanang & Mohamad Zailani Jaya, 2016; Nurrulazizi Ahmad dan Mohamed Madani Bakar, 2015). The content of Year 2 Mathematics text book can be made 'alive' through videos, audios and pictures to increase interest and skills of pupils. Pupils could further explore the content independently and learn at their own pace anywhere and anytime.

EzMath@IPGKS3.0 also provides worksheets as additional exercises for pupils. They can use the application in EzMath@IPGKS3.0 to check their answers and also steps on how to answer the exercises given. Pupils could also interact with their group members and cooperate to solve problems in the activities. Teachers could also use EzMath@IPGKS3.0 as a source of 21st century teaching and learning process. Pupils could use this innovation to help them understand and master the concept and skills in Mathematics Year 2 independently while parents could facilitate their childre's learning at home.

Methodology

This study investigates and explores the diversity of teaching strategies and mastery skills of teachers and pupils in using EzMath@IPGKS3.0 in Year 2 Malaysia Primary School. A qualitative approach was employed to gain in-depth and holistic understanding of learners' experiences and perspectives through information gathered from interviews and observations of the participants. An intervention case study is utilized to explore the use of EzMath@IPGKS3.0 in the school. In total of 4 interventions was carried out in this study.

Respondents

Respondents are selected based on purposive sampling. Respondents of this study consists of Year 2 Mathematics teacher and Year 2 pupils in Primary school (*Sekolah Kebangsaan*).

Instruments

In a case study, researcher is an important tool and responsible in making decision throughout the research journey (Noor Aini, 2014). Thus, researcher prepared 4 intervention teaching lesson plans for the research. The intervention scripts are used as a guide for smooth process to gain good internal validity. Each script has 5 components which include set induction; explanation and model; exercise guide book; and free exercises.

Apart from that, the researcher also developed content in the forms of videos, Powerpoint and pictures which are integrated in *Arzoom* application called EzMath@IPGKS3.0. All the exercises in the text book are based on the original content without being changed by the researcher. The application for the use of content in the text book has been made to Text Book Division, Ministry of Education.

Findings

Findings from observations and interviews that were carried out showed that teachers had made improvement in teaching using EzMath@IPGKS3.0. Before the intervention was carried out in the classroom, teacher uses text book and extra worksheets from work book. However, after the intervention of EzMath@IPGKS3.0, improvements have been made to teaching and learning by adding student-centred approach to achieve teaching objective. From the observation, the use of EzMath@IPGKS3.0 in the classroom had improved the fun element in learning among the pupils while teacher facilitate pupils' learning.

Sebelum ini, saya cuba gunakan unsur-unsur seperti realia, latih tubi dan sebagainya. Tetapi, mereka hanya minat sekejap sahaja. Selepas tu, mereka akan mula ganggu rakan mereka.(GM.T1.B2-3).

Saya pernah juga gunakan video dan lagu. Tapi, bila video dengan lagu dah habis, mula la budak-budak tak nak belajar (senyum).(GM.T1.B22).

Teacher was observed using the intervention EzMath@IPGKS3.0 when pupils have problems in understanding and remembering what they have learnt. Pupils constantly asked questions regarding the content they have read in the text book. Therefore, teacher used smartphone and scan the content in the text book. The content of the text book can be viewed by pupils and they can re-learn what they have learnt.

Sebelum ni, saya terpaksa ulang balik apa yang saya dah ajar. Tapi...sekarang...senang je...Scan je, dah boleh dapat penerangan. (GM.T1.B5).

Apart from teaching, teacher also agreed that pupils attitude and interest gradually improving towards learning of Mathematics. Weak pupils in Mathematics showed positive positive interest in learning Mathematics where the pupils were excited in completing the activities given to them. In addition, classroom control becomes easy because the pupils were excited and focussed in learning Mathematics using EzMath@IPGKS3.0.

Saya selalu marah tiap kali dalam kelas sebab bila mereka dah mula boring, mereka akan mula buat hal. Kacau kawan la. Ambik pensil kawan la. Macam-macam la...Bila saya beri saja aktiviti dalam phone tu (EzMath@IPGKS), mereka cepat-cepat duduk. Semua dah sedia nak belajar. (GM.T1. B45-47).

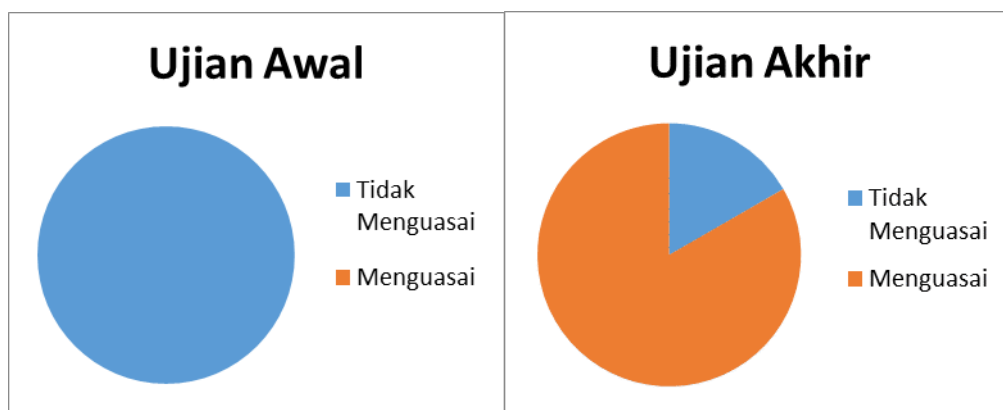
Pupils' mastery is tested using the intervention EzMath@IPGKS3.0 to look at positive impact on pupils mastery learning. Worksheets were distributed to pupils to see the impact of their Mathematics mastery learning. Total of 4 worksheets were distributed to the pupils to identify their Mathematics mastery learning. Worksheets were distributed to 28 pupils during EzMath@IPGKS3.0 intervention in the classroom. In worksheet 1, there are 3 questions on fractions and decimals, worksheet 2 consists of 4 questions about fractions, worksheets 3 consists of 5 questions about addition and subtraction and worksheet 4 consists of 4 questions about multiplication of money. Pupils were also distributed

Pre-Test which consists of 5 questions and Post-Test which also consists of 5 questions during the intervention.

Early findings found that the use of EzMath@IPGKS3.0 as teacher intervention had helped pupils in the mastery of Mathematics. The analysis of pupils mastery are stated in table 1.

Table : 1
Percentage Analysis for pupils who master the skills

Mastery Level	Correct answers	Early Test (%)	End Test (%)	Differences (%) (Early Test and End Test)
Not Mastered	0	32.00	0.00	- 32.00
	1	4.00	0.00	- 4.00
	2	44.00	0.00	- 44.00
	3	20.00	16.67	- 3.33
Mastery	4	0.00	37.50	+ 37.50
	5	0.00	45.83	+45.83



In the Early test, 100% of pupils did not master the content taught. However, after several session of EzMath@IPGKS3.0, End Test showed positive findings of 83.33% pupils who had mastered the content taught to them.

Discussion

Teaching and learning should be a fun and meaningful session. It is undeniable that the use of text book in teaching provides knowledge due to quality content supervision. However, the use of static text book posed challenges to teachers and pupils to explore realistic teaching and learning. Findings in this study found that the use of *Augmented Reality* in EzMath@IPGKS3.0 intervention had a positive impact for both teachers and pupils due to changes in teacher teaching strategy. This changes gives advantages to pupils as it allows them to be more interactive and at the same time train them to be more interpersonal. This finding supports the finding by Hazri (1998) that the presence of positive relationship in pupils' interest in certain subject has helped in their student-centred activities. The current situation in the learning of Mathematics showed that teaching of Mathematics is still practiced in the same conventional method using text book. The teacher-centred method and one way teaching reduces interaction between teacher and learner (Fauzi, 2012). However, the finding of this study showed differently because the teaching and learning becomes more interesting and more teacher-learner friendly.

The finding of this study also found that the use of multimedia which consists of videos and pictures had helped teachers in the teaching and learning process. Teacher found new teaching ideas and it helped teacher to plan interesting and informative lesson. The finding also showed that multimedia integration which consists of videos and smartphones help pupils learn effectively and help teacher in improving classroom control. This finding supports finding from Ngu Hang Ling (2017); Sivakumar (2014) dan Ferreira, Moreira, Pereira & Durão (2015) who supported that the use of multimedia in teaching gives positive impact towards learning. Eventhough the use of multimedia in teaching is viewed as passive but the use of multimedia promotes high cognitive for active learning (Mayer, 2001). Therefore, good multimedia design delivers positive message and promotes active cognitive process to students (Cruse, 2011). The use of videos in the innovation of EzMath@IPGKS3.0 supports the content and context of the text book in learning. Thus these two elements are important to ensure active learner participation (Stanovitch & Cunningham, 2004).

Based on the findings, teachers' attitude and motivation had influenced teaching. This, directly affected pupils in the classroom where they also actively participated in the lesson. There was an existence of 'harmony' in the classroom where teacher and pupils worked together to achieve learning objectives through the use of EzMath@IPGKS3.0. Teacher showed great interest in teaching while pupils were observed to be engaged with the activities in EzMath@IPGKS3.0. At the same time, teacher can integrate teaching and learning with 21st century elements which made it meaningful. This finding concured the finding from Noriati A. Rashid, Boon Pong Ying, & Sharifah Fakhriah Syed Ahmad (2017) which stated that meaningful learning occurs when new information or new materials related to the current information.

Summary

This study explore the intervention of EzMath@IPGKS3.0 in assisting teaching and learning or Mathematics. At the same time, this study also looks at the feedback and mastery of pupils in learning Mathematics. Based on the analysis and research findings, the researchers concludes that intervention of EzMath@IPGKS3.0 had given positive impact to teachers and pupils in assisting teaching and learning. EzMath@IPGKS3.0 had given meaningful and fun teaching strategy for both teachers and pupils. In addition, parents should be exposed to this innovation so that they are able to be the 'players' in helping their children to learn and love learning Mathematics. Apart from promoting this innovation to all schools in Malaysia, future research could open more rooms of opportunities and improvements for researchers so that this study could be further expanded and improved by using bigger respondents throughout Malaysia.

Initial findings showed that content of the text book should be made lively and interesting so that it would help pupils to understand and help with mastery of Mathematical skills. It is hope that the advancement of technology and new wave of education could transform EzMath@IPGKS3.0 as one of the 21st century teaching and learning platform. With the advancement of technology especially mobile phones, EzMath@IPGKS3.0 is able to help Level 1 pupils learn and master Mathematics so that they can build solid basics before moving to Level 2. It is hope that EzMath@IPGKS3.0 could collaborate with the Text Book Division, Ministry of Education, Malaysia to make this innovation as one of the teaching and learning materials for teachers, pupils and parents. This initiative could help promote positive improvement of teaching and learning standard in Mathematics. Eventually, more teachers, pupils and parents could benefit from this innovation. Now, we can also be Superheroes!

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SOCIAL & ENTREPRENEUR

VITA-SPREAD - VitAto Based Healthy Bread Spread

Aznida Wati Abdul Ghani^{1, a}, Nurul Aseaking Binti Ismail^{1, b}

¹Department Of Commerce, Politeknik Hulu Terengganu, 21700 Kuala Berang, Terengganu, Malaysia

^aaznida@pht.edu.my, ^baseaking@pht.edu.my

Abstract. VitAto sweet potato, which is known scientifically as "Ipomea Batatas" comes from sweet potato family, not only full of fiber but also rich in vitamins and minerals. However, the use of this plant is rarely varied. The idea to produce VITA-SPREAD, a natural based breadspread product that contains 70 percent of vitAto sweet potato arouses while considering the high potential of this crop to be commercialized. The objectives of this study are to identify the market potential of VITA-SPREAD products and to determine the level of community readiness for new sweet potato based products. The study was carried out descriptively using questionnaires which was distributed to 50 respondents in Kuala Berang that have been selected randomly. The findings of this study show that respondents tend to believe that vitAto sweet potatoes are capable to be used as a main ingredient in producing nutritious foods and vitAto based products have the potential to be commercialized. Respondents indicated positive feedback in which they were ready to try new innovation of vitAto based product. In conclusion, the community's tendency towards a healthy diet based on natural ingredients made it possible for vitAto based products, especially VITA-SPREAD to be marketed and commercialized.

Keywords: Healthy spread, vitAto spread, vitAto based product

Introduction

The study was conducted to identify the potential marketability of sweet potato based spreads. VitAto sweet potato is a new variation that is rich in vitamins A, B, C and E. Studies from MARDI states that nutrients that are available in vitAto sweet potatoes able to prevent damage to cells and DNA, preventing problems such as cancer and other defects to the fetus as well as able to slow the aging process (Source: www.usahawantani.com, Ruhizal Nazman, 13 December 2007).

Problem Statements And Background Issues

As stated in the article "*Keledak VitAto*" by Ruhizal Nazman, December 13, 2007, production of VitAto sweet potatoes is about 40 tonnes per hectare. However, it is still less popular to the public due to the lack of exposure to its benefits and uses. Therefore, we came up with the idea to try to diversify our product range by producing VITA-SPREAD.

Research Objective

The study was conducted with the primary objective of assessing the potential marketability of VITA-SPREAD products to commercialize and assessing people's perception of the product, as well as the potential and attractiveness of the product for commercialization.

Methodology

This study was conducted descriptively using questionnaire instrument. There are two types of data used, primary and secondary data. Primary data is obtained from the questionnaire forms while secondary data is obtained through mass media, print and electronic media and internet sources.

Uma Sekaran (2003) defines a population is referring to the whole human being in a group, phenomenon or object of interest that researchers want to study. The population of this study was the residents of Kuala Berang. Researchers used non-probability sampling, ie: simple and purposeful sampling as it helped us to collect data with ease, quick and effective ways. Data is collected from 50 respondents to represent the entire population.

Product Development

In order to prepare this VITA-SPREAD, researchers have used basic ingredients containing VitAto sweet potato, brown sugar, milk, flour, salt and eggs.

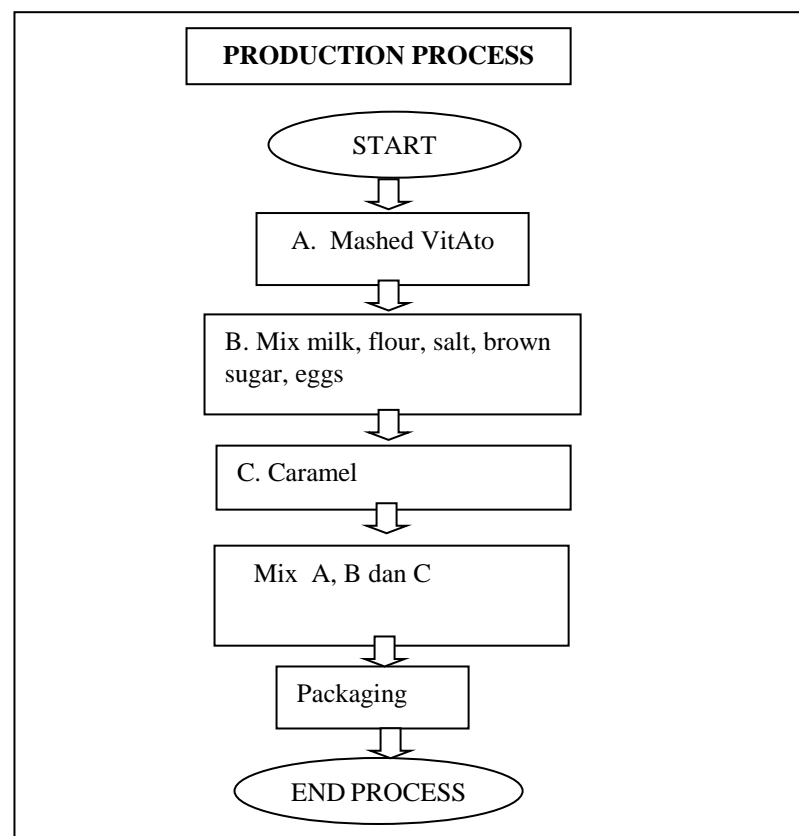


Figure 1: Production Process

The process of production begins by soaking and cleaning the sweet potato in clean water mixed with a little salt for the purpose of cleaning up any waste that is attached to it. The sweet potato will then be thoroughly cleansed and peeled before boiling until thoroughly softened to ensure the texture of the paste will be soft and delicate. The softened potatoes will then be mashed to serve as a vitAto paste. The next step is to prepare caramel to give natural color to the paste. Then, all the other ingredients such as milk, brown sugar, eggs, flour and sweet potato paste will be cooked on low heat to obtain the appropriate texture. They are then cooled to room temperature before being bottled.

Laboratory tests were conducted on the nutritional content of the product at the Faculty of Food Technology Laboratory, University of Terengganu as shown in Table 1.

Table 1: Nutrition Content (Per serving)

No	Sample	Fat %	Protein %	Energy cal/g
1	VITA SPREAD 1	0.81	0.78	1087.00
2	VITA SPREAD 2	0.84	0.80	1046.70
	Average	0.83	0.79	1066.50

For the bottling and commercialization aspects, the product uses labels as shown in Figure 2 below.



Figure 2: Bottling And Packaging

Research Findings

The first objective of the study to evaluate the marketability of VITA-SPREAD products in terms of potential to be commercialized, to assess people's perceptions towards the product and their readiness to accept new innovation of vitAto based product. The result shows that positive opportunities of this product as it achieved mean value above 3.5 out of scale 5. The study also found that majority of respondents agreed that the VITA SPREAD can be commercialized with a high mean score of 3.98 because they believe that VITA SPREAD is socially acceptable and they willing to accept new products in the market.

The second objective evaluated the potential acceptance of new vitAto based product among the community members, had scored mean values above 3.5. This shows that respondents can enjoy the new vitAto based product and they agree that the vitAto's nutrients is suitable for all walks of life. This finding also indicates that respondents are willing to accept vitamin-based product renewal and they generally agree that product-based products able to compete with other products in the market.

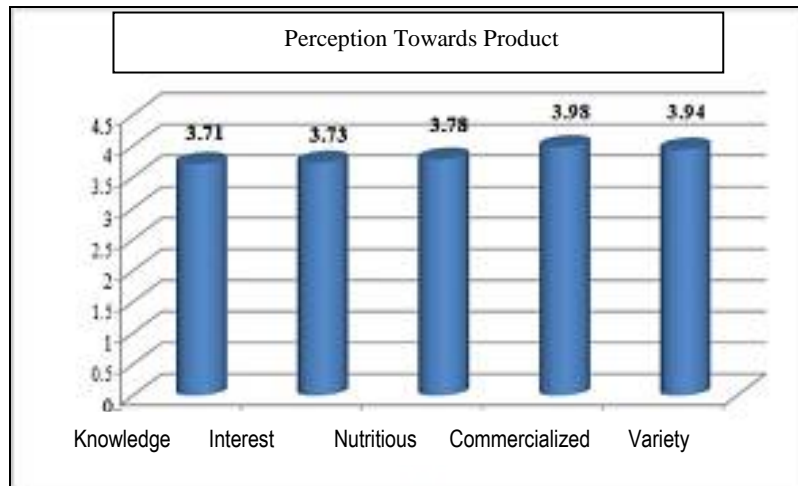


Figure 3: Perception Towards Product

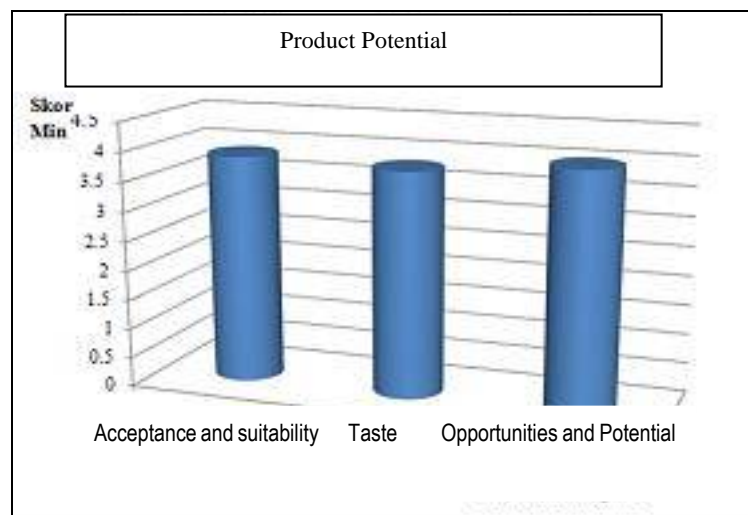


Figure 4: Product Potential

The third objective, to evaluate the attractiveness of the vitAtO based products when commercialized, has shown a mean score value of over 3.5 for all elements and this shows that VITA SPREAD has its own unique appeal, business opportunity and attractive packaging to attract attention of the public.

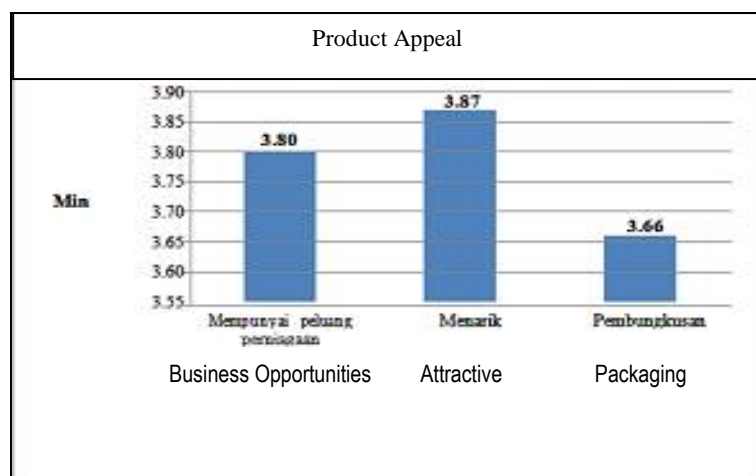


Figure 5: Product Appeal

Discussion And Summary

Overall, this study clearly shows that the public is responding positively to the VITA SPREAD product. According to the survey conducted, the people of Kuala Berang are willing to accept sweet potato based products and they are ready to receive a wide variety of new vitAto based products . The specialty of bottling strategy also captures the attention of respondents as it is easy to apply, practical and easy to carry anywhere.

Indeed, traditional crops especially sweet potato vitA to have a variety of unknown nutrients. There are a lot of new business opportunities to be explored by using vitAto sweet potato as their main ingredients. The government agencies should therefore take appropriate action to create awareness and communicate the business potential to encourage participation from the community.

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Development of Qber Corn Bag to Promote Tourism Industry in Kuala Berang

Nurul Ilyani Abdullah^{1,a}

¹Politeknik Hulu Terengganu, Malaysia

^ailyani@pht.edu.my

Abstract. Corn is one of the most attractive tourism products in Kuala Berang. To further dazzle the tourism industry in Kuala Berang, there has been an innovation called Qber Corn Bag. It is made from corn bark. These innovations can also address the issue of waste material especially in waste paper at home, work, office or business premises. This innovation is also a project that saves the environment. The objective to preserve the natural source of paper which is the tree. Raw material as petroleum sources is cannot accommodate to produce plastics for daily use. Such as Qber Corn Bag is a great alternative the replacement of paper and plastic. It also can boost Kuala Berang's corn products. Indirectly it is the best innovation product that will be increased the tourism industry in Kuala Berang for the future.

Keywords: Products, tourism, corn, paper, plastic

Introduction

Kuala Berang is famous for corn products. If visitors come to Kuala Berang, they will buy corn as a souvenir. However, corn husk will be thrown away after it is used for the preparation of food products as well as for livestock. Based on observations, corn husk is suitable to replace plastic bags or paper bags to wrap the products purchased or used. It is produced from corn husk known as Qber Corn Bag.

By look up present as well in which the waste paper is already occurring at the home, office or business premises, the problem of waste plastic bags became a hot issue today as it impacts on the surrounding environment. Using plastic bags is increasing every year, which accounted for 500 billion to 1 trillion every day. Major pollution caused by plastics. It is because plastic bags are used every day and is regarded as the essential requirements. Within a month an individual estimated to use as much as 100 pieces of plastic bags (Arjunaidi, 2017)

A variety of ways such campaigns have been carried out to reduce the use of plastic bags. But it does not give effect to the reduction of these pollution problems. In addition, it also impacts on forest conservation because it involves the felling of trees to make paper. Felling of trees will also cause pollution problems to increase as the trees and the timber is very important to neutralize the contamination. If many trees are cut down global warming will increase. The alternative is to find a suitable material to replace plastic and paper (Mohamad, 2014).

Moreover, vision 2020 inspired by the Prime Minister of Malaysia, Dr. Mahathir Mohammad is to identify challenges to the environment as one of the challenges that must be addressed by the Malaysian especially in the journey to the destination into a developed nation by the year 2020. Therefore, the use of Qber Corn Bag is a product that will meet the challenges of 2020.

Literature Review

Corn Husk

Corn husk, which sheet leaf wrapping corncob. The husk previously dried and can be used in the production of handicrafts. In this innovation, corn husk is the main ingredient to produce Qber Corn Bag.

Corn

Corn is one of the most important food-producing carbohydrate in the world, other than wheat and rice. Nowadays, corn has become an essential component of livestock. Another use is as source material for oil and flour. A variety of products produced and used in the pharmaceutical, cosmetics, and chemicals. Corn is the base material of which produce corn husk or skin.

Paper

Paper is the material used for writing, painting also related in printing. Paper is a thin material, which is produced by pressing flat fiber. Typically the fibers were using natural fibers and cellulose-based. The most common material used is wood pulp trees. Wood pulp mostly softwood like spruce, But the material vegetable fiber including cotton, linen and shirt also by using corn husk in the production of Qber Corn bag, the paper will recommend to not be used at all.

Environment

The environment is an important part of human life, regardless of race, religion, and country. The environment includes areas of green vegetation, air, and water, such as rivers and the sea. Nowadays, the environment affected because there are parties who are not responsible for polluters such as garbage disposal in rivers, the use of chemical fertilizers and others. The environment should be maintained because the environment is now not only used in the present will be up to hundreds of years. In other to restore the environmental health, the use of plastic and paper should be avoided (Mampu, 2012). So it is best to cover the replacement of corn.

Problem Statement

Paper and waste disposal problems that occur in the home, workplace, business premises is often to be heard in the media or print media. Besides, the increasing environmental problems additionally is heard due to the use of plastics that take a long time for disposal. The innovation is intended to address these issues to ensure that future generations can experience-the natural beauty like today.

Objectives

- To address the issue of waste and paper waste at home, workplace or business premises
- To maintain the sustainability of nature
- To make the Kuala Berang product's standing in the eyes of the public
- To enhance the tourism industry in Kuala Berang

Methodology

Based on observations in the market and the night market stalls selling corn, it was found that corn husks had been no longer absolutely used. They are used for livestock or meals purposes only.

Implementation Process

- Week 1-3 - Select the type of skin that is old enough
- Week 4 - Produce Qber Corn bag (dry, boil, dye with the appropriate color, and combine them using appropriate glue)
- Week 5 - Give Qber Corn bag to consumers for testimonials
- Week 6 - Produce Qber Corn bag findings of the distribution.

Findings

The researcher was provided a brief questionnaire to identify the reputation of Qber Corn Bag use among the Hulu Terengganu Polytechnic students at PHT Coop. The questionnaire consisted of four constructs namely section A (2 items) of demographic respondents, section B (6 items) identifying forms of Qber Corn Bag to meet student needs, section C (3 items) Identifying Qber Corn Bag as a source of everyday life and section D (7 items) Determine the level of satisfaction of using Qber Corn Bag.

Data Analysis

Data analysis was using Statistical Packages for Social Science (SPSS) software version 20.

Student Gender

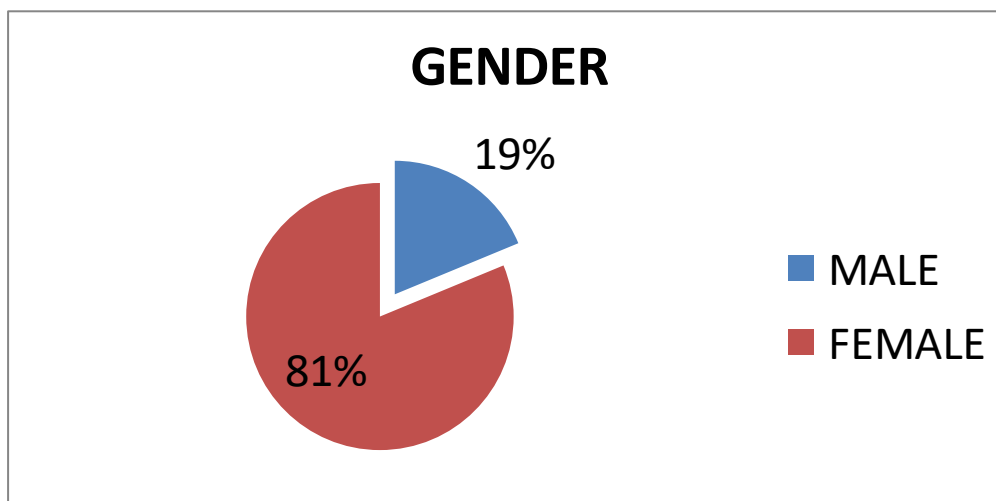


Figure 1: Respondent Gender

Analysis of data from the survey conducted found that the gender of the students was 19% male and 81% female respectively 13 boys and 51 female students.

State of Birth

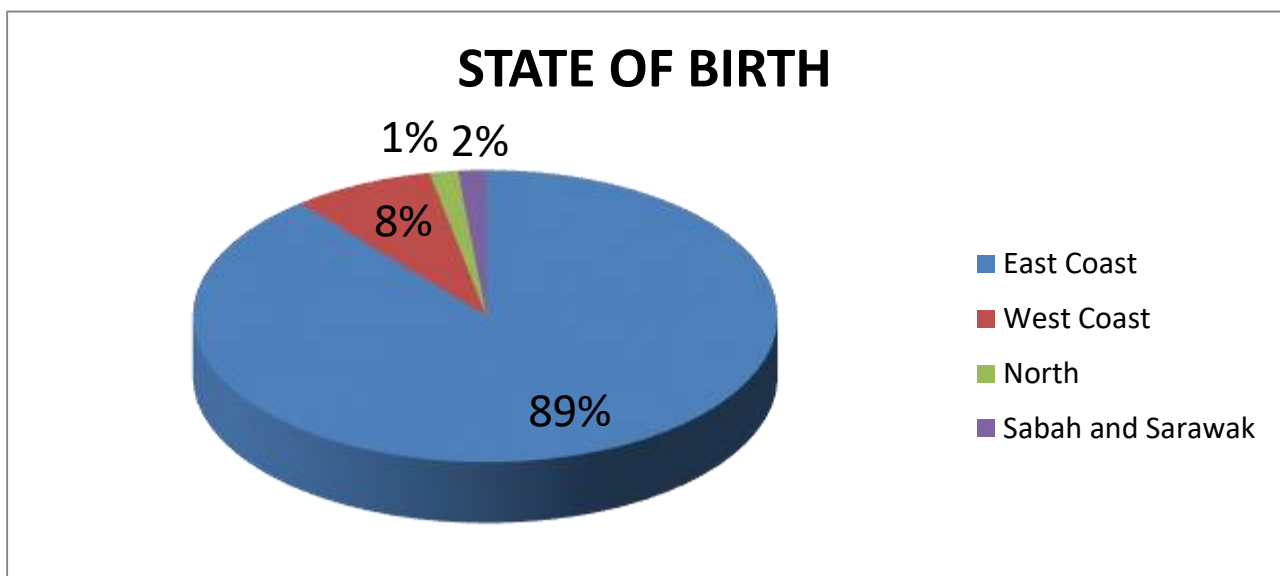


Figure 2: State of Birth of the Respondent

Analysis of data from the survey conducted found that the state of birth of students was 89% from the East Coast and only 1% from the North and 2% from Sabah and Sarawak and 8% from West Coast.

Identifying forms of Qber Corn

Shape of Qber Corn Bag

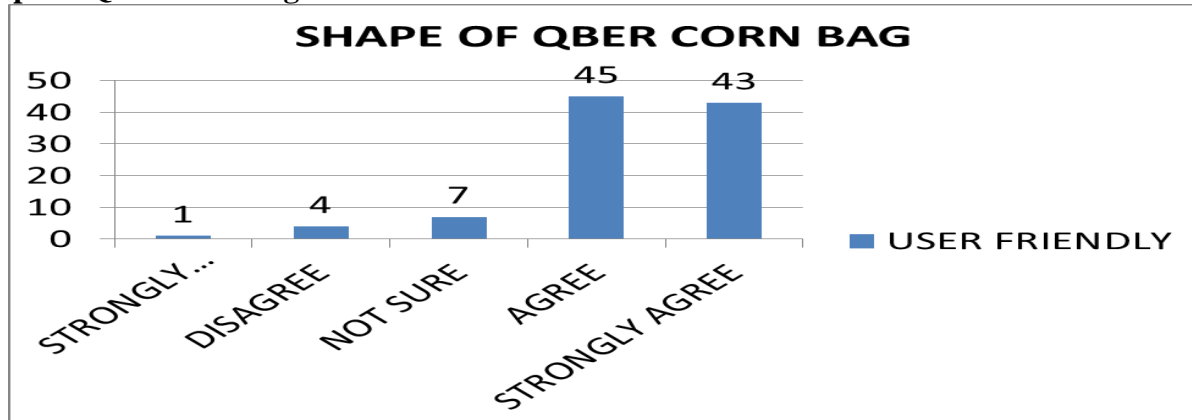


Figure 3: Shape of Qber Corn Bag

Analysis of data from the conducted survey found that Qber Corn Bag is user friendly refer to Figure 3. Based on Figure 3, 45% of respondents agree and 43% strongly agree that Qber Corn Bag is user friendly where this Qber Corn Bag allows respondents to easily carry their food/drink at the PHT Coop because it's small and lightweight and only 4% say they disagree Qber Corn Bag is very user friendly.

Qber Corn Bag is interactive

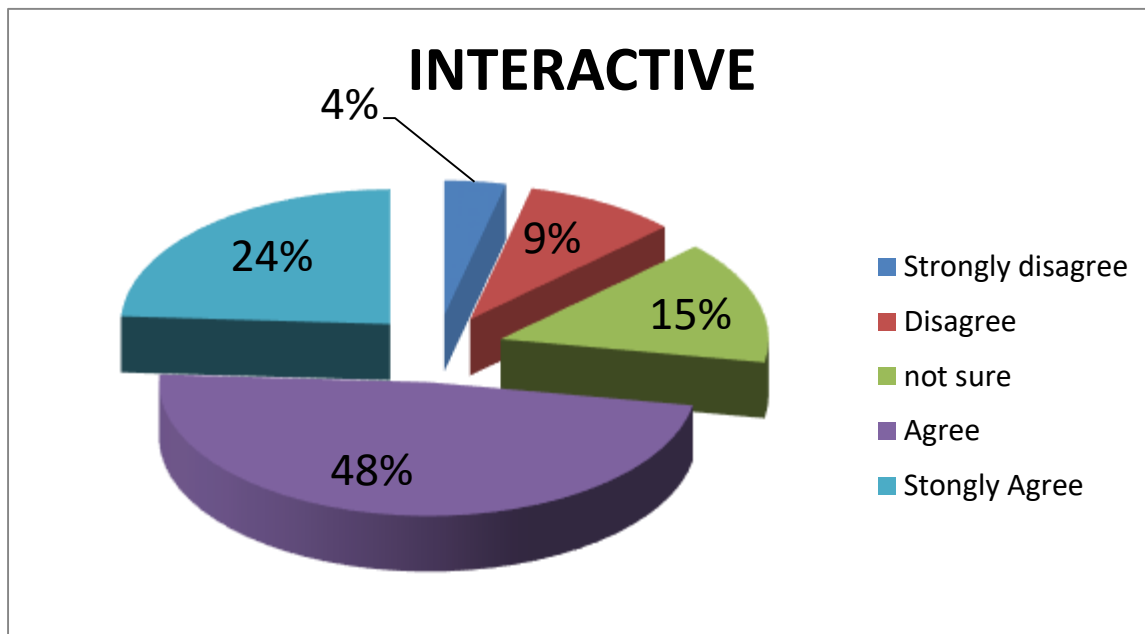


Figure 4: Qber Corn Bag is interactive

In terms of interactivity, the data analysis found that Qber Corn Bag is interactive refer to Figure 4. Based on Figure 4, 48% of respondents agreed that Qber Corn Bag is interactive where the color and uniqueness of Qber Corn Bag from Corn husk are interesting. Only 4% said it was not interactive.

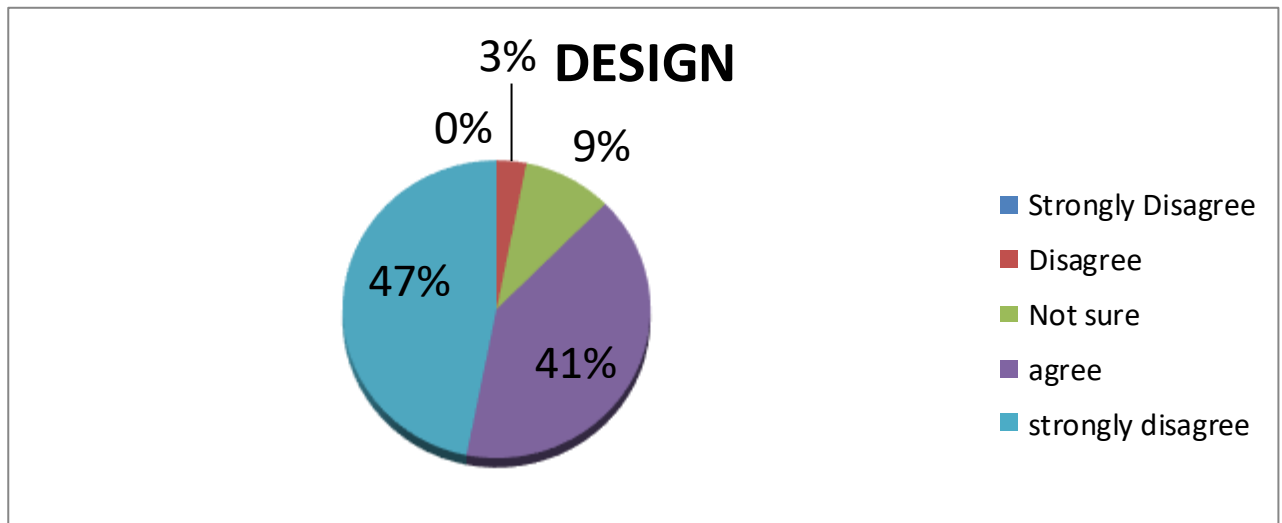
Design of Qber Corn Bag

Figure 5: Design of Qber Corn Bag

Analysis of the data from the survey conducted shows that Qber Corn Bag has a suitable design. Based on Figure 5, 47% of respondents agree that Qber Corn Bag has an appropriate size to carry which makes it look interesting and 3% said they disagree.

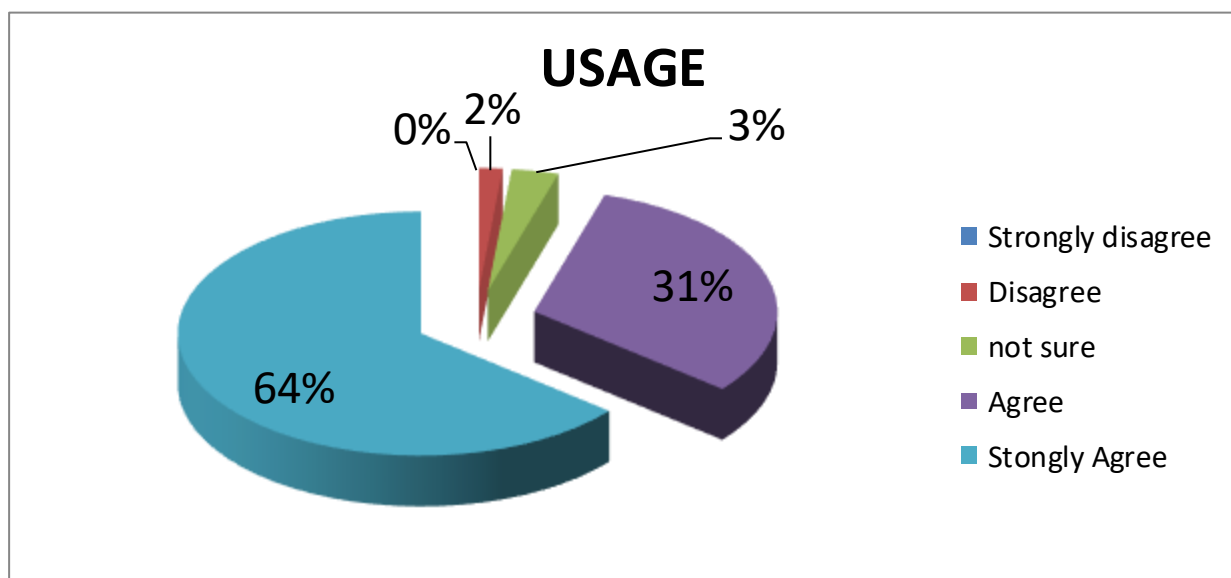
Identifying Qber Corn Bag as a source of everyday life**Uses of Qber Corn Bag**

Figure 6: Uses of Oh My Ganu

Analysis of the data from the conducted surveys found that Qber Corn Bag was very useful. Based on Figure 6, 64% of respondents strongly agree that Qber Corn Bag has useful to students because Qber Corn Bag can keep meals and beverage when they're buying at the PHT Coop.

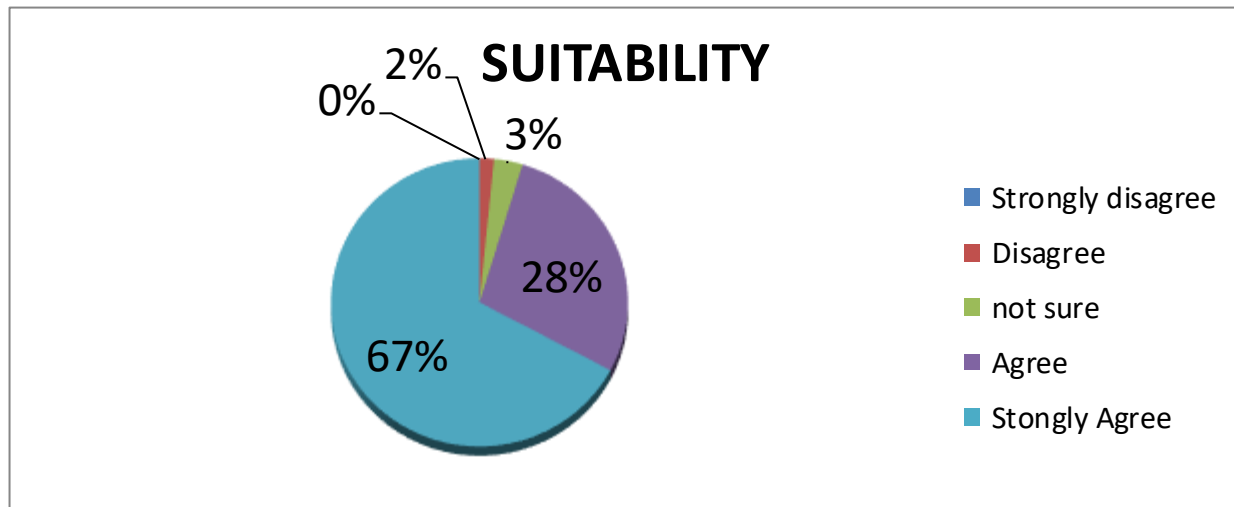
Suitability of Qber Corn Bag

Figure 7: Suitability of Qber Corn Bag

Analysis of the data from the survey conducted showed that Qber Corn Bag is very suitable and easy to bring. Based on Figure 7, 67% of respondents strongly agree that Qber Corn Bag is compatible and easy to bring, followed by agreeing 28%, uncertain 3%, 2% disagree, and 0% strongly disagree. This shows that it is very handy and convenient to bring.

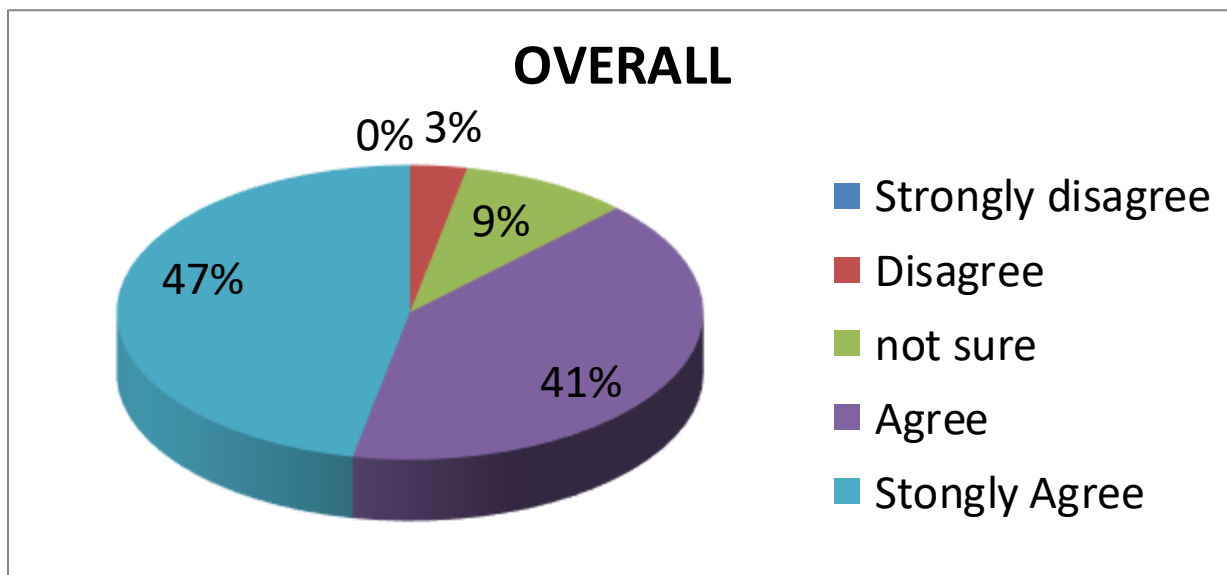
Overall Qber Corn Bag

Figure 8: Overall Qber Corn Bag

Based on data analysis conducted, 47% of respondents said Qber Corn Bag is very useful to the students of Terengganu Hulu Polytechnic as it is very interesting, easy to use, useful, is very innovative and provides a new way for students to bring any product at the PHT Coop also very user friendly. It showed that almost all respondents were satisfied with the use of Qber Corn Bag. Only a small percentage were dissatisfied with the use of Qber Corn Bag at 3%.

Discussion

Rationale for the Project

The rationale of these innovations is to address the problem of disposal and waste paper that occurs in the home, workplace, office or business premises as well as prevent major pollution sources which is plastic. In addition, it is produced to save the environment from pollution and disposal. It also aims to introduce this innovation in the eyes of the public and attract tourists to come to Kuala Berang.

Scope and limitations of the project

The scope of the project " Qber Corn bag " is for the public to deal with the placing of a variety of products that have been through the transaction.

Some things have been limiting the project " Qber Corn bag" which is produced in which the current time-consuming. It is also created manually. If taken into consideration by the parties who have an authority like ministry it can be commercialized using chemical processes that can improve the quality of Qber Corn bag and can be used by all parties.

The importance and impact of the project

Qber Corn bag can have a positive impact on sellers and buyers in general and especially to Kuala Berang as to facilitate business transactions using the Qber Corn Bag. Then the uniqueness of this product can introduce existing products in Kuala Berang to the public eye also can avoid a major source of pollution and avoid the wastage of resources.

Conclusion

Overall, the project's Qber Corn bag innovation can assist all parties in the placement of their products. Although the present innovation is to assist small maintenance and conservation of the environment. It also could be a big blow if it succeeds widely commercialized. Besides, the use of Qber Corn bag can foster sustainability in line with the objective to ensure continuity for the next day, there are also some other purpose that leads to the importance Qber Corn bag is designed to replace plastic bags or paper bags readily available, such as to reduce the waste that cannot be decomposed based polymers and petroleum, help minimize the use of petroleum as it is not renewable and its cost is also much cheaper than the cost of production of a plastic and paper bags. Accordingly, the presence of Qber Corn bag is also expected to Kuala Berang be known in the eyes of the public as a world class tourism destination to be visited also known as place that support green tourism.

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