FINAL PROJECT REPORT
THERAPY CURE
(A DEVELOPED HAND FINGER EXERCISER WITH LATEST TECHNOLOGY

NUR FARIDAH BT PAWI 08DEU14F1057
WAN NADZIRAH BT AB HADI 08DEU14F1069
NURUL SYAZWANI BT MOHD DAUD 08DEU14F1031
NUR ANIS BT MAMAT 08DEU14F1083

DIPLOMA KEJURUTERAAN ELEKTRIK
(PERUBATAN)
JABATAN KEJURUTERAAN ELEKTRIK
POLITEKNIK SULTAN SALAHUDDIN ABDUL
AZIZ SHAH

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This Report Is Submitted In Partial Fulfillment Of The Requirements For Diploma Electronic Engineering (Medical)

Jabatan Kejuteraan Elektrik
Politeknik Sultan Salahuddin Abdul Aziz Shah

DIS 2016

ENDORSEMENT

"I hereby acknowledge that i have read this report and i find that its contents meet the requirements in terms of scope and quality for the award of the Diploma in Electronic Engineering (Medical)"

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DECLARATION

"We hereby declare that the work in this report is our own except for quotation and summaries which have been duly acknowledge"

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ABSTRACT

Therapy cure is an innovative idea combining a developed hand finger exerciser with the latest technology which is smartphone application and database. This therapy cure is a therapy device to improve the grip strength and also can measure the strength by using force sensing resistor when patients exerts force to this device, to analyze user performance during therapy session. The data of grip strength of patient are sent to smartphone application via bluetooth connection for display and also to database for storage to analyze patients performance by therapist. This project combines hand finger exerciser (therapy), smartphone application and database to allow home therapy. Application software is developed to enable online monitoring and training.. With its portability, users can use their application to complete different tasks, anywhere and anytime.

ABSTRAK

Therapy cure merupakan satu idea inovatif yang menggabungkan alat terapi tangan iaitu *hand finger exerciser* dengan teknologi terkini iaitu aplikasi pada telefon pintar dan *database*. Alat terapi ini bukan sahaja dapat meningkatkan kekuatan genggaman tangan tetapi ia juga dapat mengukur kekuatan tersebut menggunakan *force sensing resistor*. Ia dihubungkan dengan aplikasi pada telefon pintar dan juga database untuk memudahkan ahli fisioterapi merekod dan menganalisa data pesakit tersebut dari jarak yang jauh tanpa pemantauan

Projek ini terdiri daripada tiga bahagian iaitu *hand-finger exerciser,* aplikasi pada telefon pintar dan juga database. Alat terapi ini akan mengukur kekuatan genggaman apabila pesakit memberikan tekanan pada alat ini. Dan data kekuatan jari pesakit tersebut akan dihantar ke aplikasi pada telefon pintar melalui sambungan *bluetooth.* Aplikasi telefon pintar ini akan memaparkan data kekuatan pesakit dan menghantar data tersebut semula ke database untuk rekod pesakit oleh ahli terapi. Ini memudahkan ahli fisioterapi mengendalikan beberapa pesakit serta merekod keputusan rawatan pesakit yang ramai dengan sangat mudah. Dengan adanya database, rekod pesakit akan dikemaskini secara automatik dan dapat disimpan dengan rapi dan selamat.

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Chapter 1

Introduction

1.1 Introduction

Hand finger exerciser are designed for a patient to work each finger individually. It develops isolated finger strength, flexibility and coordination as it builds hand, wrist and forearm strength.

The hand is an organ of grasp and play a role on a daily life activities. But unfortunately, not only stroke victim but also the incidence of injury directly affecting the hand or fingers has risen dramatically in the recent years. It was directed into developing therapy methods and procedures in order to successfully apply treatment in a wide scale[1].

In this project, we present a 'therapy cure' which is an innovative idea combining a developed hand finger exerciser with the latest technology. This therapy cure is a therapy device that can also measure the finger and grip strength by using

force sensing resistor when patients exerts force to this device to analyze user performance during therapy session.

This project combines hand finger exerciser (therapy), smartphone application and database to allow home therapy. Application software is developed to display and record the data measured by force sensing resistor. With its portability, users can use their application to complete different tasks, anywhere and anytime.

1.2 Problem statement

The problem that we could identified is regarding on the difficulty to display and save patients data. This is because existing hand finger exerciser does not give out or display any reading, means that the therapist will observe the fingers or grip strength manually by using different models of existing hand finger exerciser for each stage. This is why we design a new device that measure and display a reading on a smartphone application.

The second problem that we could identified is patient need to go to hospital frequently to do the therapy session. But with this device a patient can undergo therapy session in more convenience way (home-therapy). Because it connect directly with database, the data will be directly sends to server. The server will act as a database to save all the data and help therapist to analyze and keep track multiple patients performance no matter the distance

1.3 Objectives

1. Innovate hand finger exerciser
2. To help therapist analyze patient's condition
3. To develop a device that can display and save data immediately

1.4 Study population

We had carried out a few researches through the internet and also from interviews. We have done a survey and research with Pn Norazlina Ya'acob, *Pegawai Pemulihan Perubatan Fisioterapi Gred U41* in Hospital Besar Kuala Lumpur. And also a few therapists in KPJ Rawang Selangor. We also have done a research with biomedical engineer, En Khairil Azhar Bin Ahmad Sha'ari from Radibems. Sdn. Bhd Branch of Hospital Besar Kuala Lumpur.

Questionnaires were given to them and from the research and the opinion that we gained from them, it's allowed our team to begin compiling problem statements and objectives pertaining to the specific observation. And from the survey that we done in both hospital, we get a good feedback regarding our project 'therapy cure' because it can increase and improve the efficiency of treatment in occupational therapy unit by making a patient undergo therapy session in more convenience (home therapy).

1.5 Sampling technique

Table 3.1

Table for Determining Sample Size of a Known Population

N	S	N	S	N	S	N	S	N	S
10	10	100	80	280	162	800	260	2800	338
15	14	110	86	290	165	850	265	3000	341
20	19	120	92	300	169	900	269	3500	346
25	24	130	97	320	175	950	274	4000	351
30	28	140	103	340	181	1000	278	4500	354
35	32	150	108	360	186	1100	285	5000	357
40	36	160	113	380	191	1200	291	6000	361
45	40	170	118	400	196	1300	297	7000	364
50	44	180	123	420	201	1400	302	8000	367
55	48	190	127	440	205	1500	306	9000	368
60	52	200	132	460	210	1600	310	10000	370
65	56	210	136	480	214	1700	313	15000	375
70	59	220	140	500	217	1800	317	20000	377
75	63	230	144	550	226	1900	320	30000	379
80	66	240	148	600	234	2000	322	40000	380
85	70	250	152	650	242	2200	327	50000	381
90	73	260	155	700	248	2400	331	75000	382
95	76	270	159	750	254	2600	335	1000000	384

Note: N = Population Size; S = Sample Size *Source: Krejcie & Morgan, 1970*

Figure 1.1 Sampling technique

Respondents from Polytechnic of Sultan Salahuddin Abdul Aziz Shah, Shah Alam are selected for this survey to determine our usability for our product. The first sample are 40 students from Electronic Engineering (Medical) Course. These students are in final year that have undergoing their industrial training in hospitals and company. In this sample, a questionnaire was given to the students.

The second sample are 5 therapist from Hospital Kuala Lumpur and 2 biomedical technician from Radibems. Sdn. Bhd. Branch of Hospital Kuala Lumpur. In this sample, we demonstrate our product and a questionnaire was given to them.

The third sample are biomedical engineer from our polytechnic to verify the safety of the device. An electrical test was carried out to make sure the device is safe to be used and safe from any leakage current.

1.6 Significant of study

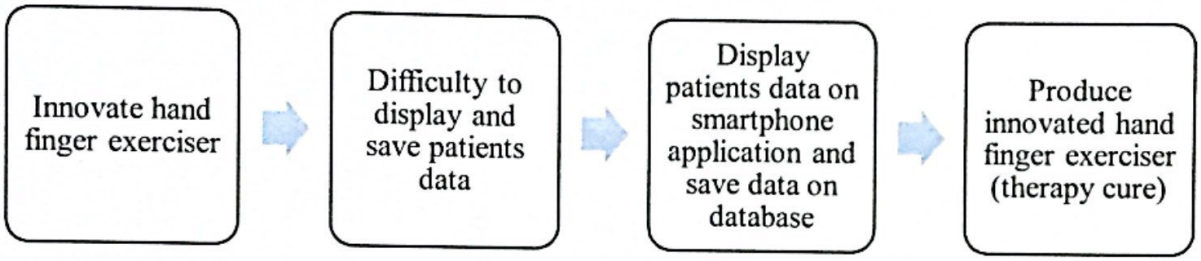


Figure 1.6 : Significant of study

1.7 Theoretical of study

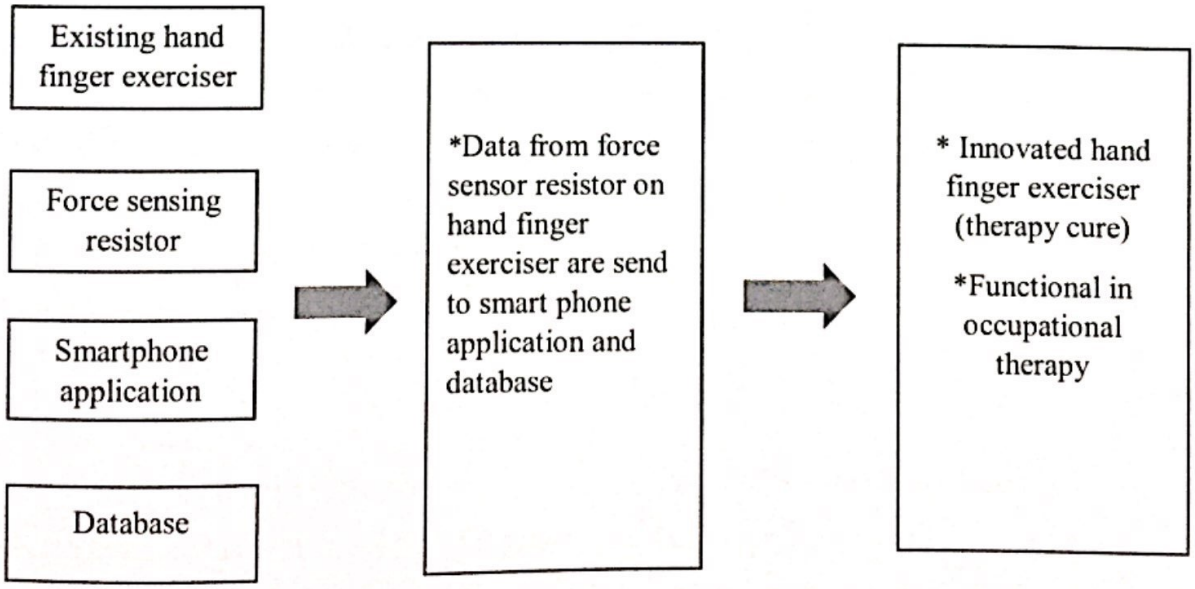


Figure 1.3 : Theoretical of study

Chapter 2

Literature review

2.1 Stroke

Hand disability is a normal condition that around the world [2], Approximately over 80% from 700,000 patient who survive stroke each year needs hand therapy[3, 4]. There are also other conditions that contributed to high incidence of hand impairment which is wrist trauma, high -level spinal cord injury, multiple sclerosis and others, thus also contributed to intensive rehabilitation training to reduce long term problems[5, 6, 7]. Unfortunately, currently only a few validated technologies for at-home upper-extremity rehabilitation after a stroke are existed. A recent systematic review of home-based upper extremity therapy analyzed only two of these included a self-guided intervention in four studies [8].

How a person is affected by their stroke depends on where the stroke occurs in the brain and how much the brain is damaged. For example, someone who had a small stroke may only have minor problems such as temporary weakness of an arm or leg. People who have larger strokes may be permanently paralyzed on one side of

their body or lose their ability to speak. Some people recover completely from strokes, but more than 2/3 of survivors will have some type of disability.

The findings are made in every countries from developed, medium developed and slow developed countries. From 1990 to 2010, incidence of stroke cause by age decreased 12% in high developed country, increased 12% in slow developed country. In 2010, there are roughly around 16.9 million number of people with stroke, while 33 million of stroke survivors, 5.9 million death related with stroke globally[9]

2.1.1 Symptoms of stroke

The main symptoms of stroke can be remembered with the word FAST: Face-Arms-Speech-Time.[9]

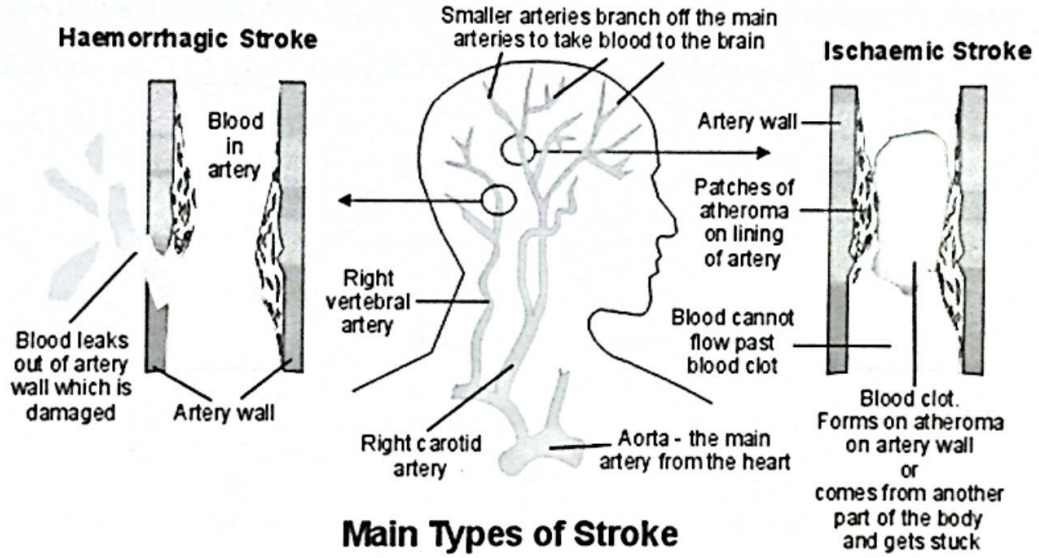
- **Face** – the face may have dropped on one side, the person may not be able to smile or their mouth or eye may have dropped.
- **Arms** – the person with suspected stroke may not be able to lift both arms and keep them there because of arm weakness or numbness in one arm.
- **Speech** – their speech may be slurred or garbled, or the person may not be able to talk at all despite appearing to be awake.
- **Time** – it is time to dial 999 immediately if you see any of these signs or symptoms.[9]

Long-term problems may occur, depending on how quickly it is diagnosed and treated. Stroke patient may experience a temporary or permanent impairment afterward.[9] There are other problem that strokes may lead patient to such as

- Depression

- Pain in the hands and feet that get worse in every movement and changes in temperature
- Paralysis or weakness on one or both side of the body
- Trouble controlling emotions[9]

2.1.2 Types of Strokes



Source : patient.info/health/stroke-leaflet

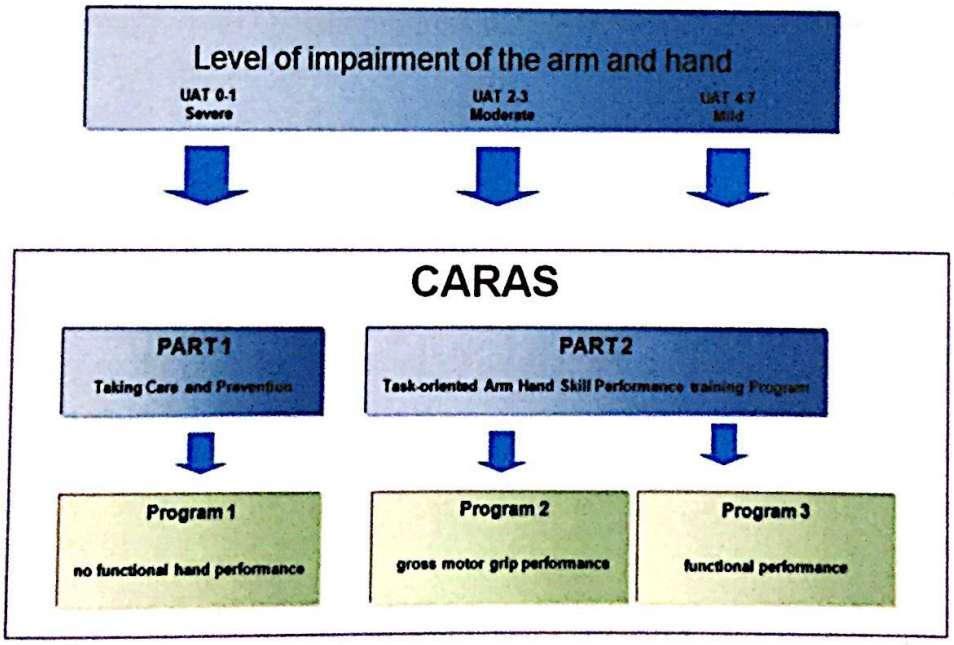
Figure 2.1 : Main type of stroke

There are two types of stroke.

- Ischemic stroke is similar to a heart attack, except it occurs in the blood vessels of the brain. Clots can form in the brain's blood vessels, in blood vessels leading to the brain, or even in blood vessels elsewhere in the body and then travel to the brain. These clots block blood flow to the brain's cells. Ischemic stroke can also occur when too much plaque (fatty deposits and cholesterol) clogs the brain's blood vessels. About 80% of all strokes are ischemic.[10]

- Hemorrhagic strokes occur when a blood vessel in the brain breaks or ruptures. The result is blood seeping into the brain tissue, causing damage to brain cells. The most common causes of hemorrhagic stroke are high blood pressure and brain aneurysms. An aneurysm is a weakness or thinness in the blood vessel wall.[10]

Level of Arm-Hand Impairment The CARAS have three modular, group-based training programs divided into two parts, (Part 1) will be taking care and prevention and high-intensity, (Part 2) will be task-oriented arm-hand performance training . (Kruitwagen-van Reenen, Post, Mulder-Bouwens, & Visser-Meily, 2009),stated based on the Utrecht Arm/Hand Test (UAT) patients enroll in one of the training programs, each of which consists of well-described and time-delimited building blocks[11]



Source : scholarworks.wmich.edu/cgi/viewcontent.cgi?article

Figure 2.2 Level of impairment of the arm and hand

2.2 Difficulty of using hand finger exerciser

All strokes are different so for some people the effects may be relatively minor and may not last long, while others may be left with more serious long term problems. A stroke can affect the way your body functions. Although all strokes are different, there are some common physical problems that many people experience. Many people experience muscle weakness or paralysis after a stroke, which can affect your mobility and balance. This often occur at one side of your body and can bring a whole lot of pain. There are many difficulty occur by using the hand-finger exerciser such as the device does not have any interface that can show or produce results, this make it hard for both physiologist and patient because the physiologist will need to keep on observe the patient progress manually only during their therapy session. While for patient, the device will literally make them less independent because they only focus on their progress during the session at the hospital only.

Other than that, the existing hand-finger exercising does not have a server to save all patients data for the physiologist to observe their progress during the home-therapy session. With this Therapy Cure device, we created a database for physiologist so they can keep track of all patients progress easier without the need to manually observe them.

2.2.1 Relationship between device and disease (Rehabilitation)

Approximately 50% of stroke survivors experience unilateral motor deficit that leads to chronic upper extremity impairment results in limited functional use of

the affected arm hence reduce the capability to interact in social life. [11] Roughly around 67% of stroke survivors after 4 years with initial unilateral motor deficit still experience non use or disuse of the affected arm as a major problem.

Strokes are life-changing events that can affect a person both physically and emotionally, temporarily or permanently. After a stroke, successful recovery will often involve specific rehabilitative activities.

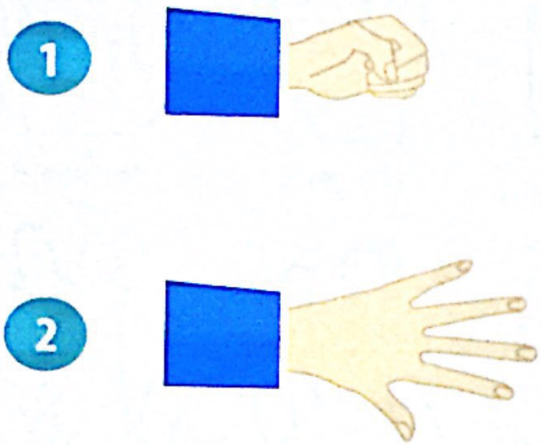
After having a stroke, normally survivors will encountered problem with Hand function and fine motor skills[12] Hand exercises are benefits in improving strength regardless of whether the stroke patient is just beginning to get hand movement or already has good hand range of motion.

Over the last decades, rehabilitation for motor skills and arm-hand performance has been changed, where patients or survivor could do variety of exercises of therapy at home[11]

In therapy, the target muscle must be contracted maximally in isometrically for 6-10 seconds. In between of each contraction, patient must be relax and wait for the device back to the baseline before starting another contraction.[14]

Therapy for single muscle or muscle group are best in between a period of 5-10 minutes, this to prevent boredom and fatigue that could happened to patients during treatment.

2.2.2 Hands therapy



Source:saebo

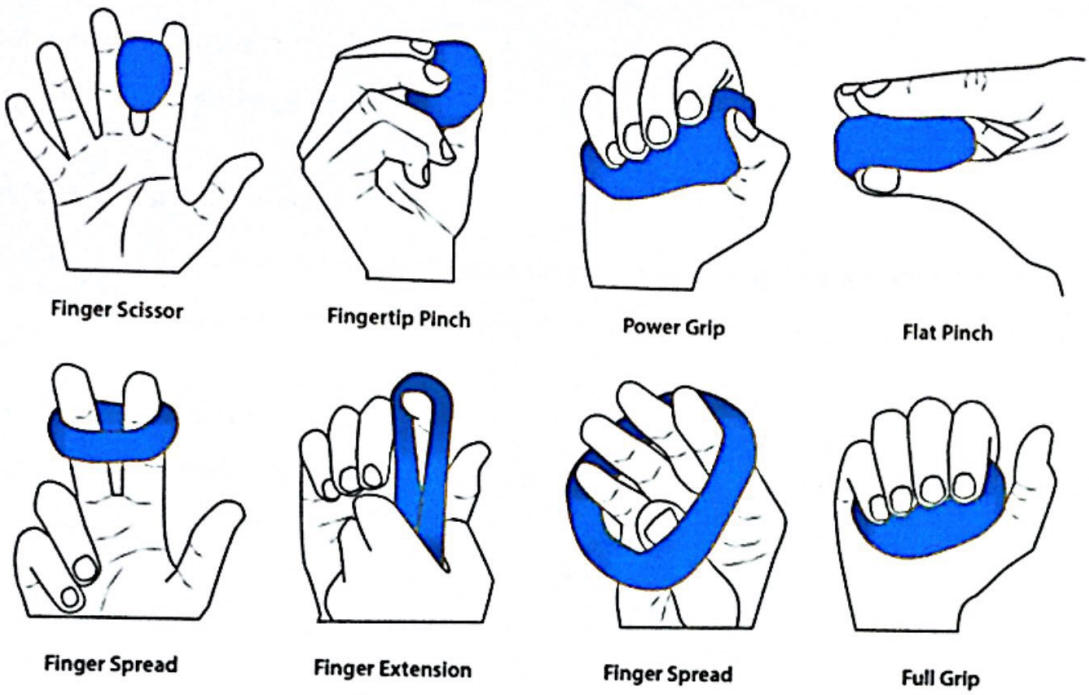
Figure 2.3 : Hand therapy

2.2.2.1 Make a fist

To begin retraining your brain and hands, make a fist by wrapping your thumb over your fingers. Then, slowly open and spread your fingers wide.

How wide you spread your fingers and how long you hold the stretch will depend on your goal. If you need to stretch the hand and increase range of motion, slowly make a fist and open it until you feel a stretch, but no pain. Repeat this slow and steady movement 10 times per session. If you have decent range of motion, but need to improve strength, open and close your fist repeatedly and steadily for 30 seconds. Then give your body the chance to rest, and repeat the movement for an additional 30 seconds

2.2.2.2 Therapeutic hand therapy



Source: saebo

Figure 2.4 Therapeutic hand therapy

Exercise 1: Finger Scissors

Roll your putty into a ball and squeeze it between your fingers.

Exercise 2: Fingertip Pinch

Take your rolled up putty and pinch it using your thumb and fingertips.

Exercise 3: Power Grip

Grab your putty and squeeze all your fingers into it.

Exercise 4: Flat Pinch

Use your straightened fingers to pinch the putty down into your thumb

Exercise 5: Finger Spread

Take your putty, stretch it out, and wrap it around two fingers to form a donut shape. Then spread your fingers apart.

Exercise 6: Finger Extension

Take your putty and stretch it out. Then bend one of your fingers to make a hook and wrap the putty around the back of your finger. Once you're set up, straighten your finger using the putty as resistance.

Exercise 7: Finger Spread

Take the putty, stretch it out, and wrap it around your hand in a donut shape while keeping your fingers together. Then spread your fingers out to stretch the putty out.

Exercise 8: Full Grip

Take the putty and form it into a ball and squeeze down, pressing your fingers into your palm.

2.3 Hand finger exerciser

Source : saebo

Figure 2.5 : Hand finger exerciser

Hand therapy exerciser is combining occupational and physical therapy modalities to help rehabilitate the hands, fingers, and wrist disorders and injuries by using physical methods and devices such as grips, balls, bands, stacking cones, and weight bars. Hand therapy exercise is used for a variety of applications in rehabilitation centers, sports medicine facilities, hospitals and clinics for such conditions as arthritis, nerve damage, carpal tunnel syndrome, fractures and muscles/tendon tears.

Finger and hand exercisers provide resistance for the building of a stronger, more reliable grip and more well-defined hand and finger muscles. Fingers are naturally dexterous, but this will increase their ability and strength, as well as endurance. Recent developments on stroke diagnosis form MNT news state that, through predicting the grip strength can identified the risk of stroke.[9]

2.3.2 Design

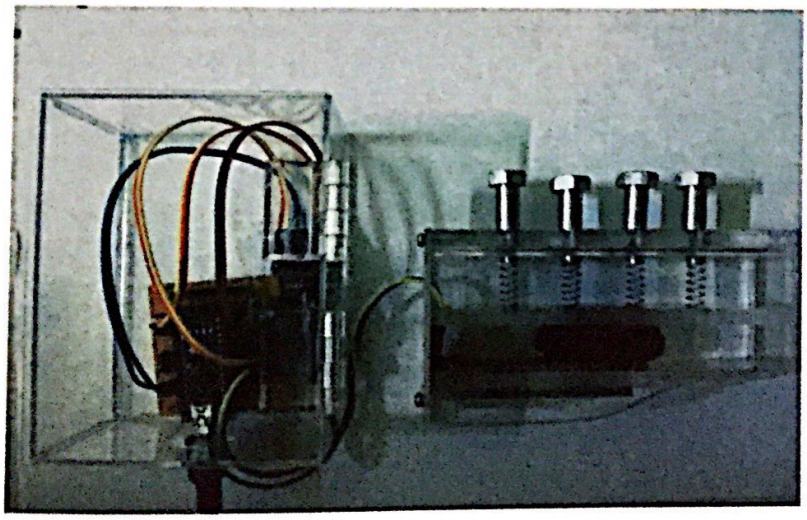


Figure 2.6 design

The design are created by using the 123 Design Autocad and in 3D mode. The design consists of two(2) circuit which are separated from each other. One circuit are the sensor circuit which are located exactly below the Therapy Cure device, while the other circuit is located outside with jumper wires connect them. This circuit is a (processing circuit) which contains arduino nano as the interface, bluetooth module(HC-06) and a peripheral device which is ESP 8266 (Wifi module) as the interface for database.

This device is an upgraded version of the recent hand-finger exerciser device which it brings more benefits. This device can helps patient to undergo treatment at home as in a Home-therapy device, this can helps them to save time and also save cost from commute to hospital for treatment.

Not only that, this device can also be used to assists physiotherapist in monitoring patient's condition remotely. Because this device have a force sensing resistor(FSR) located at the base. The function of this FSR is to detect any presence of pressure given by the patients during treatment.

2.4 Sensor

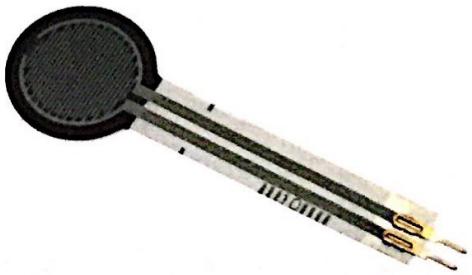
Generally, there are many force sensor in the market such as piezoelectric sensors, capacitive force sensors, barometric MEMS, and other types of force sensors some are based on light [15] and others on magnetic sensor[14].

Piezoelectric sensors are resistive sensors, such as strain gauges. They generates an electric charges when stressed. A very modern electronic device are

needed to measure the charge since parasitic effects tend to recombine the charge making the material shortly neutral [14]

A capacitive sensor is a force sensor that detects electric charge which changes its capacitance depends on the force applied to it. They usually a parallel-plate capacitor. This is due to the dielectric as in a squeezable object that gets thinner whenever it get pressed. Even with these sensor, it will give a complex circuit hence subjected to noise.[14]

Finally, barometric MEMS can be used to sense an interface pressure if they are drowned in some soft or liquid material such as silicone.[14]. None of the above force resistor are more suitable to be used into a wearable material [14] in fact most of them have been developed for mechanic applications where the materials that are involved are usually steel, aluminum, or other stiff materials.

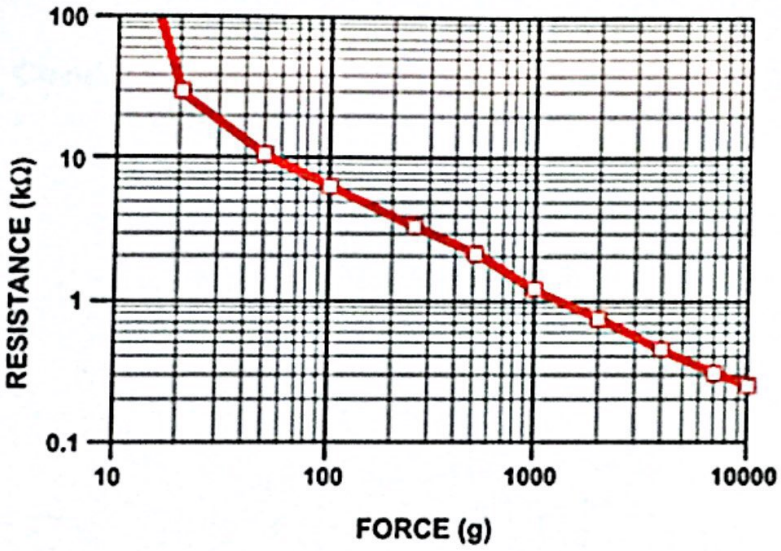


Source :https://solarbotics.com/product/50803/

Figure 2.7 Force sensing resistor

Flexible resistive force sensors or a force sensing resistor (FSR) are more suitable to be used because they are widely used; they involve low cost electronics and therefore suitable for wearable, even for those targeting the consumer market.

There are many applications related to the force-sensing resistor, which they are transducer that can convert force into electrical quantity.[14] These sensors (FSR) are sensors that allow you to detect physical pressure, squeezing and weight. They are simple to use and low cost. This sensor is a Interlink model 402 FSR with 1/2 diameter sensing region. It is basically a resistor that changes its resistive value (in ohms) depending on how much it been pressed.



Source : www.adafruit.com/product/166

Source : www.adafruit.com/product/166

Force (lb)	Force (N)	FSR Resistance	(FSR + R) Ω	Current thru FSR+R	Voltage across R
None	None	Infinite	Infinite!	0 mA	0V
0.04 lb	0.2 N	30KΩ	40 KΩ	0.13 mA	1.3 V
0.22 lb	1 N	6 KΩ	16 KΩ	0.31 mA	3.1 V
2.2 lb	10 N	1 KΩ	11 KΩ	0.45 mA	4.5 V
22 lb	100 N	250 Ω	10.25 KΩ	0.49 mA	4.9 V

From the table we can see how the resistance, force(N) and force(lb) are related to each other. From this table we can conclude that this force sensing resistor

are the most suitable sensor to be used for medical purpose which is a therapy for stroke's patient. The pressure detected from the sensor can be measured in any unit that a physiotherapists want. When a device can actually get and display a result, this can help the physiotherapist to do their job more effectively.

2.5 Circuit

2.5.1 Sensor Circuit

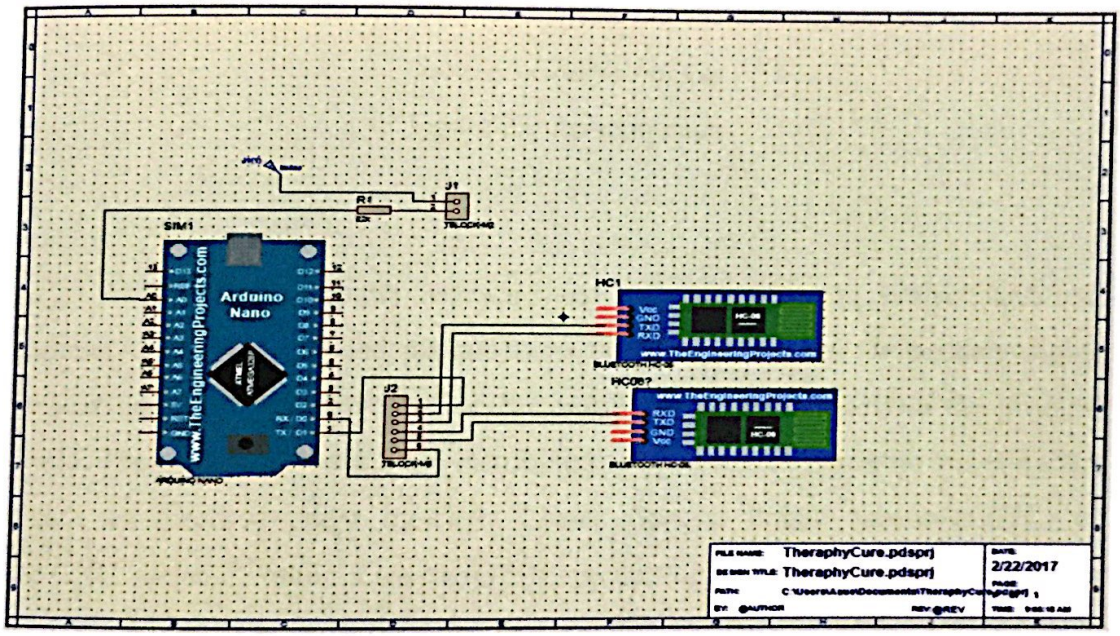
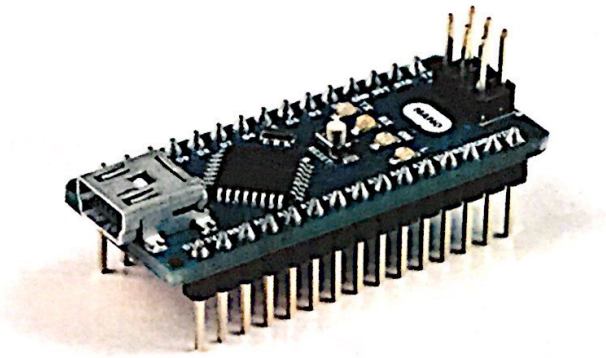


Figure 2.8 Sensor circuit

This sensor circuit is designed by using a software called proteus 8.0 professional. This circuit consists of an arduino nano which act as an interface between analogue and digital compartment. Two(2) HC-06 bluetooth module tare connected to one(1) arduino nano. These bluetooth are used as the communication which involved receive and transmits data from sensor to phone application. One(1) force sensing resistor(FSR) connected to analogue pin of arduino nano(Pin A0). A 22k resistors connected in between of arduino and sensor.

2.5.2 Arduino nano



Source : Google Images

Figure 2.9 Arduino nano

Arduino is a computer hardware and software company, project, and user community that designs and manufactures microcontroller kits for building digital devices and interactive objects that can sense and control objects in the physical world. The project's products are distributed as open-source hardware and software, which are licensed under the GNU Lesser General Public License (LGPL) or the GNU General Public License (GPL), permitting the manufacture of Arduino boards and software distribution by anyone. Arduino boards are available commercially in preassembled form, or as do-it-yourself kits.

Arduino board designs use a variety of microprocessors and controllers. The boards are equipped with sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards (*shields*) and other circuits. The boards feature serial communications interfaces, including Universal Serial Bus (USB) on some models, which are also used for loading programs from personal computers. The microcontrollers are typically programmed using a dialect of features from the programming languages C and C++. In addition to using traditional compiler tool

chains, the Arduino project provides an integrated development environment (IDE) based on the processing language project

2.5.3 Configuration

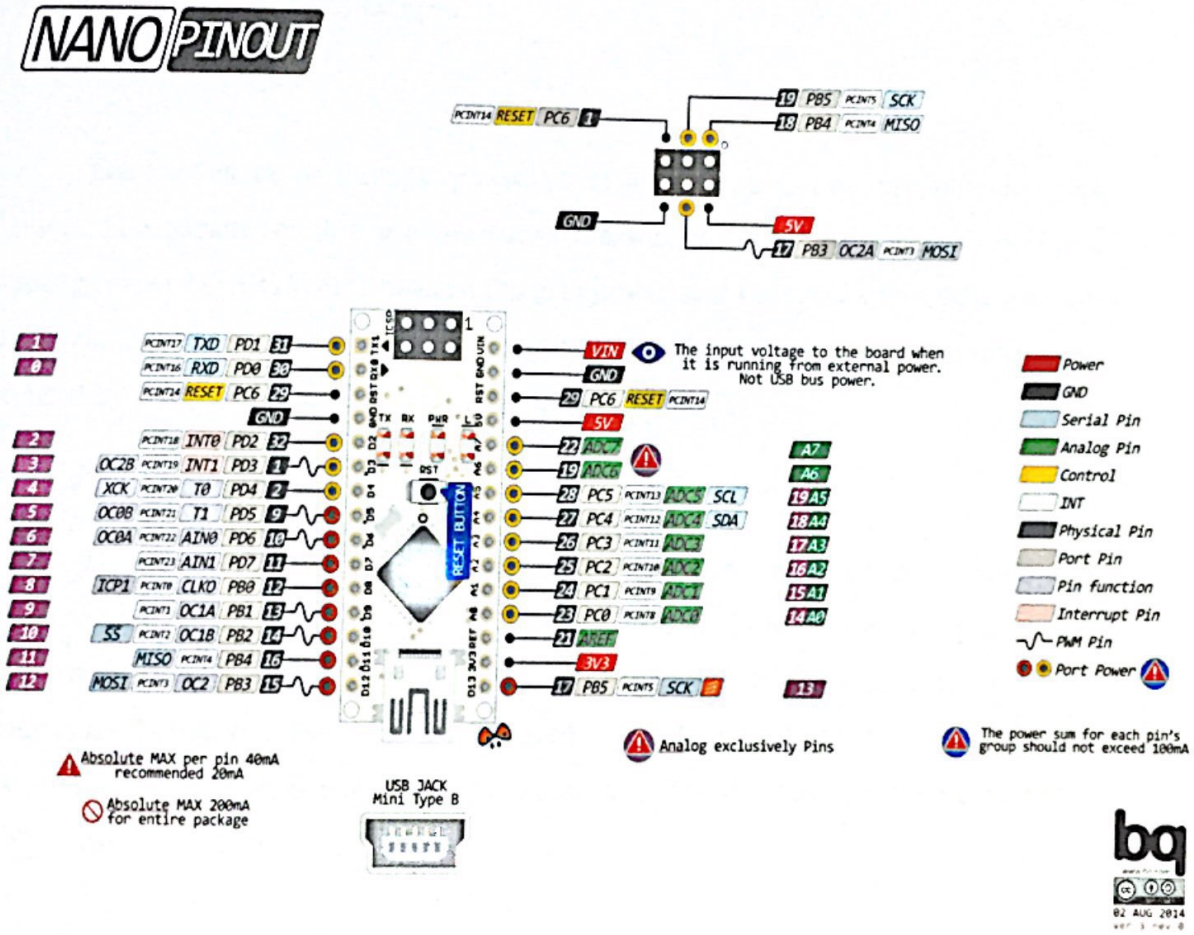


Figure 2.10 Configuration

Pins used:

1) Pin A0 - Input signal from sensor
2) Pin Gnd - Ground (sensor)
3) Pin 5v - Power supply
4) Pin Tx - Bluetooth transmitter
5) Pin Rx- Bluetooth receiver

2.5.4 Programming

When users/patient turn on the (Therapy Cure) device, an introduction that was programmed will start and showed on the screen. After that, the device will be completely on and ready to be used.

For treatments or therapy, patients and users need to give pressure onto the device. The parameter that are measured are the power of their grip. The force sensing resistor (FSR) will measured the grip power and the results will be shown on the device (application) the connection between the device and the circuit sensor are secured by using a bluetooth module(HC-06).

The results that are shown on the device (application) will then be send to a database that are used to be a storage. This database will then store and sync all the data from different patient into it. A computer is used to be a database and the connection between these two are secured by a bluetooth module(HC-06). A peripheral device(ESP) is used to create a database. The database are then created by using a Visual Basic 6.0.

From the database, it will help any physiologist to observe and watch all patients progress when they are having a Home-Therapy treatment. These brings lots of benefits for both physiologist and patients.

Chapter 3

Methodology

3.1 Introduction

This chapter will discuss about the method that has been used to solve the problem for developing a Therapy Cure. The project will follow the method stage by stage. The method consists of planning, designing of system, developing of software and testing to make the development of the project is systematically. In this project the implementing step divide into three major phase.

The first of methodology include the subject to study, research and searching of information and then gathering the information together. This step is important to develop deep understanding about the product. The source of information are mainly focus from library or any book resources, advice from lectures or technician and lastly the world-wide internet. The information gathering is needed to determine the technical requirement, material requirement, specify the functions and estimate the cost.

The following steps will be problem identification. This steps able students to find out the problem that will affect or bring any inconvenience to user. After that, find out the solutions and solve the related problem. Basically to design our product appearance in this process, we used Arduino software.

Second phase comprises into production process and internal and external system design. The development of the product can be the most important step for our project. In this step, solutions are compared on a qualitative basic such as appearance, durability and cost. The purpose is to build the product completely and successfully achieve the objective for this product.

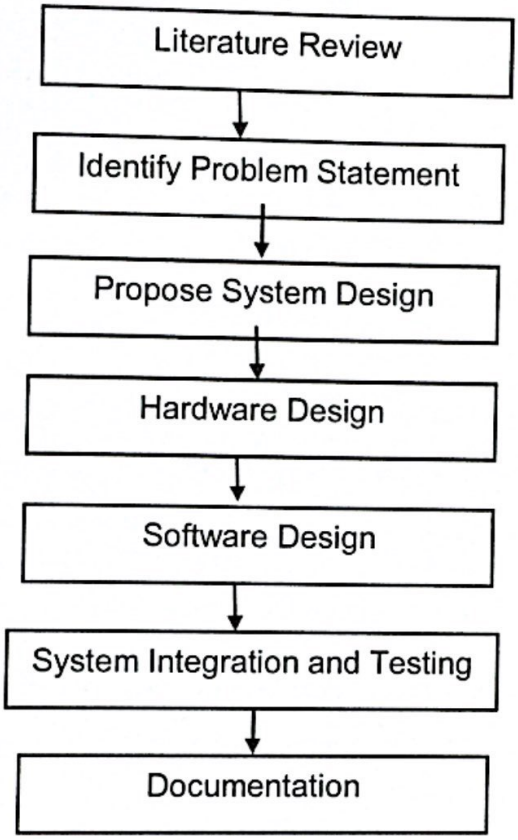
Third phase is identification and modification, namely, if there is a problem in material or equipment which used in the project mechanism. Final process is the testing of simulation of the project. The purpose is to know the project movement. In this phase, if the project got problem, it will return back to phase 1 to recheck and identify the problem.

3.2 Planning

Systematic planning is needed to ensure that projects are completed on time and run smoothly. Planning is the key ingredient to make a success project. Systematically project planning will produce excellent results

There are a few stages needed for this project to be completed. The stages are literature review, identifying problem statement, proposing the system design

including for hardware design and software design, system integration and testing and lastly is producing the documentation for a good reference.



Flowchart 3.1. Flowchart planning

The literature review is needed to understand what is required for this project to determine approaches and guidance in the selection of appropriate technologies and to understand the previous projects, so we could learn from their successes and investigate the problem to be solved or improvement to be taken for this project. Furthermore, the learning of the previous projects will help to minimize the costs and choosing the appropriate components to be used. This also will reduce the time to complete the design of the smart switch. Finally, the documentation of the product should be prepared after completed the system integration and testing process for future reference.

3.2.1 Data collection

Data collection is a stage in any area of study. At this stage we planned about the projects resources and requirements, literature studies and schedule to get more information in this study. All the materials are collected from journal, texts book and research papers gathered from libraries and Internet.

Within the data collection period we have found the study about the product. Once I got the project manual, I tried to find out the electronic component and other materials and some of equipment to be used.

While planning, we have done the research about the project related, which including with study about the electronic component such as capacitor, resistor, inductance, transistor and diode. The study is not just for the function of the component but the types of small circuit build by each component related.

3.2.2 Requirement of Hardware and Software

3.2.2.A Hardware

- Force Sensing Resistor (Interlink 400)

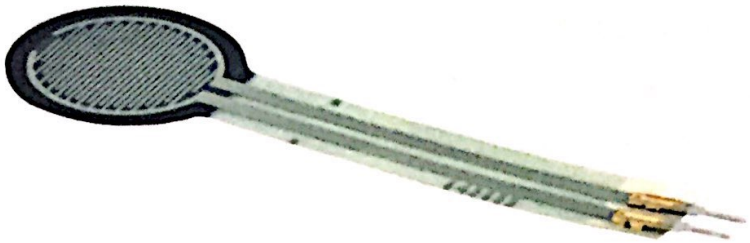


Figure 3.1 Force sensing resistor

Interlink 400 is resistive force sensing resistor which changes its resistance depends on the force of user. The resistive force sensing resistor is made of two layers of thick film conductive polymers. The more pressure the user gives, the more area of the resistive ink and traces contact and hence the resistance of the force sensing resistor decreased. This property allows continuous measurement of force.

- Spring 5 lbs

Figure 3.2 springs

Spring is an elastic object used to store mechanical energy. Springs are usually made out of spring steel. There are a large number of spring designs in everyday usage the term often refers to coil springs.

- PCB
  I. Bluetooth Module (HC-05)

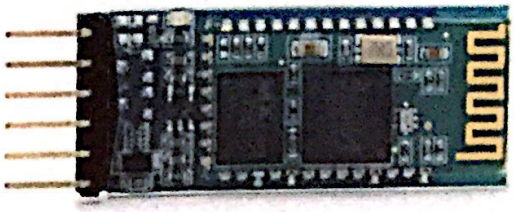


Figure 3.3 Bluetooth module

HC-05 module is an easy to use Bluetooth SPP (Serial Port Protocol) module, designed for transparent wireless serial connection setup. Serial port Bluetooth module is fully qualified Bluetooth V2.0+EDR (Enhanced Data Rate) 3Mbps Modulation with complete 2.4GHz radio transceiver and baseband.

- Arduino Nano

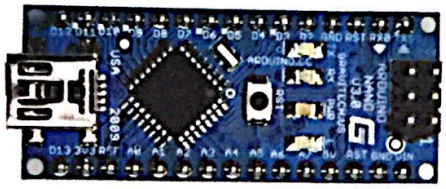


Figure 3.4 Arduino nano

Arduino Nano is a small, complete, and breadboard-friendly board based on the ATmega328 (Arduino Nano 3.x) or ATmega168 (Arduino Nano 2.x). It has more or less the same functionality of the Arduino Duemilanove, but in a different package.

3.2.2.B Software

- Android Application

Figure 3.5 Application

An Android Application is designed to guide user to achieve difference gesture of hands. The acquired data from force sensing resistor are then sent to Arduino Nano to calculate the result. We will use Bluetooth module at the device to send the result to the smartphone application. Application software in the smartphone not only view the result to the user but also gives an instruction and guide the user to go through the therapy interactively and as log in and registration function.

- Database

Figure 3.6 Database

A database is a collection of information that is organized so that it can easily be accessed, managed, and updated. Data from smartphone application are sent to server for storage. Database can sync user's data and as a data collection. Users can retrieve past record from the server for analysis

3.2.3 Design

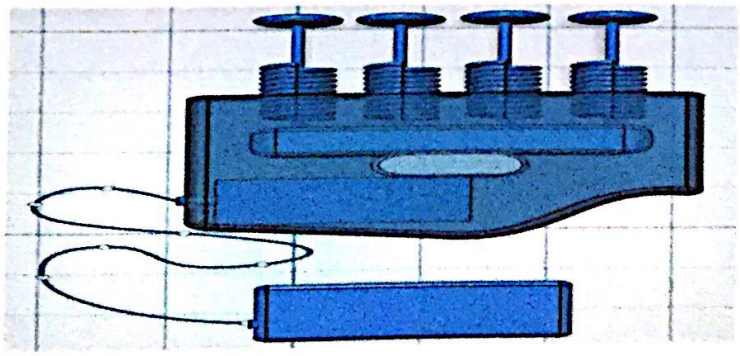


Figure 3.7 Autocad

3.2.4 Circuit design

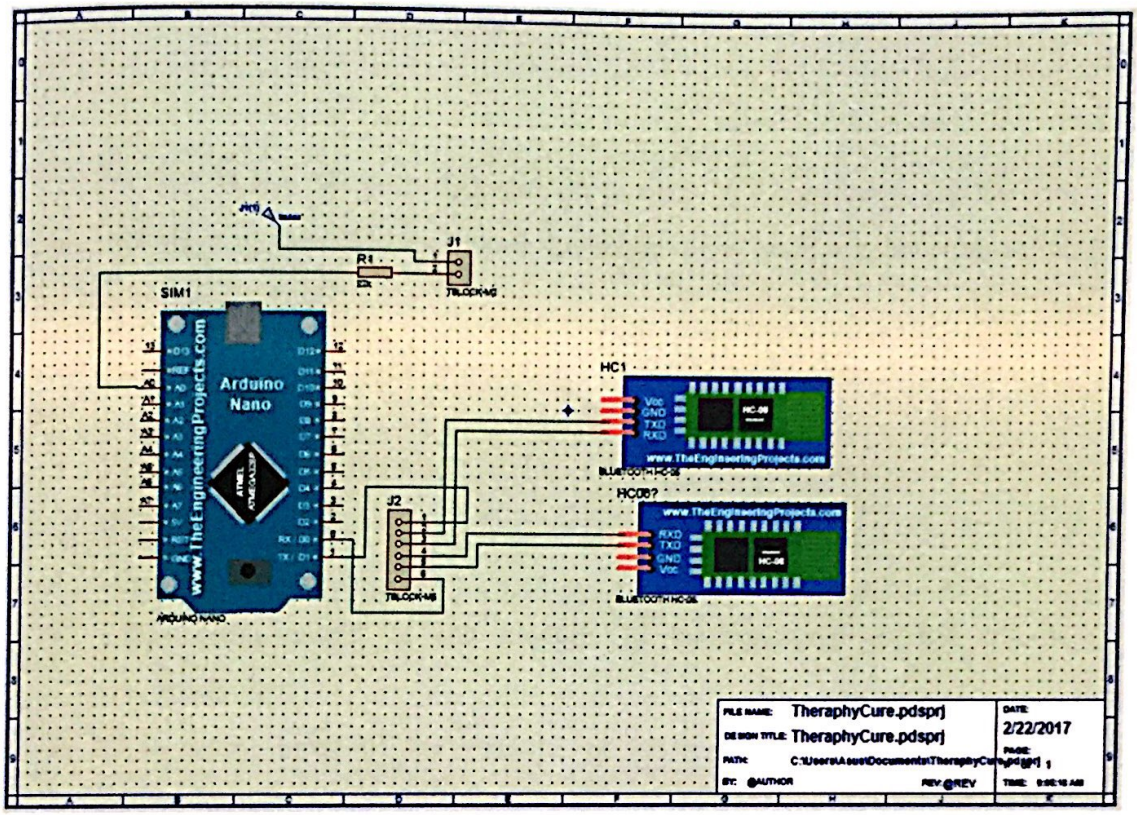


Figure 3.8 : Circuit Proteus

3.3 Implementing

3.3. 1Bluetooth module HC-05 & HC-06

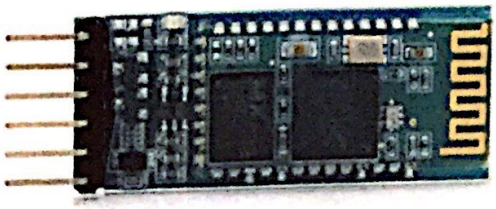


Figure 3.9 : Bluetooth Module

HC-05 module is an easy to use Bluetooth SPP (Serial Port Protocol) module, designed for transparent wireless serial connection setup. Serial port Bluetooth module is fully qualified Bluetooth V2.0+EDR (Enhanced Data Rate)3Mbps .Modulation with complete 2.4GHz radio transceiver and baseband.

HC-05 has the 'full' firmware on it: many AT commands, and be both master and slave module. In other word this module can build a connection to the other modules.

Pins:

- VCC- indicated in the range of 3.6V- 6V. the module worked for me both with 3.3V and 5V.
- GND- ground
- TXD- serial output of the module, to be connected to RX of the microcontroller.
- RXD- serial input of the module, to be connected to the TX of the microcontroller .
- STATE- connected to LED2 (pin 32) of the module.

Specification:

- Model: HC-05
- Color: green
- Material: PCB, plastic and iron
- Features: wireless Bluetooth series pass-through module
- Application: all kinds of electronic products

Hardware Features:

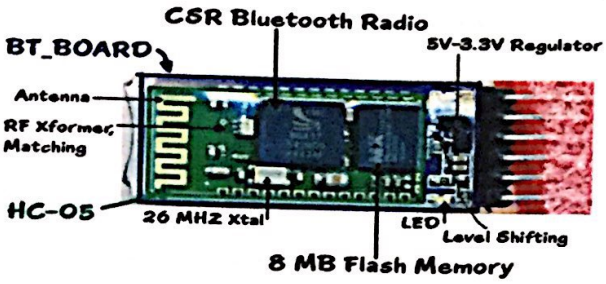


Figure 3.10 : Hardware features

- Typical -80dBm sensitivity
- Up to +4dBm RF transmit power
- Low power 1.8V Operation, 1.8 to 3.6V I/O
- PIO control
- UART interface with programmable baud rate
- With antenna
- With edge connector

Software Features:

- Default Baud: 38400
- Data bits: 8
- Stop bits: 1
- Parity: no parity
- Data control: has
- Auto-connect to the last device on power as default
- Permit pairing device to connect as default.

HC-06 firmware on the other hand only can be slave device, with very limited AT commands.

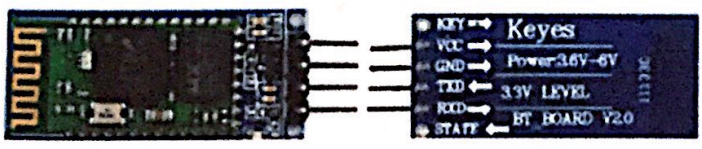


Figure 3.11: Bluetooth Module HC-06

Specification:

- Bluetooth protocol: Bluetooth 2.0+ EDR standard
- USB protocol: USB v1.1/2.0
- Operating frequency : 2.4 GHz ISM frequency band
- Modulation mode: gauss frequency shift keying
- Transmit power: <4dBm, second stage
- Sensitivity: <-84dBm at 0.1% Bit Error Rate
- Transmission speed: 2.1 Mbps(Max)/60 kpbs (asynchronous)
- Safety feature: authentication and encryption
- Supply voltage: +3.3 VDC 50mA

3.3.2 5 lbs spring

Figure 3.12 : Spring

Spring is an elastic object used to store mechanical energy. Springs are usually made out of spring steel. There are a large number of spring designs in everyday usage the term often refers to coil springs. when a spring is compressed or stretched from its resting position, it exerts an opposing force approximately proportional to its change in length (this approximation breaks down for large deflections).

The rate or spring constant of a spring is the change in the force in exerts, divided by the change in deflection of the spring. That is, it is the gradient of the force versus deflection curve. An extension or compression spring's rate is expressed in units of force divided by distance, for example lbf/in or N/M.

Hand finger exerciser have five model measurement of spring. The highest is hand finger exerciser in black color which is 9 lbs, blue color 7 lbs, green color 5 lbs, red color 3 lbs and yellow color 1.5 lbs. So we chose a green one (5 lbs) because it basic device (average of the five model)

. Force test measurement was performed to find the spring with exact force 5.00 lbs for our device. Force gauge is used to measure the maximum force that can be applied until spring is fully compressed.

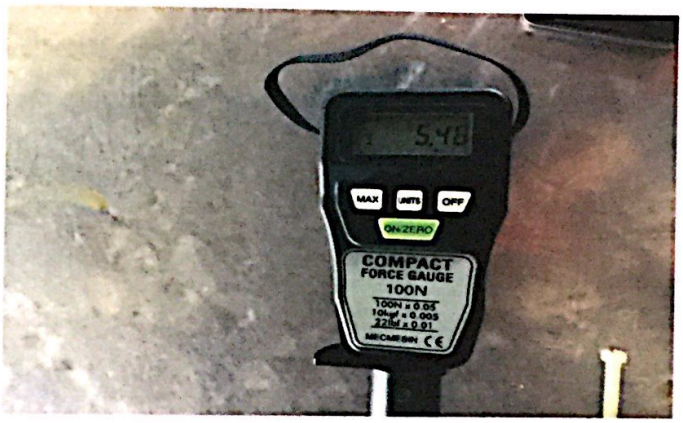


Figure3.13 : Force gauge

Application:

- Tension springs:

To resist stretching or tension loading. Tension coil springs typically utilize a hook or eye feature to secure the coil spring at each end.

- Compression springs:

To resist compression. Compression coil springs typically are utilized to resist compression loads. The ends of a compression coil spring are normally ground flat.

3.3.3 Database

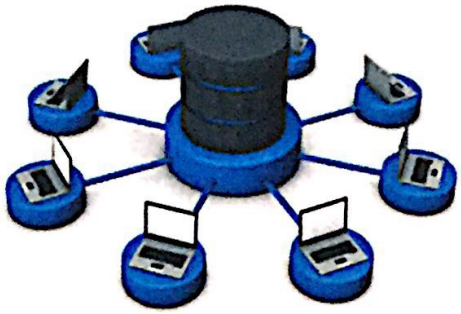


Figure 3.14 : Database

Database is an organized collection of data. It is the collection of schemas, tables, queries, reports, views, and other objects. The data are typically organized to model aspects of reality in a way that supports processes requiring information.

A database management system (DBMS) is a computer software application that interacts with the user, other applications, and the database itself to capture and analyze data. A general-purpose DBMS is designed to allow the definition, creation, querying, update, and administration of databases.

Well-known DBMSs include MySQL, PostgreSQL, MongoDB, MariaDB, Microsoft SQL Server, Oracle, Sybase, SAP HANA, MemSQL and IBM DB2. A database is not generally portable across different DBMSs, but different DBMS can interoperate by using standards such as SQL and ODBC or JDBC to allow a single application to work with more than one DBMS.

Database management systems are often classified according to the database model that they support; the most popular database systems since the 1980s have all supported the relational model as represented by the SQL language. Sometimes a DBMS is loosely referred to as a 'database'.

For our project, we use Visual Basic 6 as database. Visual Basic is a third generation event-driven programming language and integrated development environment (IDE) from Microsoft for its Component Object Model (COM) programming model first released in 1991 and declared legacy in 2008. Microsoft intended Visual Basic to be relatively easy to learn and use. Visual Basic was derived from BASIC, a user-friendly programming language designed for beginners, and it enables the rapid application development (RAD) of graphical user interface (GUI) applications, access to databases using Data Access Objects, Remote Data Objects, or ActiveX Data Objects, and creation of ActiveX controls and objects.

A programmer can create an application using the components provided by the Visual Basic program itself. Over time the community of programmers developed third party components. Programs written in Visual Basic can also use the Windows API, which requires external function declarations.

3.3.4 Application

Figure 3.15 : Application

Application that we use was Bluetooth Electronics apps. This app communicates using Bluetooth to an HC-06 or HC-05 Bluetooth module. This app with a library containing 10 Bluetooth examples for Arduino. It also ideal for learning electronics in fun way, rapid prototyping a new idea and for exhibiting the project.

Features:

- 20 customizable panels
- Import/export panels
- Library of 10 Arduino examples
- Send a accelerometer values over Bluetooth
- Rolling or X-Y scatter graphs

Technical details:

- Size: 5.0MB
- Version: 1.1
- Developed by: Keuwlsoft
- Required android: Android 4.0 and up

3.3.4 Force sensing resistor

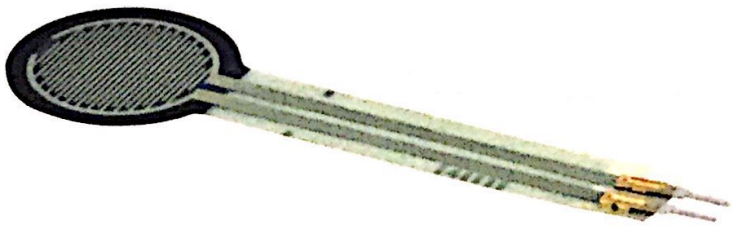


Figure 3.16 Force sensing resistor

A force-sensing resistor is a material whose resistance changes when a force or pressure is applied. They are also known as "force-sensitive resistor".

Interlink 400 is a single-zone Force Sensing Resistor optimized for use in human touch control of electronic device such as automotive electronics, medical systems, and in industrial and robotics applications. FSRs is two wired devices. They are robust polymer thick film (PTF) sensors that exhibit a decrease in resistance with increase in force applied to the surface of the sensor. It has a 5.1mm diameter active area and is available in 4 connection options.

Connector option:

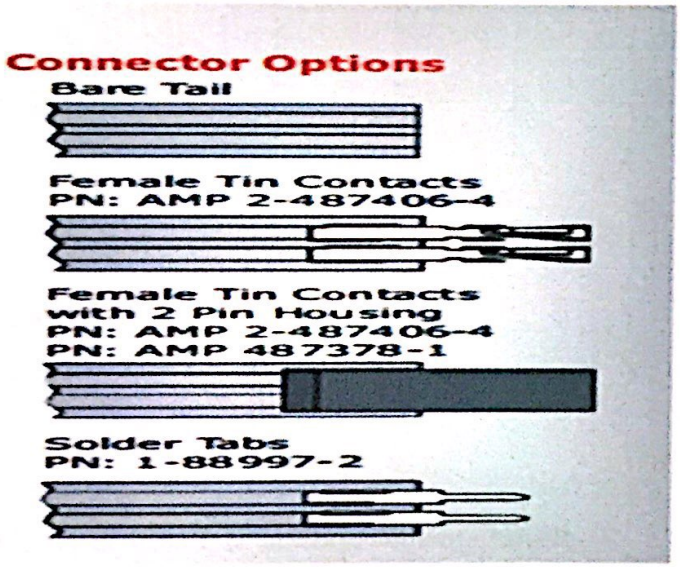


Figure 3.17 : Cable connector option

Features:

- Actuation force as low as 0.1N and sensitivity range to 20N.
- Easily customizable to a wide range of sizes.
- Cost effective.
- Ultra thin.
- Robust: up to 10 million actuation.
- Simple and easy to integrate

Application:

- Detect and qualify press – sense whether a touch is accidental or intended, by reading force.
- Use force for UI feedback – detect more or less user force, to make a more intuitive interface.
- Find centroid of force – use multiple sensors to determine centroid of force.
- Detect presence, position or motion of a patient in a bed, chair or medical device.

Related products:

- FSR 400 short
- FSR 402 short
- FSR 402
- FSR 406
- FSR 408
- FSR 400 series HDK

3.4 Data Analysis (Bluetooth Connection)

3.4.1 Without obstacle

Table 3.1 Bluetooth connection without obstacle

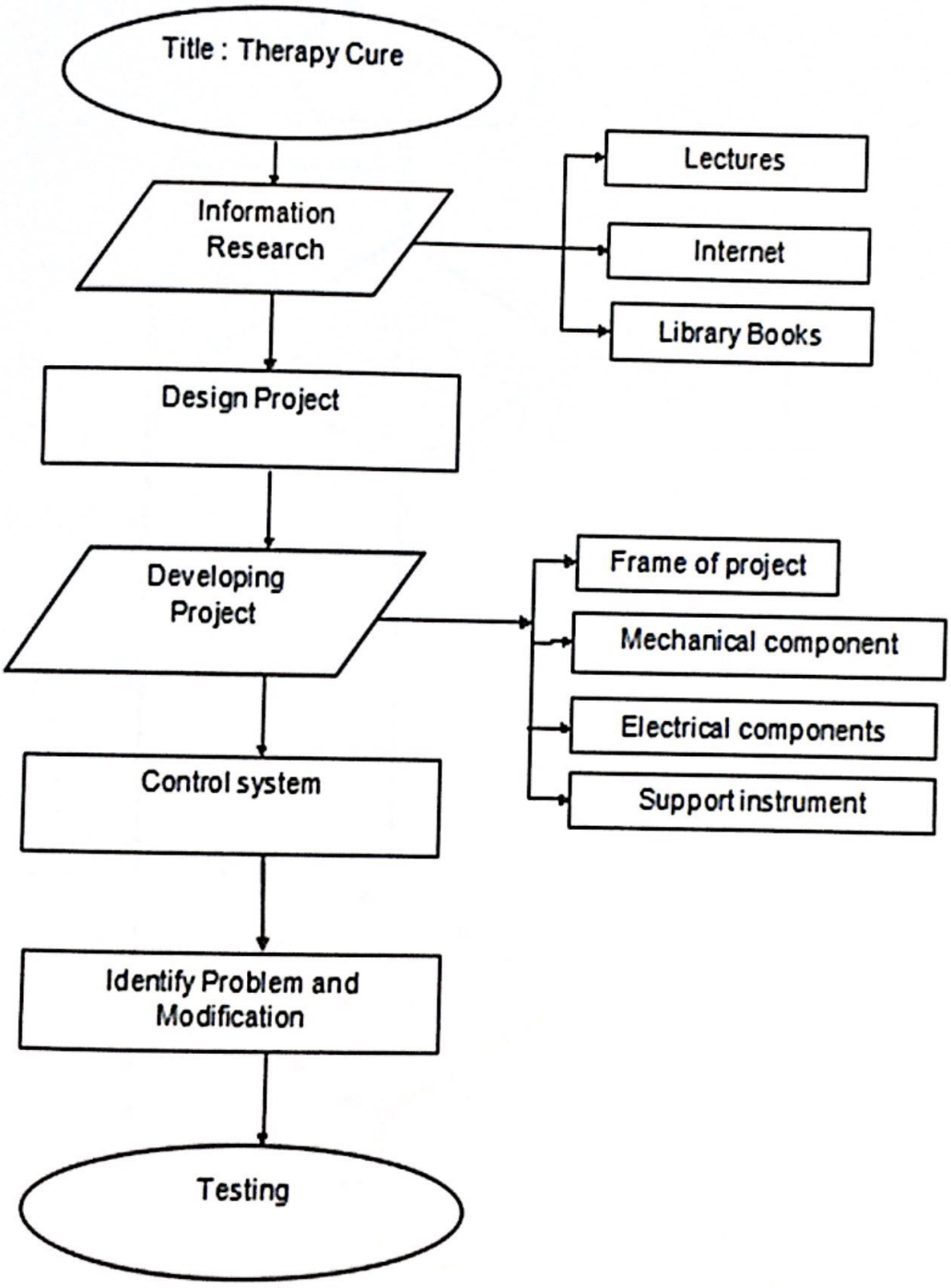
DISTANCE (m)	CONNECTION
2	Connected
4	Connected
6	Connected
8	Connected
10	Not connected

3.4.2 With Obstacle

Table 3.2 Bluetooth connection with obstacle

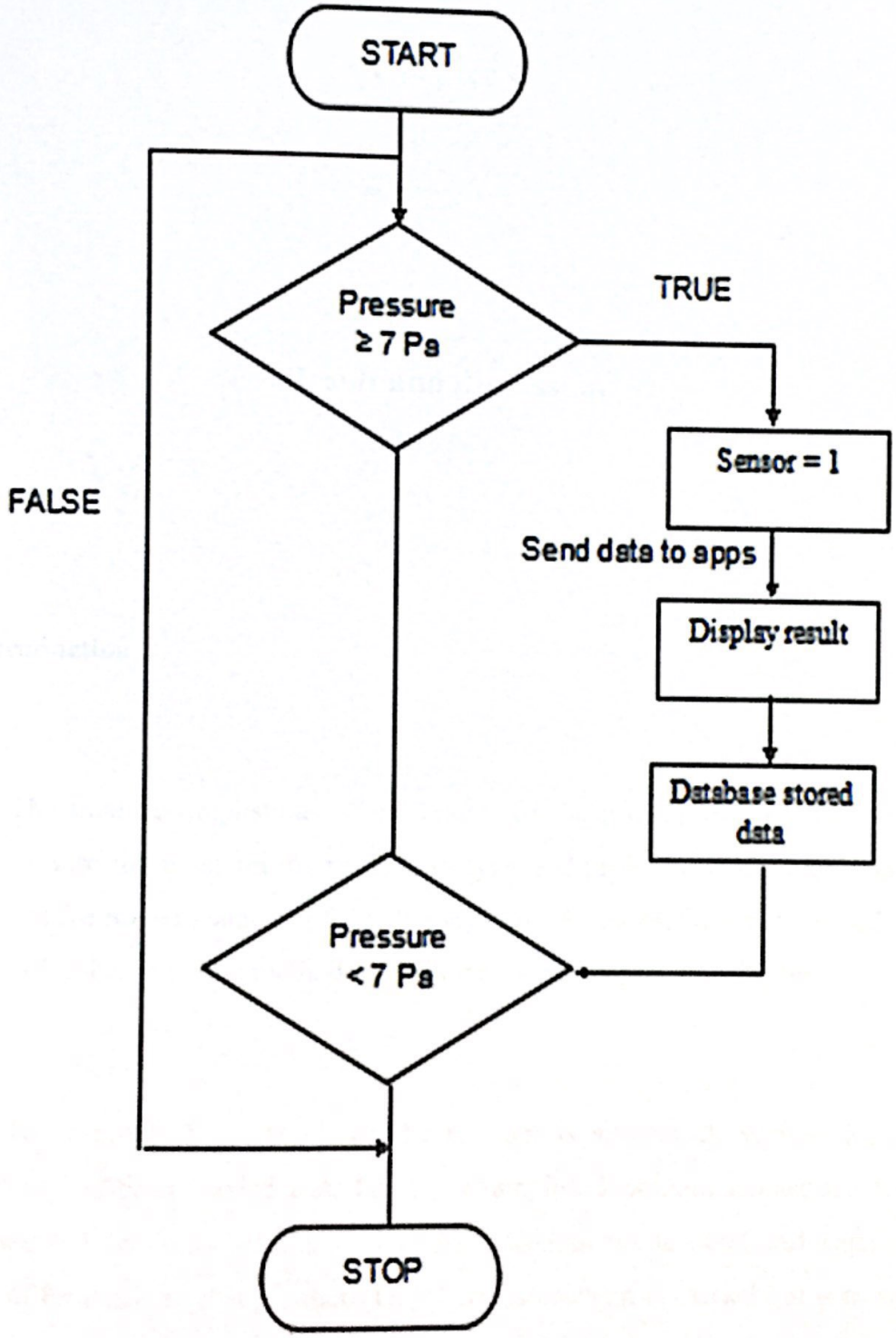
DISTANCE (m)	CONNECTION
2	Connected
4	Connected
6	Connected
8	Not connected
10	Not connected

3.5 Flowchart of methodology



Flowchart 3.2 : Methodology of the project

3.6 Flowchart of programming



Flowchart 3.3 : Flowchart programming

Chapter 4

Result and discussion

4.1 Introduction

The final accomplishments and results of the project are explained in this chapter. It also discusses on the results, analysis and problems that are encountered throughout the implementation of the therapy cure. A successful result was achieved in this project based on the methodology as mentioned in preview chapter

To ensure that the result of the product is successful, various forms of assessment has been carried out. For the examples, bluetooth connection test to measure speed durability of this product and questionnaire to obtain information on the use of feedback on this product . Objective assessment is carried out is to ensure that all the weaknesses of the product can be repaired before final presentation and the product is safe to use and can achieve the objectives.

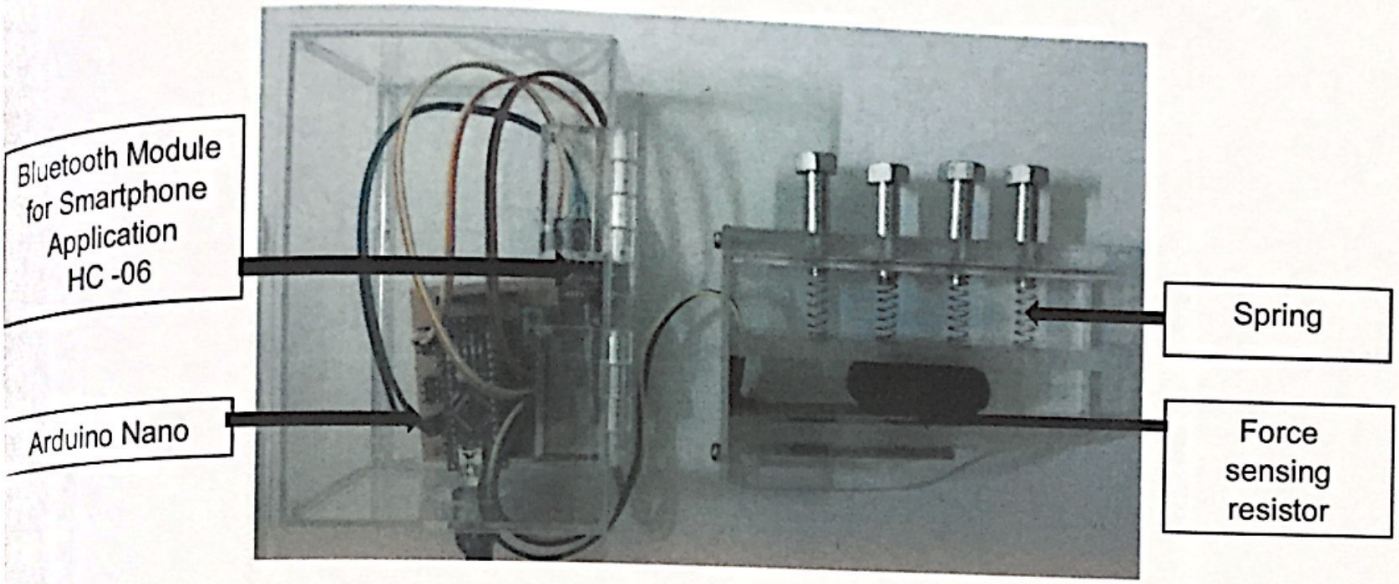


Figure 4.1 Hardware design

Figure 4.2 : Hardware design

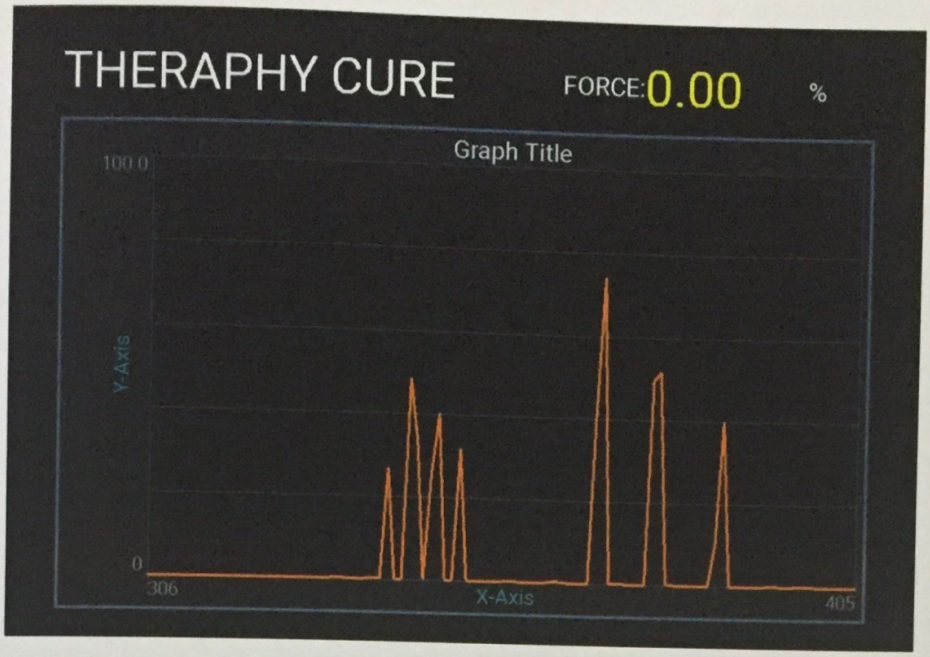


Figure 4.3 : Smartphone application

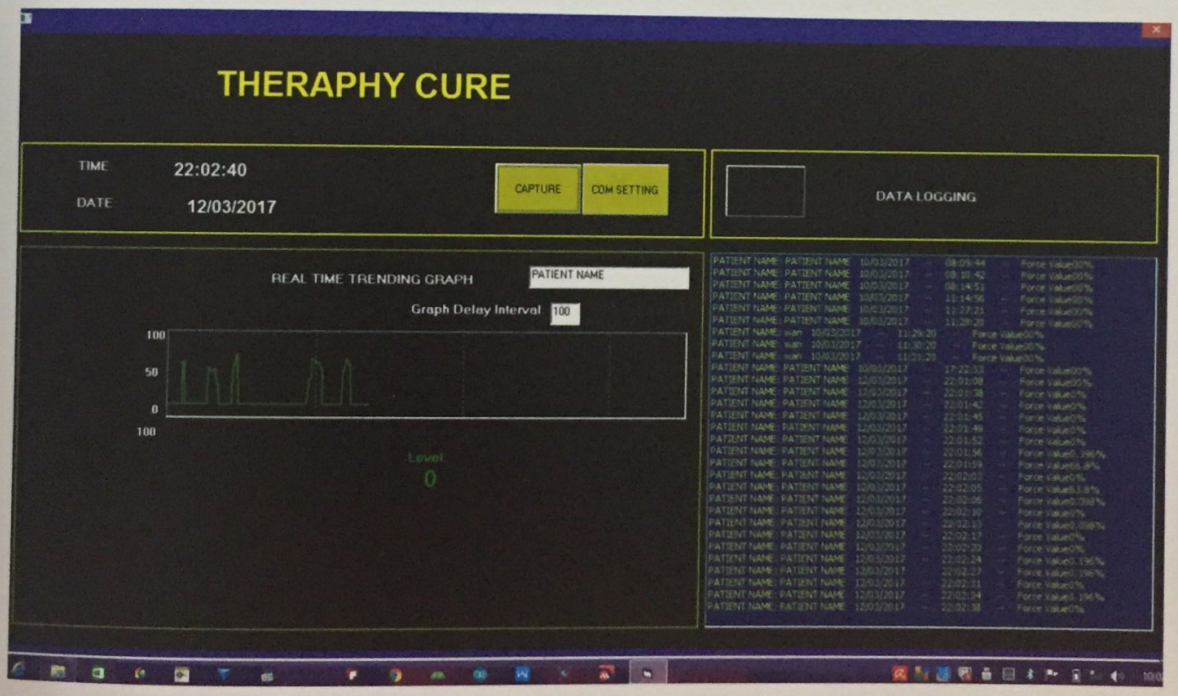


Figure 4.4 : Database

4.2 Technical analysis

The purpose of technical analysis is to ensure that the resulting product is to function properly and achieve the objectives set. And to ensure the project after testing is safe to be use.

4.2.1 Electrical safety test

An electrical safety test was carried out to make sure our product therapy cure is safe to be used and safe from any leakage current. It is essential to ensure safe operating standards for our product that uses electricity.

Table 4.1 :Electrical Safety Test Questionnare

No	Statement	Yes	No
1.	Is there any leakage current on the device?		✓
2.	Is the device are properly grounded?	✓	
3.	Continuity test (passed)?	✓	
4.	Connection between components are properly connected?	✓	
5.	Does the device has safety features?	✓	
6.	Calibration (spring) are done	✓	

4.2.2 Bluetooth connection test

Bluetooth module HC-06 are used to send data from arduino nano (product) to smartphone application, while bluetooth module HC-05 are used to send data from smartphone application to database. This Bluetooth connection test are performed to analyze how far bluetooth connection can be made.

Table 4.2 Bluetooth connection test with obstacle

Distance (m)	Connection
2	Connected
4	Connected
6	Connected
8	Connected
10	Not connected

Based on the table above, we can conclude that Bluetooth connection without obstacle can only be connected to 9 meter away.

Table 4.3 Bluetooth connection test without bluetooth

Distance (m)	Obstacle
2	Connected
4	Connected
6	Connected
8	Not connected
10	Not connected

Based on the table above, we can conclude that Bluetooth connection with obstacle can only be connected to 7 meter away.

4.2.3 Force measurement test

Spring are used to provide resistance for more reliable grip from user when they exert force on the device.

Force gauge is used to measure the maximum force that can be applied until spring is fully compressed. Force test measurement was performed to find the spring with exact force 5.00 lbs for our device.

Spring are picked randomly and are measured one by one until we find a spring with a closest reading which is 5.46 lbs.

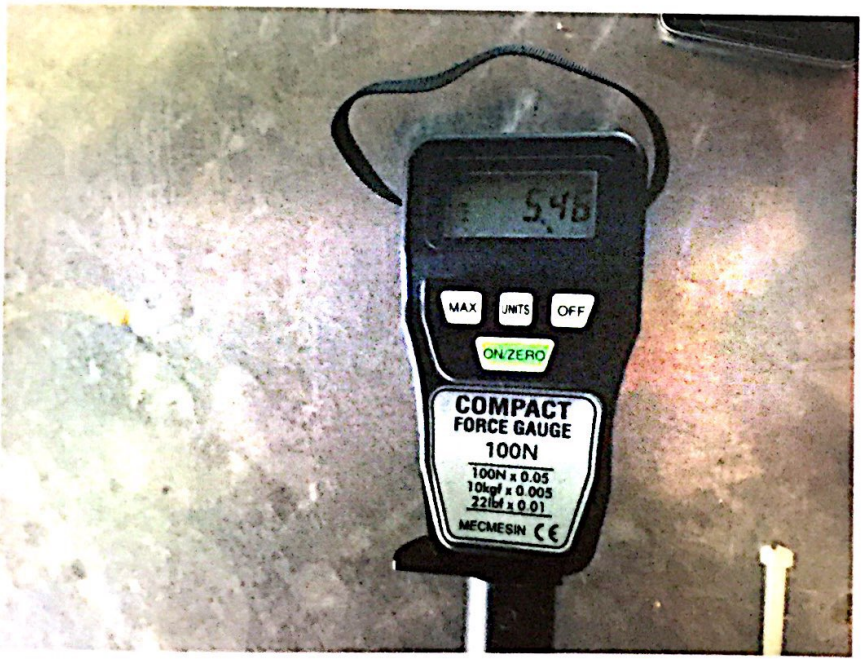


Figure 4.5 : Force test measurement

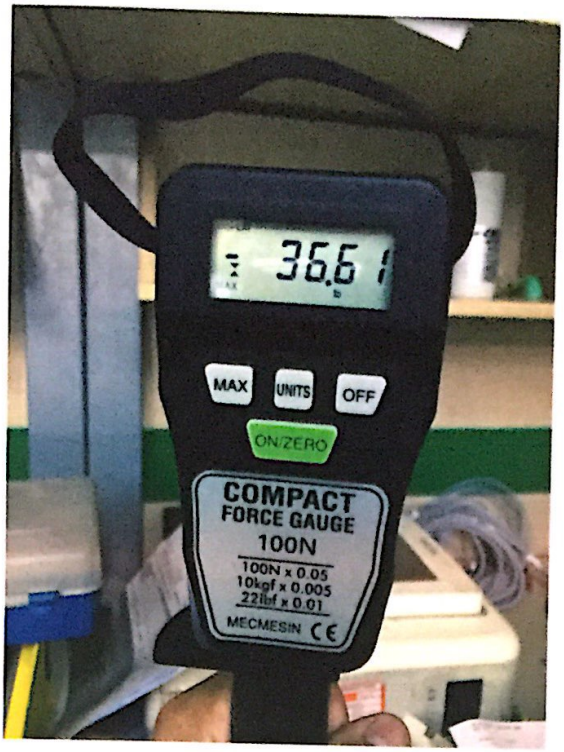


Figure 4.6 : Force Test Measurement

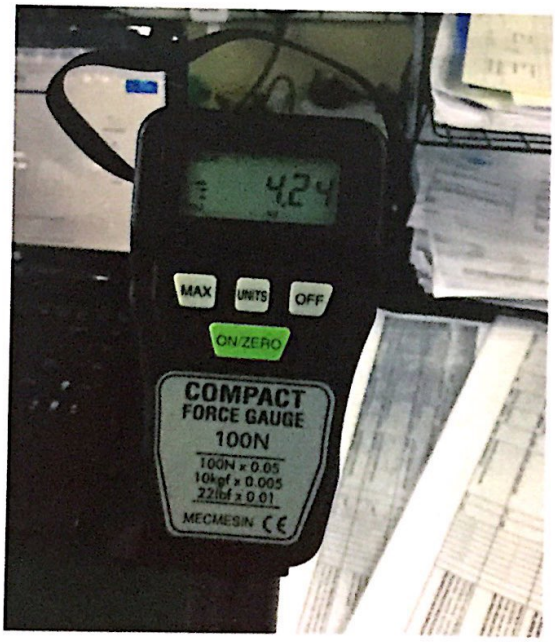


Figure 4.7 : Force Test Measurement

4.3 Data analysis

The purpose of data analysis is to obtain information from the feedback on this product to function properly according to the objectives set. And to ensure the user meet the requirement of the market

4.3.1 Questionnaire

A questionnaire is a research instrument consisting of a series of questions and other prompts for the purpose of gathering information from respondents. Product that have been ready, will be carried out studies on the product and its uses. Studies conducted to obtain information on the use of feedback on this product. In addition, the distribution of survey forms were distributed level of user satisfaction to ensure the information is correct in order to improve this product.

This survey was conducted involving 40 students from Polytechnic of Sultan Salahuddin Abdul Aziz Shah, Shah Alam in Electronic Engineering (Medical) Course are selected for this questionnaire. These students are in final year that have undergoing their industrial training in hospitals and company. Other than that, we also do the survey involving 5 therapist from Hospital Kuala Lumpur and 2 biomedical technician from Radibems. Sdn. Bhd. Branch of Hospital Kuala Lumpur. In this sample, we demonstrate our product and a questionnaire was given to them.

Figure 4.8 : Demonstration

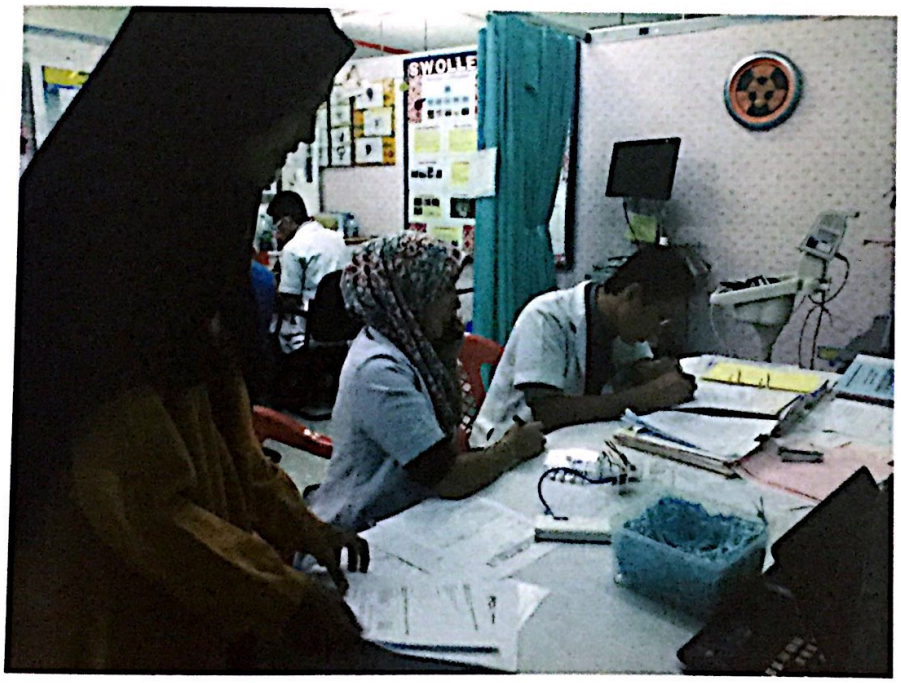
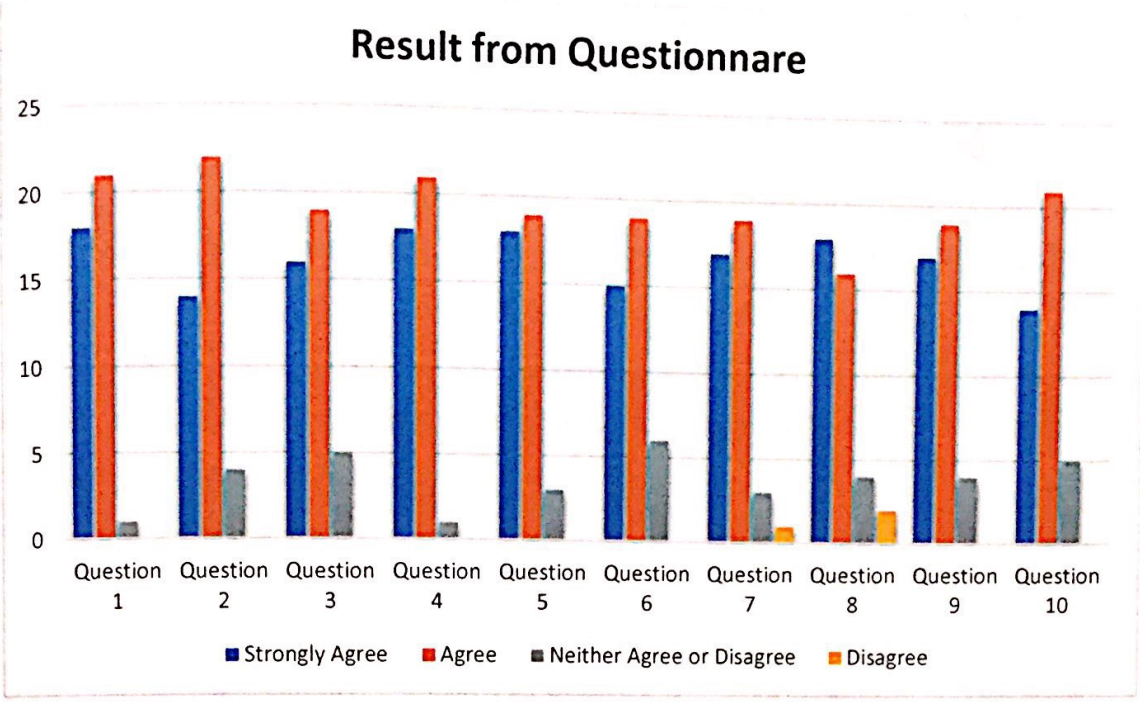


Figure 4.9 : Survey session

Table 4.4 Table below represent the data collected during our survey as shown.

No	Statement	Strongly Agree	Agree	Neither Agree or Disagree	Disagree	Strongly Disagree
1.	Do you agree therapy cure combine with the latest technology?	**18**	**21**	**1**	**0**	**0**
2.	This therapy cure is easy to be used?	**14**	**22**	**4**	**0**	**0**
3.	This therapy cure is safe to be used?	**16**	**19**	**5**	**0**	**0**
4.	This therapy cure helps you to analyse your performance?	**18**	**21**	**1**	**0**	**0**
5.	This therapy cure can display and save your result immediately?	**18**	**19**	**3**	**0**	**0**
6.	Can you do treatment by using this therapy cure without supervision by therapist?	**15**	**19**	**6**	**0**	**0**
7.	This therapy cure design is comfortable to be used?	**17**	**19**	**3**	**1**	**0**
8.	This therapy cure is portable?	**18**	**16**	**4**	**2**	**0**
9.	This therapy cure can increase the efficiency of treatment?	**17**	**19**	**4**	**0**	**0**
10.	This therapy cure meet the requirement of the market?	**14**	**21**	**5**	**0**	**0**



Graph 4.1 : Survey Graph

This bar chart above shows the responses of 40 students from Electronic Engineering (Medical) course that are in final year that have undergoing their industrial training in hospitals and company. Also, 6 therapist from Hospital Kuala Lumpur and one biomedical engineer from Radibems Sdn. Bhd. Branch o f Hospital Kuala Lumpur. In this survey, we demonstrate our product and a questionnaire was given to them.

This particular bar chart Question 1 above shows the survey result about do you agree a developed hang finger exerciser combine with the latest technology. 18 respondents answered strongly agree, 21 respondents answered agree, and only one respondent answered disagree. We can conclude that most of the respondents agree that a therapy device combine with the latest technology

This particular bar chart Question 2 above shows the survey result about this therapy cure is easy to be used. At the bar chart above we can see that, 14 respondents answered strongly agree, 22 respondents answered agree, and 4 respondents answered disagree. We can conclude that this therapy cure is easy to be

use because it connect with the smartphone application and database to display and record a data

This particular bar chart Question 3 above shows the survey result about this therapy cure is safe to be used. 16 respondents answered strongly agree, 19 respondents answered agree, and 5 respondents answered neither agree or disagree. Overall, most of the respondents include biomedical engineer agree that this therapy cure is safe to be use.

This particular bar chart Question 4 above shows the survey result about this therapy cure helps you to analyse your performance. 18 respondents answered strongly agree, 21 respondents answered agree and only one respondents answered neither agree or disagree. We can conclude that it helps to analyse a performance or development of grasp strength by using force sensing resistor.

This particular bar chart Question 5 above shows the survey result about this therapy cure can display and save your result immediately. At the bar chart above we can see that the 18 respondents answered strongly agree, 19 respondents answered agree, and 3 respondents answered neither agree or disagree. We can conclude that most of the respondents agree that therapy cure display and save result immediately.

This particular bar chart Question 6 above shows the survey result about can you do treatment by using this therapy cure without supervision by therapist. We can see that 15 respondents answered strongly agree, 19 respondents answered agree, and 6 respondents answered neither agree or disagree. We can conclude that this therapy cure can be use without supervision by therapist because a patient can undergo therapy session using this product in more convenience way (home-therapy). Because it connect directly with database that the data will be directly sends to server (therapist).

This particular bar chart Question 7 above shows the survey result about this therapy cure design is comfortable to be used. As we can see, 17 respondents answered strongly agree, 19 respondents answered agree, 3 respondents answered neither agree or disagree, and only one answered disagree. Overall, most of respondent was answered agree that they comfortable when they use this product.

This particular bar chart Question 8 above shows the survey result about this therapy cure is portable. At the bar chart above we can see that 18 respondents answered strongly agree, 16 respondents answered agree. 4 respondents answered neither agree or disagree and 2 respondents answered disagree. Based on the result, we can conclude that this therapy cure is portable to be used

This particular bar chart Question 9 above shows the survey result about this therapy cure can increase the efficiency of treatment. At the bar chart above we can see that 17 respondents answered strongly agree, 19 respondents answered agree and 4 respondents answered neither agree or disagree. We can conclude most the respondents especially therapist strongly agree that this therapy cure can increase the efficiency of treatment.

This particular bar chart Question 10 above shows the survey result about is this therapy cure meet the requirement of the market. We can see that, 14 respondents strongly agree, 21 respondents agree and 5 respondents neither agree or disagree. We can conclude that most of the repondents espeacially therapists and biomedical engineer agree that this therapy cure meet the requirement of the market because it combine with the latest technology.

Overall we can conclude that our product, therapy cure can achieve the objectives and can be used in occupational therapy unit and also as a home therapy because most of the respondents was satisfied with our product

Chapter 5

Conclusion and suggestion

5.1 Conclusion

During the whole two(2) semester our group has been working really hard to make this project is a success. All problem that comes we'll face it together with our group members. We manage to produce good teamwork between us in handling managing all works and problems.

Other than that, during the process of making and building a circuit for the device, we involved into too many problems. We as an electrical student, we're don't really have experience in handling electronic components such as arduino nano, bluetooth module, and others. So when we tried ourselves to connect the circuit with the components, we often blown out the component away. Not only that it cost us our time, since we need to redo the circuit so many times, but this incident also cost us our money, we need to keep buying those components that blown out.

So in order to prevent any blown out happened again, we decided to asked opinions from the experienced one. From their suggestion, we used a more suitable material and tools to ensure there will be no more blown out happened to the other materials.

Next is, we happened to have a problem with the spring that need to be used for the device. The spring that we used is 5 lbs which is about 7.3 kg precisely. We have problem to search the exact spring for the device and it took us about more than a week to search for it, but at the end we managed to handle the problem pretty well.

Next is regarding the design for the casing of the device. At first we decided to use an ABS plastic as what we know that kind of plastic is pretty durable and good. But sadly, when we're trying to search for that plastic we receive lots of negative opinions from the seller stating that, that kind of plastic is hard to find and can only be found from the factory. Not only that, that kind of plastic can also cost us an arm and leg since its very expensive. So we found another way to settle this problem and we decided to use a Perspex instead. Perspex can be pretty strong against pressure and not really expensive. Though it have many disadvantage compare to ABS but it sure worth too.

As for the conclusion, we as a group did face all the problems that arise since the beginning of the semester until the end that we managed to finish the project. This project would not be here without all the hard works from everyone from the group, friends and the lecturer that have been always supervise us in many ways.

5.2 Suggestion

Once the project is done, we did some questionnaire around Politeknik Sultan Salahuddin Abdul Aziz Shah. According to the Krejcie and Morgan sample size table, we decided to do a questionnaire to 40 people including physiotherapy staff and physiotherapy doctor. Most of them gave us positive and excellent feedback regarding our project but there are still some comments and suggestion that they gave for us to improve our project.

One of the suggestion that we get is from a therapist of Hospital Kuala Lumpur. En Muhammad Azhari suggest us to use soft pad around the tool to give more comfort for patient and user while gripping. This is one of the suggestion that we thought could help in improving our project to be better and also can increase the market value. Not only that, he believe that by using a soft pad can help patient to undergo treatment more easily, since with a soft pad, the friction between the device and patient's hand could be decreased hence it will not inflict hurt on patient.

Suggestion is also from a therapist, En Muhammad Saifullah suggest a device that can be more smaller without the need of attachments. He also suggest for us to create a device that can be used in any position of hand which maybe we will build in the future. To build a device that can be more smaller without the need of attachments maybe needs more time for research since to measure grip power, we need a device with the size of a grip.

Another suggestion is about the resistance on the device, Miss Nur Farhana suggest us to put variable resistance on the device. This variable resistance can be setting according to the condition of the patient. At first our group also thought to build this kind of device but we don't have enough info and time to do it, so we decided to build a basic device instead.

Lastly, would be a suggestion from a biomedical student. She suggest us to use a design of product which more compact and interesting. We do agree to her suggestion, perspex might be not very compact and interesting. Maybe in the future we could think of other design that could be more attractive and compact according to the liking of both users and patients.

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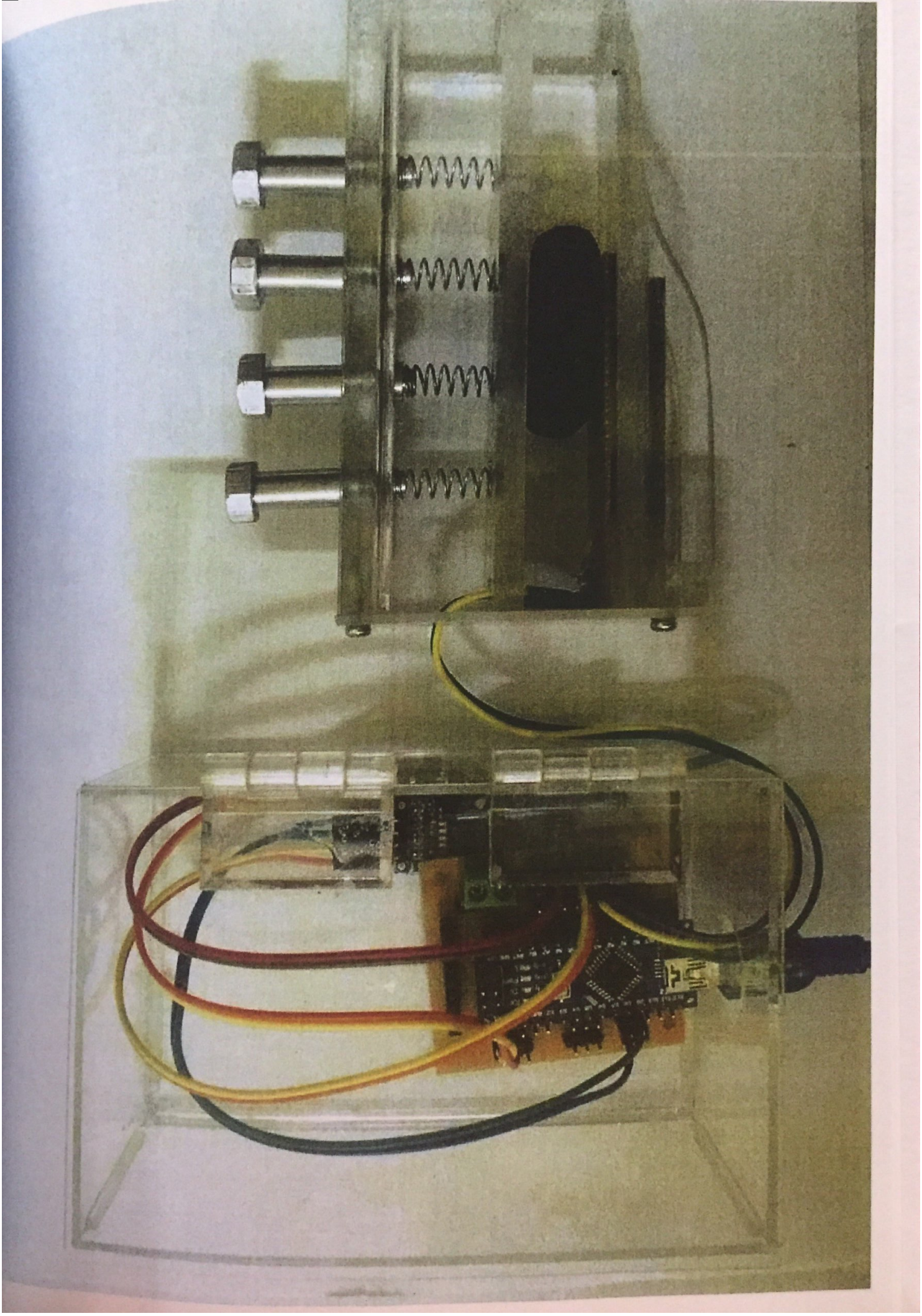


POLITEKNIK
Sultan Salahuddin Abdul Aziz Shah
Jabatan Pengajian Politeknik

FEEDBACK FORM

THERAPY CURE

SECTION A

NAME :

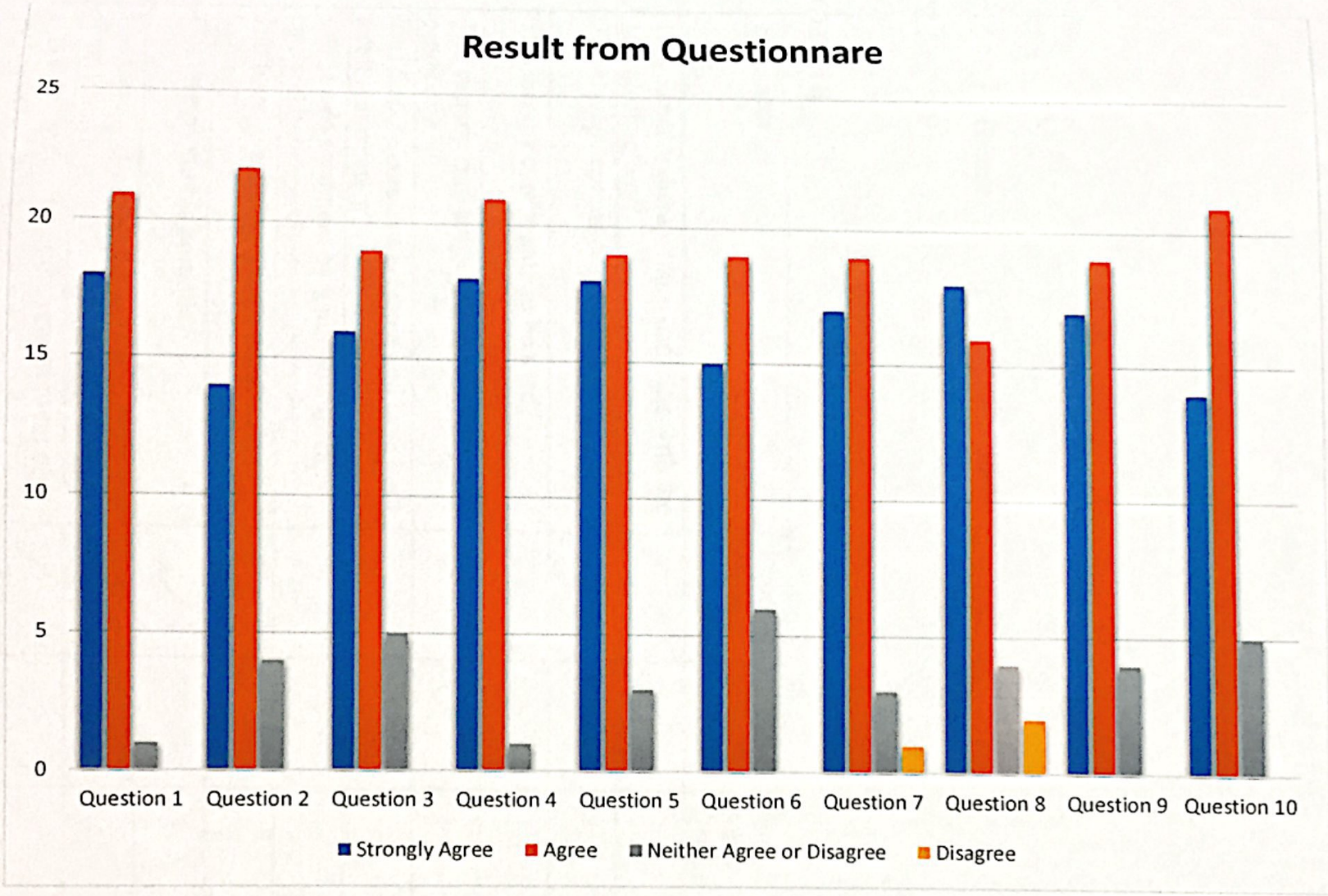
GENDER : Female ☐ Male ☐

AGE :

SECTION B

No	Statement	Strongly Agree	Agree	Neither Agree or Disagree	Disagree	Strongly Disagree
1.	Do you agree therapy cure combine with the latest technology?					
2.	This therapy cure is easy to be used?					
3.	This therapy cure is safe to be used?					
4.	This therapy cure helps you to analyze your condition?					
5.	This therapy cure can produce and save your result immediately?					
6.	Can you do treatment by using this therapy cure without supervision by therapist?					
7.	This therapy cure design is comfortable to be used?					
8.	This therapy cure is portable?					
9.	This therapy cure can increase the efficiency of treatment?					
10.	This therapy cure meet the requirement of the market?					

Suggestion or recommendation that can be added on this therapy cure



POLITEKNIK
Sultan Salahuddin Abdul Aziz Shah
Jabatan Pengajian Politeknik

FEEDBACK FORM

THERAPY CURE

SECTION A

NAME : Norzlin Yaacob

GENDER : Female [✓] Male [ ]

AGE : 38

SECTION B

No	Statement	Strongly Agree	Agree	Neither Agree or Disagree	Disagree	Strongly Disagree
1.	Do you agree therapy cure combine with the latest technology?	✓				
2.	This therapy cure is easy to be used?	✓				
3.	This therapy cure is safe to be used?	✓				
4.	This therapy cure helps you to analyze your condition?		✓			
5.	This therapy cure can produce and save your result immediately?	✓				
6.	Can you do treatment by using this therapy cure without supervision by therapist?		✓			
7.	This therapy cure design is comfortable to be used?	✓				
8.	This therapy cure is portable?	✓				
9.	This therapy cure can increase the efficiency of treatment?	✓				
10.	This therapy cure meet the requirement of the market?	✓				

Suggestion or recomendation that can be added on this therapy cure

Norzlin Ya'acob
Pegawai Pembantu Perubatan Fisioterapi Gred 1441
Jabatan Fisioterapi

POLITEKNIK
Sultan Salahuddin Abdul Aziz Shah
Jabatan Pengajian Politeknik

FEEDBACK FORM

THERAPY CURE

SECTION A

NAME : IRWAN SHAHIR BIN MOHAMED ZAMRI
Sr BMT II
Biomedical Engineering Maint. Services
Radicare (M) Sdn Bhd
Kuala Lumpur

GENDER : Female ☐ Male ☑

AGE : 26

SECTION B

No	Statement	Strongly Agree	Agree	Neither Agree or Disagree	Disagree	Strongly Disagree
1.	Do you agree therapy cure combine with the latest technology?	✓				
2.	This therapy cure is easy to be used?		✓			
3.	This therapy cure is safe to be used?		✓			
4.	This therapy cure helps you to analyze your condition?	✓				
5.	This therapy cure can produce and save your result immediately?	✓				
6.	Can you do treatment by using this therapy cure without supervision by therapist?	✓				
7.	This therapy cure design is comfortable to be used?		✓			
8.	This therapy cure is portable?		✓			
9.	This therapy cure can increase the efficiency of treatment?	✓				
10.	This therapy cure meet the requirement of the market?	✓				

Suggestion or recomendation that can be added on this therapy cure

The device is safe to be used.

IRWAN SHAHIR BIN MOHAMED ZAMRI
Sr BMT II
Biomedical Engineering Maint. Services
Radicare (M) Sdn Bhd
Kuala Lumpur

POLITEKNIK
Sultan Salahuddin Abdul Aziz Shah
Jabatan Pengajian Politeknik

FEEDBACK FORM

THERAPY CURE

SECTION A

NAME : NURFARHANA DAHLAN ~~MOHD HAFIZUL HASIMIN B. MOHD NOOR~~

GENDER : Female [✓] Male [✗]

AGE : 25

SECTION B

No	Statement	Strongly Agree	Agree	Neither Agree or Disagree	Disagree	Strongly Disagree
1.	Do you agree therapy cure combine with the latest technology?	✓				
2.	This therapy cure is easy to be used?		✓			
3.	This therapy cure is safe to be used?	✓				
4.	This therapy cure helps you to analyze your condition?	✓				
5.	This therapy cure can produce and save your result immediately?	✓				
6.	Can you do treatment by using this therapy cure without supervision by therapist?		✓			
7.	This therapy cure design is comfortable to be used?		✓			
8.	This therapy cure is portable?	✗			✓	
9.	This therapy cure can increase the efficiency of treatment?		✓			
10.	This therapy cure meet the requirement of the market?		✓			

Suggestion or recommendation that can be added on this therapy cure

To produce resistance setting for the device.

NURFARHANA DAHLAN
Juruphilin Perubatan
Fisioterapi Gred U29
Jabatan Fisioterapi
Hospital Kuala Lumpur

POLITEKNIK
Sultan Salahuddin Abdul Aziz Shah
Jabatan Pengajian Politeknik

FEEDBACK FORM

THERAPY CURE

SECTION A

NAME : MUHAMMAD AZHARI B. ABDUL AZIZ.

GENDER : Female ☐ Male ☒

AGE : 26

SECTION B

No	Statement	Strongly Agree	Agree	Neither Agree or Disagree	Disagree	Strongly Disagree
1.	Do you agree therapy cure combine with the latest technology?	✓				
2.	This therapy cure is easy to be used?		✓			
3.	This therapy cure is safe to be used?	✓				
4.	This therapy cure helps you to analyze your condition?	✓				
5.	This therapy cure can produce and save your result immediately?	✓				
6.	Can you do treatment by using this therapy cure without supervision by therapist?		✓			
7.	This therapy cure design is comfortable to be used?		✓			
8.	This therapy cure is portable?	✓				
9.	This therapy cure can increase the efficiency of treatment?	✓				
10.	This therapy cure meet the requirement of the market?		✓			

Suggestion or recommendation that can be added on this therapy cure

Soft pad around the tool ~~for~~ to give more comfort while gripping.

MUHAMMAD AZHARI ABDUL AZIZ
JURUPULIH PERUBATAN FISIOTERAPI U29
JABATAN FISIOTERAPI
HOSPITAL KUALA LUMPUR.

POLITEKNIK
Sultan Salahuddin Abdul Aziz Shah
Jabatan Pengajian Politeknik

FEEDBACK FORM

THERAPY CURE

SECTION A

NAME : W. Muhamad Saifullah b. W. Ibrahim

GENDER : Female ☐ Male ☑

AGE : 27

SECTION B

No	Statement	Strongly Agree	Agree	Neither Agree or Disagree	Disagree	Strongly Disagree
1.	Do you agree therapy cure combine with the latest technology?	✓				
2.	This therapy cure is easy to be used?			✓		
3.	This therapy cure is safe to be used?		✓			
4.	This therapy cure helps you to analyze your condition?	✓				
5.	This therapy cure can produce and save your result immediately?			✓		
6.	Can you do treatment by using this therapy cure without supervision by therapist?			✓		
7.	This therapy cure design is comfortable to be used?				✓	
8.	This therapy cure is portable?				✓	
9.	This therapy cure can increase the efficiency of treatment?		✓			
10.	This therapy cure meet the requirement of the market?	✓				

Suggestion or recommendation that can be added on this therapy cure

- smaller size without need for attachment
- more comfortable design and material for gripping
- Be able to use in any position
- charger port straight at the device.
- Normalization of data can be collected
- Need to be able to meet various patient conditions of hand power or function

MUHAMAD SAIFULLAH B. W. IBRAHIM
JURUPULIH PERUBATAN
FISIOTERAPI GRED U29
JABATAN FISIOTERAPI
HOSPITAL KUALA LUMPUR

PENGESAHAN PROJEK TAHUN AKHIR DIPLOMA KEJURUTERAAN ELEKTRONIK (PERUBATAN)

Pengarah,
Politeknik Sultan Salahuddin Abdul Aziz Shah
Persiaran Usahawan Syeksyen U1,
40150 Shah Alam
Selangor

Tarikh : 10 Mac 2017

_____
_____
_____
_____

Tuan/Puan,

PENGESAHAN PROJEK TAHUN AKHIR DIPLOMA KEJURUTERAAN ELEKTRONIK (PERUBATAN)

NAMA PROJEK : THERAPY CURE

Bil.	Nama Pelajar	No. Matrik
1.	Nurul Syazwani binti Mohd Daud	08DEU14F1031
2.	Nur Faridah binti Pawi	08DEU14F1057
3.	Wan Nadzirah bt Ab. Hadi	08DEU14F1069
4.	Nur Anis binti Mamat	08DEU14F1083

KURSUS : DIPLOMA KEJURUTERAAN ELEKTRONIK (PERUBATAN)

Merujuk perkara di atas, sukacita dimaklumkan bahawa pelajar-pelajar berkenaan telah berjaya menyiapkan projek akhir tahun yang juga berkaitan dengan unit fisioterapi dengan jayanya.

Sekian, terima kasih.

Tandatangan Pegawai :
Nama Pegawai : Norazlina Ya'acob
Jawatan : Pegawai Perubatan Perubatan Fisioterapi Gred U41
Tarikh : Jabatan Fisioterapi
Hospital Kuala Lumpur
10/3/17

PENGESAHAN PROJEK TAHUN AKHIR DIPLOMA KEJURUTERAAN ELEKTRONIK (PERUBATAN)

Pengarah,
Politeknik Sultan Salahuddin Abdul Aziz Shah
Persiaran Usahawan Syeksyen U1,
40150 Shah Alam
Selangor

Tarikh : 10 Mac 2017

_____
_____
_____
_____

Tuan/Puan,

PENGESAHAN PROJEK TAHUN AKHIR DIPLOMA KEJURUTERAAN ELEKTRONIK (PERUBATAN)

NAMA PROJEK : THERAPY CURE

Bil.	Nama Pelajar	No. Matrik
1.	Nurul Syazwani binti Mohd Daud	08DEU14F1031
2.	Nur Faridah binti Pawi	08DEU14F1057
3.	Wan Nadzirah bt Ab. Hadi	08DEU14F1069
4.	Nur Anis binti Mamat	08DEU14F1083

KURSUS : DIPLOMA KEJURUTERAAN ELEKTRONIK (PERUBATAN)

Merujuk perkara di atas, sukacita dimaklumkan bahawa pelajar-pelajar berkenaan telah berjaya menyiapkan projek akhir tahun yang juga berkaitan dengan unit fisioterapi dengan jayanya.

Sekian, terima kasih.

Tandatangan Pegawai :
Nama Pegawai : MUHAMMAD AZHARI ABDUL AZIZ
Jawatan : JURUPULIH PERUBATAN FISIOTERAPI U29
Tarikh : JABATAN FISIOTERAPI
HOSPITAL KUALA LUMPUR.
10/3/17

PENGESAHAN PROJEK TAHUN AKHIR DIPLOMA KEJURUTERAAN ELEKTRONIK (PERUBATAN)

Pengarah,
Politeknik Sultan Salahuddin Abdul Aziz Shah
Persiaran Usahawan Syeksyen U1,
40150 Shah Alam
Selangor

Tarikh : 10 Mac 2017

Radibems Sdn. Bhd,
Branch of Hospital kuala Lumpur.

Tuan/Puan,

PENGESAHAN PROJEK TAHUN AKHIR DIPLOMA KEJURUTERAAN ELEKTRONIK (PERUBATAN)

NAMA PROJEK : THERAPY CURE

Bil.	Nama Pelajar	No. Matrik
1.	Nurul Syazwani binti Mohd Daud	08DEU14F1031
2.	Nur Faridah binti Pawi	08DEU14F1057
3.	Wan Nadzirah bt Ab. Hadi	08DEU14F1069
4.	Nur Anis binti Mamat	08DEU14F1083

KURSUS : DIPLOMA KEJURUTERAAN ELEKTRONIK (PERUBATAN)

Merujuk perkara di atas, sukacita dimaklumkan bahawa pelajar-pelajar berkenaan telah berjaya menyiapkan projek akhir tahun yang juga berkaitan dengan unit fisioterapi dengan jayanya.

Sekian, terima kasih.

Tandatangan Pegawai :
Nama Pegawai : M. IQBAL SADIQ M. MUSTAKIM
Jawatan : BMT III
Biomedical Engineering Maint. Services
Radicare (M) Sdn Bhd
Kuala Lumpur
Tarikh :

Therapy Cure

SAFETY TEST

	Yes	No
1) Is there any Leakage current on the device?	☐	☑
2) Is the device are properly grounded?	☑	☐
3) Continuity test (passed)	☑	☐
4) Connection between components are properly connected?	☑	☐
5) Does the device has safety features?	☑	☐
6) Calibration (spring) are done?	☑	☐
7) resistance between appliance chassis and ground	N/a ∞ ohm	

Recommend : Safety test ok.

Signature :

Name : HJ RAMLI BIN JIMAN
Position : Technical Head
Centre for Medical Electronic Technology
Politeknik Sultan Salahuddin Abdul Aziz Shah