POLITEKNIK SULTAN SALAHUDDIN ABDUL AZIZ SHAH

PARKING ASSISTANT

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JABATAN KEJURUTERAAN MEKANIKAL

JUN 2019

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TITLE : **PARKING ASISSTANT**

SESSION : **JUNE 2019**

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DECLARATION

I hereby declare the final year project book is an authentic record on my own work carried out for one – year final year project for the award of the Diploma of Mechanical Engineering with Honours, under the guidance of AHMAD FAKARUDDIN BIN MOHD FAUZI from the week 1 until week 15.

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ACKNOWLEDGMENTS

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ABSTRACT

Definition of parking is an area of storage or storage of a stationary vehicle and the engine is turned off in one area. Parking is a facility for vehicle users to park or store vehicles while carrying out their own business. Parking also act of stopping and disengaging a vehicle and leaving it unoccupied. Parking on one or both sides of a road is often permitted, though sometimes with restrictions. Some buildings have parking facilities for use of the buildings' users. But for an open parking area it just have a divider and a line to separate the parking and if there is a lot of vehicle at the parking it will be difficult to find an empty parking lot, especially in open parking area. The driver had to turn around several times in search of an empty parking lot. This would result in wasted energy use on the user's vehicle as they had to move around the parking lot just to find the empty parking lot. Because of that, we have designed a product that will make an easier ways for drivers to find an unmanned parking. The product just use a simple equipment such as a pole, servo motor, ultrasonic sensor and an Arduino. How it will be function is, firstly, the ultrasonic sensor will detect an obstacle in it view. After that, it will send an impulse to the Arduino for processing. Lastly, after the Arduino have process the impulse it will send to servo motor for reaction. This can save drivers time as well as the fuel used to locate uninsured parking. This product also environmentally friendly. The target marketing of this product are to supermarket that have an open parking area and also to city council.

Keywords: **parking, empty parking, Arduino, ultrasonic sensor, servo motor**

ABSTRAK

Takrif tempat letak kereta adalah kawasan penyimpanan atau penyimpanan kenderaan pegun dan enjin dimatikan di satu kawasan. Tempat letak kereta adalah kemudahan bagi pengguna kenderaan untuk meletak kenderaan atau menyimpan kenderaan semasa menjalankan perniagaan mereka sendiri. Tempat letak kereta juga bertindak berhenti dan menyekat kenderaan dan membiarkannya kosong. Tempat letak kereta di satu atau kedua-dua belah jalan sering dibenarkan, walaupun kadang-kadang dengan sekatan. Sesetengah bangunan mempunyai kemudahan tempat letak kereta untuk kegunaan pengguna bangunan. Tetapi untuk kawasan parkir terbuka, ia hanya mempunyai pembahagi dan garis untuk memisahkan tempat letak kereta dan jika terdapat banyak kenderaan di tempat letak kereta, sukar untuk mencari tempat letak kereta yang kosong, terutama di kawasan parkir terbuka. Pemandu terpaksa berpusing beberapa kali untuk mencari tempat letak kereta yang kosong. Ini akan menyebabkan penggunaan tenaga yang sia-sia pada kenderaan pengguna kerana mereka terpaksa bergerak di tempat letak kereta hanya untuk mencari tempat letak kereta yang kosong. Oleh itu, kami telah merancang produk yang akan memudahkan cara pemandu untuk mencari tempat letak kereta tanpa pemandu. Produk ini hanya menggunakan peralatan mudah seperti tiang, servo motor, sensor ultrasonik dan arduino. Bagaimana fungsinya adalah, pertama, sensor ultrasonik akan mengesan halangan di dalamnya. Selepas itu, ia akan menghantar impak kepada arduino untuk diproses. Terakhir, selepas arduino memproses dorongan ia akan dihantar ke servo motor untuk reaksi. Ini dapat menjimatkan masa pemandu serta bahan api yang digunakan untuk mencari tempat letak kereta yang tidak diinsuranskan. Produk ini juga mesra alam. Pemasaran sasaran produk ini adalah pasar raya yang mempunyai kawasan parkir terbuka dan juga untuk dewan kota.

Kata kunci: **tempat letak kereta, parkir kosong, Arduino, sensor ultrasonik, servo motor**

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CHAPTER 1

INTRODUCTION

1.1 Introduction

Definition of parking is an area of storage or storage of a stationary vehicle and the engine is turned off in one area. Parking is a facility for vehicle users to park or store vehicles while carrying out their own business. Parking facilities are an important part of providing traffic planning and control and are fundamental to providing the perfect transport policy in an area. Therefore, we have designed a product to help vehicle users find a place to park their vehicles. This product is specifically for the convenience of vehicle users using open parking located in open spaces.

1.2 Background of Study

In the year 2006, 458,293 new registered vehicles were reported compared to the year 1999 where there were only 296,716 new registered vehicles, which makes it a rough estimate of 54.5% increase in a span of 7 years (Malaysian Ministry of Transportation, 2007). Referring to the aforesaid statistics provided by the Malaysian Ministry of Transportation, the current transportation infrastructure and car park facilities are deemed insufficient in sustaining the influx of vehicles on the road.

Therefore, problems such as traffic congestion and insufficient parking space inevitably crops up. In Asia, the situation are made worse by the fact that the roads are significantly narrower compared to the West (Inaba et al., 2001). Various measures have been taken in the attempt to overcome the insufficient car parking space problems. Although, the problem can be addressed via many methods, the paper focuses on the open parking space area introduced, which is the Parking Assistant. This study will review the evolution of parking system technologies as well as the detection systems developed over the years.

1.3 Problem Statement

To begin the solution to a design problem with a clear, unambiguous definition of the problem. Creating a clear definition of a design problem is more difficult than defining an analysis problem.

The problem that we have is :

1. Drivers especially four-wheel vehicle have difficulty finding an empty parking lots, especially in open parking area.
2. The driver will have to search many times until there is an empty parking lot.
3. The energy used by the vehicle is wasted simply just to find an empty parking lot.

1.4 Objective

1. We are designing a product that can makes an easy way for drives expecially four-wheel vehicle to find an empty parking lot.
2. This can save time for the drivers to find an empty parking lots.
3. Designing a product that is environmentally eco-friendly.

1.5 Significant of the project

Can this project help the four-wheel driver find empty parking spaces expecially open parking area more faster and efficient?

1.6 Scope of Study

This project will minimize the duration of the driver to find empty parking spaces expecially in open parking area. In the modern world, where parking-space has become a very big problem, it has become very important to avoid the wastage of time and energy in modern building and etc. In places where more than 100 cars need to be parked, this project proves to be useful in reducing wastage of time and energy. This Parking Assistant enables the parking of vehicles more efficient.

1.7 Importance of the project

Let's be honest: Parking and traffic congestion is a common problem in the Malaysia. Next-generation Parking Assistant systems can be the ideal solution for the driver who wish to save more of their time and energy. The sensors embedded in the project and been set up in selected parking spaces to detect when vehicles occupy or leave a specific space. The reflected board will change due to the existence of vehicle. The availability of parking spaces is presented to the drivers by the reflected board.

- Benefits of Smart Parking
- Reduce traffic congestion
- Improve parking management
- Reduces pollution
- Optimized energy
- Reduced time
- Improve drivers' experience

1.8 Definition of Operation/Terms

This project is geared towards easing the process of searching for parking for the end user. Searching for a vacant parking spot, especially in a busy CBD setting, is tiring & time consuming. It therefore causes a drop in work productivity. Additionally, there are the environmental concerns to think about such as constantly driving in a certain area for one parking space will cause traffic congestion & air pollution. It will also be useful in management functions for revenue based parking garages. This is due to the fact that the data collected, over a period of time, will uncover patterns and trends which will be paramount in decision making for these stakeholders. For these too, a problem of parking space inefficiency will be tackled by ensuring that the parking spaces are fully utilized.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

Drivers searching for parking are estimated to be responsible for about 30% of traffic congestion in cities. Historically, cities, businesses, and property developers have tried to match parking supply to growing demand for parking spaces. It has become clear, though, that simply creating more parking spaces is not sufficient to address the problem of congestion. New approaches using smart parking systems look to provide a more balanced view of parking that better manages the relationship between supply and demand. Smart parking can be defined as the use of advanced technologies for making more efficient in finding empty parking spaces.

2.2 Concept/Theory

Parking Assistant uses sensing devices such as ultrasonic sensor installed in the project and etc. it will be used to determine occupancy of the parking lot. More and more robust sensing systems are being built to analyze and transmit the information to the database in real time.

The system increases the availability of parking with the use of sensors. It prevents the drivers from spending too much time searching for a parking space and wasting their energy. Ultrasonic sensors detect the vacant parking spaces and transmit the data to help the drivers get an idea about the vacant spaces for parking with help of the reflected board.

2.3 Earlier Research

2.3.1 Parking Counting System

Parking counting system is considered as a common need for the comfort of visitors to monitor the number of available spaces in the parking facility. Parking counting system automatically count the number of vehicles and the direction in which the vehicle are moving. Accurate parking counting system keeps a complete information of the vehicles entering and leaving the parking facility. When the parking spaces are occupied it display a sign at the entrance of parking facility to indicate there are no parking spaced left.

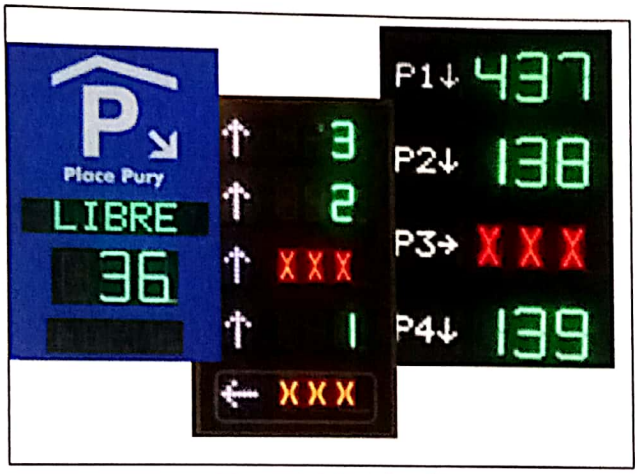


Figure 2.1 Parking Counter

- Accurate Parking Counting System can optimize use of car parking facility
- Maximizes revenue potential and improves customer experience
- Reduces the pollution effect on environment
- Data analysis allows better control of resources
- Reduced running cost
- Sensors are used to automatically detect the direction of vehicle

2.3.2 Floating Parking Balloon

In an effort to help drivers save gas, Korean petroleum corporation S-Oil launched the 'Here Balloon' campaign. The campaign used balloons filled with helium to show drivers where empty parking spots were. Empty spaces had giant yellow arrows pointing down at them so that drivers could easily figure out where to go. When someone parked in an empty space, the car would pull a string down and lower the balloon. As a result, drivers could save gas by finding parking spots efficiently.

S-Oil's campaign was conceived by ad agency Cheil Worldwide. The ad agency set out to create an image that S-Oil is an oil-saving firm. By helping drivers save gas, Cheil is branding S-Oil as a company that helps consumers save time, oil and money.

Figure 2.2 Floating Parking Balloon

2.3.3 Parking Management System

Camera parking management system adopts integrated barrier gate to achieve high efficient in entrance/exit management.

The smart barrier is integrated with vehicle license plate recognition HD camera, flashing light, VMS, auto barrier, controller machine, parking management software, etc. With simple hardware combining the smart software, to realize non-stop at the entrance/exit.

Figure 2.3 Parking Integrated Barrier

Integrated Barrier

Basic Function

1.Camera Entrance/Exit Management:

The smart gate can automatically scan the vehicle license plate, then let go the vehicle.

2.Parking Fee Collection Management:

Under man power collection, computers or Pad(mobile) will be used. If installed with auto-pay machine, drivers can pay on it before getting to the exit, realizing non-stop at the exit.

2.3.4 Component Research

A good product can be generated by studying every part and material used. In order to produce the best product. The purpose of the study was to obtain information and gain insight into the main components and materials of the product. The components and materials are as follows:

- Ultrasonic Sensor
- Arduino Board
- Servo Motor
- Breadboard
- Jumper
- Battery

2.3.4.1 Ultrasonic Sensor

Ultrasonic sensor are a type of acoustic sensor divided into three broad categories: transmitters, receivers and transceivers. Transmitters convert electrical signals into ultrasound, receivers convert ultrasound into electrical signals, and transceivers can both transmit and receive ultrasound. In a similar way to radar and sonar, ultrasonic transducers are used in systems which evaluate targets by interpreting the reflected signals. For example, by measuring the time between sending a signal and receiving an echo the distance of an object can be calculated. Passive ultrasonic sensors are basically microphone that detect ultrasonic noise that is present under certain conditions. Ultrasonic probes and ultrasonic baths apply ultrasonic energy to agitate particles in a wide range of materials.

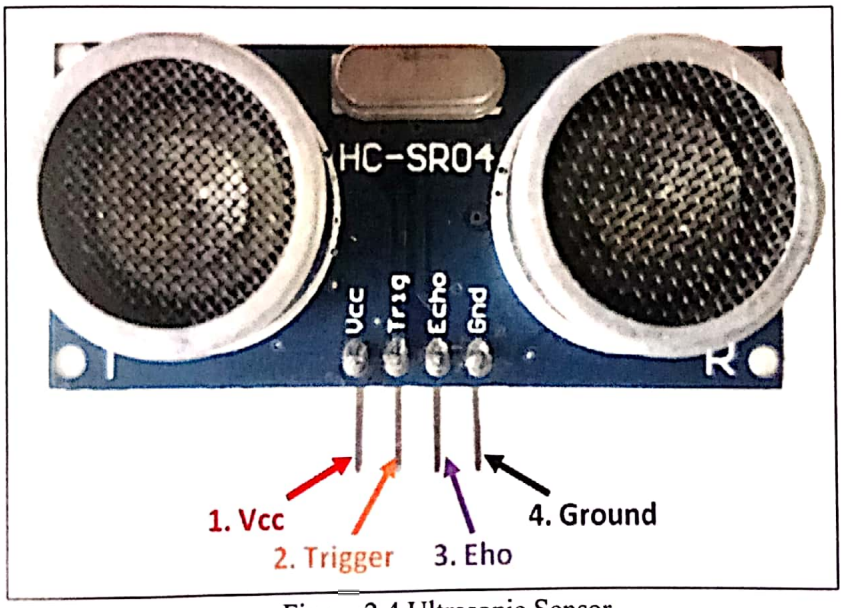


Figure 2.4 Ultrasonic Sensor

Specification

Supply voltage 5 v Global Current Consumption 15 mA Ultrasonic Frequency 40k Hz Maximal Range 400 cm Minimal Range 3 cm Resolution 1 cm Trigger Pulse Width 10 µs Outline Dimension 43x20x15 mm Seeed ultrasonic sensor is non-contact distance measurement module, which is also compatible with electronic brick.

Electrical Parameters	HC-SR04 Ultrasonic Module
Operating Voltage	DC-5V
Operating Current	15mA
Operating Frequency	40KHZ
Farthest Range	4m
Nearest Range	2cm
Measuring Angle	15 Degree
Input Trigger Signal	10us TTL pulse
Output Echo Signal	Output TTL level signal, proportional with range
Dimensions	45*20*15mm

Figure 2.5 Ultrasonic Sensor Specifications

2.3.4.2 Arduino Board

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 or breadboards(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 can be programmed using Cand C++ programming languages. In addition to using traditional compiler toolchains, the Arduino project provides an integrated development environment (IDE) based on the Processing language project.

Types of Arduino Board :

- Arduino UNO (R3)
- LilyPad Arduino.
- Red Board.
- Arduino Mega (R3)
- Arduino Leonardo.

Arduino UNO (R3)

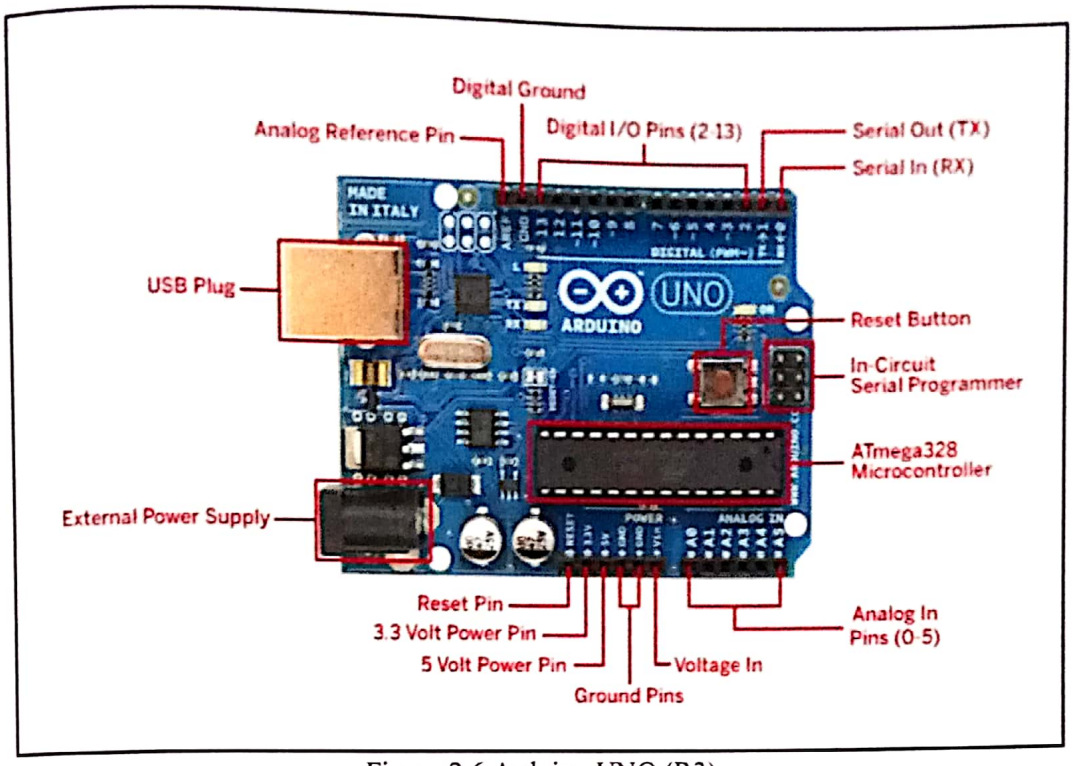


Figure 2.6 Arduino UNO (R3)

This is the Arduino Uno R3. In addition to all the features of the previous board, the Uno now uses an ATmega16U2 instead of the 8U2 found on the Uno (or the FTDI found on previous generations). This allows for faster transfer rates and more memory. No drivers needed for Linux or Mac (inf file for Windows is needed and included in the Arduino IDE), and the ability to have the Uno show up as a keyboard, mouse, joystick, etc.

The Uno R3 also adds SDA and SCL pins next to the AREF. In addition, there are two new pins placed near the RESET pin. One is the IOREF that allow the shields to adapt to the voltage provided from the board. The other is a not connected and is reserved for future purposes. The Uno R3 works with all existing shields but can adapt to new shields which use these additional pins.

The Arduino Uno is a microcontroller board based on the Atmega328. Arduino is an open-source, prototyping platform and its simplicity makes it ideal for hobbyists to use as well as professionals. The Arduino Uno has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and

a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started.

The Arduino Uno differs from all preceding boards in that it does not use the FTDI USB-to-serial driver chip. Instead, it features the Atmega8U2 microcontroller chip programmed as a USB-to-serial converter.

"Uno" means one in Italian and is named to mark the upcoming release of Arduino 1.0. The Arduino Uno and version 1.0 will be the reference versions of Arduno, moving forward. The Uno is the latest in a series of USB Arduino boards, and the reference model for the Arduino platform.

The Arduino open-sourced IDE drivers can be downloaded for free and we have created a download and installation tutorial for the Windows XP platform.

Features of the Arduino UNO:

Table 2.1 Features of the Arduino UNO

Microcontroller	Atmega328
Operating Voltage	5V
Input Voltage (recommended)	7-12V
Input Voltage (limits)	6-20V
Digital I/O Pins	14 (of which 6 provide PWM output)
Analog Input Pins	6
DC Current per I/O Pin	40 mA
DC Current for 3.3V Pin	50 mA
Flash Memory	32 KB of which 0.5 KB used by bootloader
SRAM	2 KB (Atmega328)
EEPROM	1 KB (Atmega328)
Clock Speed	16 MHz

LilyPad Arduino

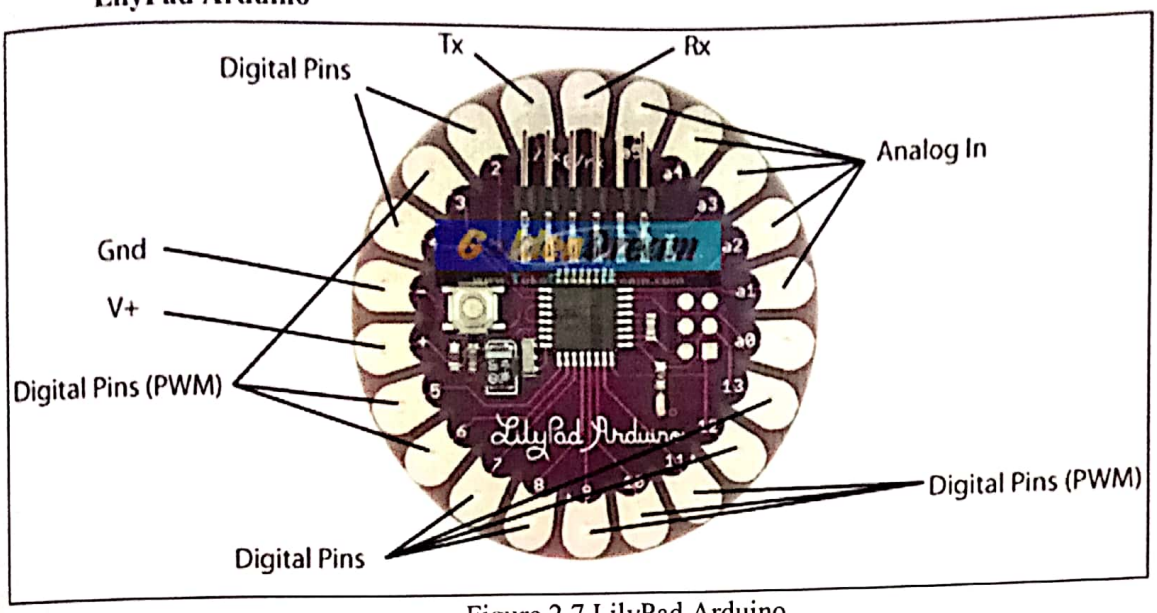


Figure 2.7 LilyPad Arduino

At first glance, the LiliPad Arduino USB board may surprise you with its neat, feminine look: that's because it's ideally suited to electronic clothing and e-textile project. It is sewn directly onto a piece of fabric, while its supply, sensors, and actuators are connected up using conductive thread embroidery.

The LilyPad USB is a board fitted with an ATmega32u4 microcontroller: Most commonly used with the Arduino Leonardo boards, the ATmega32u4 microcontroller has the great advantage of including 2 USB protocols that can operate simultaneously.

The LilyPad Arduino USB board has 9 input/output pins: 4 of them can be used as PWM outputs and 4 others as analogue inputs. It also has an 8 MHz electric resonator, a micro USB connection, and a JST connector allowing powering via a 3.7 V LiPo battery.

hanks to its use of an ATmega32u4 microcontroller, the LilyPad Arduino USB board can be powered via a micro USB connection.

What makes the LilyPad Arduino board so different from the other models in the series is of course its ATmega32u4 microcontroller (the 'u' stands for USB). LilyPad Arduino boards are usually fitted with an ATmega168V or ATmega328V microcontroller. This type of microcontroller requires use of a USB port to serial port adaptor. Using the ATmega32u4, this is unnecessary, as your computer will recognize your LilyPad Arduino USB board as a mouse and keyboard, while the CDC serial interface can continue to send and receive information. You can therefore connect up your LilyPad Arduino USB board directly to your computer via a USB cable to start with, or of course more simply use your LiPo battery.

Specifications of the LilyPad Arduino USB board

Table 2.2 Specifications of the LilyPad Arduino USB board

Microcontroller	ATmega32u4
Flash memory	32 kB, of which 4 kB are used by the bootloader
SRAM	2.5 kB
EEPROM	1 kB
Operating voltage	3.3 V
Input voltage	3.8–5 V
Digital input/output pins	9
PWM channels	4
Analogue input channel	4
Direct current per I/O pin	40 mA
Clock speed	8 MHz

Red Board

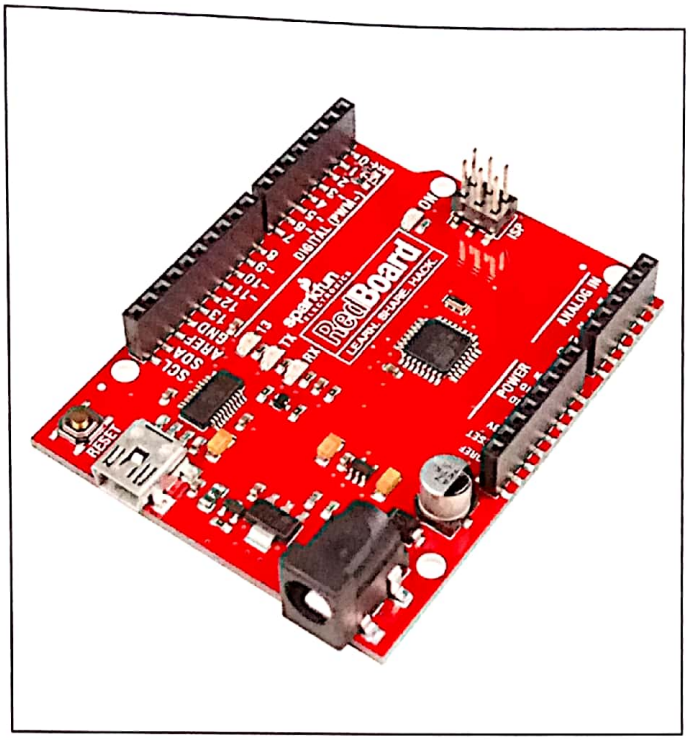


Figure 2.8 Red Board

The best of Arduino combined in a single programming board: check out this SparkFun RedBoard, which can be programmed using Arduino IDE and a simple USB connection.

Each Arduino board has its own strengths and weaknesses, but the RedBoard is the only one that combines the simplicity of the Arduino UNO bootloader, compatibility with the UNO R3 shield and the versatility of the FTDI chip used on the much-missed Arduino Duemilanove. And lo, the Arduino IDE programmable SparkFun RedBoard was born! In concrete terms, simply connect it with a mini-B USB cable to begin programming your microcontroller in the Arduino environment. The Arduino IDE can be downloaded free of charge from our resources section. The little bonus that will make you even happier? The board offers the SDA, SCL and IOREF pins found also on the UNO R3, making your RedBoard compatible with all future shields designed for the R3.

This Arduino board allows you to connect lots of modules and peripherals thanks to its digital, analogue, UART and PWM ports and ISP header for in-system programming, all gifts that hackers will adore!

The SparkFun RedBoard can be powered by USB or using its jack socket, and handles supply voltages between 7 and 15 Vdc.

Technical specifications of the SparkFun RedBoard microcontroller

ATmega328 microcontroller with Optiboot (UNO) bootloader

Table 2.3 Technical specifications of the SparkFun RedBoard microcontroller

USB programming facilitated	FTDI FT231X chip
Input voltage	7–15V
Compatible inputs	0–5V outputs with 3.3V
14 digital I/O pins	(6 PWM outputs)
Analogue inputs	6
ISP header	1
Flash memory	32K
Clock speed:	16 MHz
R3 shield	Compatible

Arduino Mega (R3)

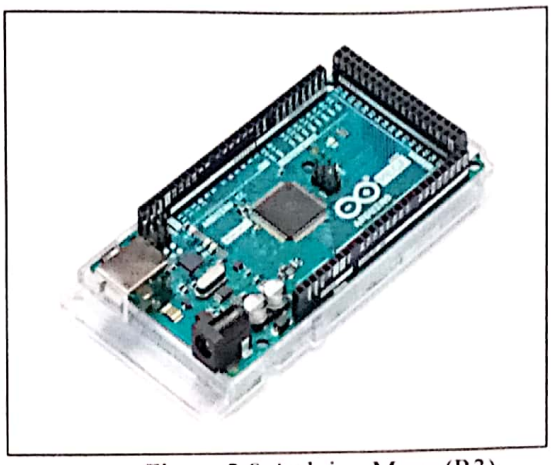


Figure 2.9 Arduino Mega (R3)

Arduino is an open-source physical computing platform based on a simple i/o board and a development environment that implements the Processing/Wiring language. Arduino can be used to develop stand-alone interactive objects or can be connected to software on your computer (e.g. Flash, Processing, MaxMSP). The open-source IDE can be downloaded for free (currently support Mac OS X, Windows, and Linux). The Arduino Mega is a microcontroller board based on the ATmega2560. It has 54 digital input/output pins (of which 14 can be used as PWM outputs), 16 analog inputs, 4 UARTs (hardware serial ports), a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started. The Mega is compatible with most shields designed for the Arduino Duemilanove or Diecimila.

This is the new Arduino Mega 2560 which replaces previous Arduino Mega. In addition to all the features of the previous board, the Mega 2560 now uses an Atmega8U2 instead of the FTDI chip. This allows for faster transfer rates, no drivers needed for Linux or Mac (inf file for Windows is needed), and the ability to have the board show up as a keyboard, mouse, joystick, etc. It also has twice as much flash memory.

Specification:

Table 2.4 Specification of Arduino Mega (R3)

Developer	Arduino.cc
Manufacturer	Many
Type	Single-board microcontroller
Operating system	None
CPU	Atmel AVR (8-bit), ARM Cortex-M0+ (32-bit), ARM Cortex-M3 (32-bit), Intel Quark (x86) (32-bit)
Memory	SRAM
Storage	Flash, EEPROM

Arduino Leonardo.

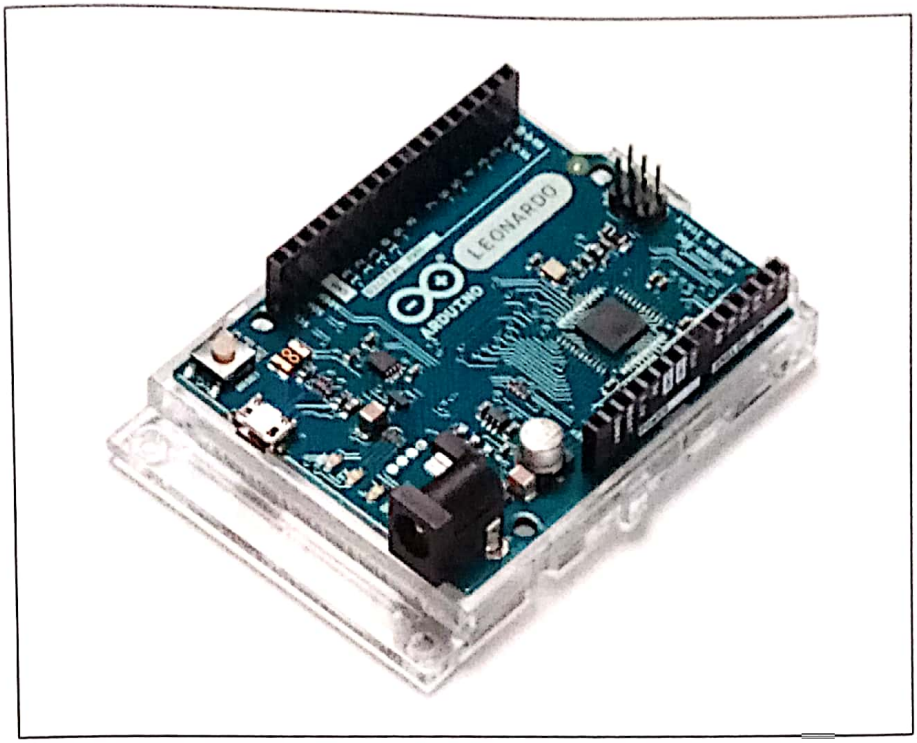


Figure 2.10 Arduino Leonardo

The Arduino LEONARDO is an integrated USB HID Arduino board. Ideal for projects requiring the board to behave (act) as a USB human interface devices.

The Arduino Leonardo is a microcontroller board based on the ATmega32u4 (datasheet). It has 20 digital input/output pins (of which 7 can be used as PWM outputs and 12 as analog inputs), a 16 MHz crystal oscillator, a micro USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started.

The Leonardo differs from all preceding boards in that the ATmega32u4 has built-in USB communication, eliminating the need for a secondary processor. This allows the Leonardo to appear to a connected computer as a mouse and keyboard, in addition to a virtual (CDC) serial / COM port. It also has other implications for the behavior of the board.

Specifications of Arduino Leonardo

Table 2.5 Specifications of Arduino Leonardo

Microcontroller	ATmega32u4
Operating Voltage	5V
Input Voltage (Recommended)	7-12V
Input Voltage (limits)	6-20V
Digital I/O Pins	20
PWM Channels	7
Analog Input Channels	12
DC Current per I/O Pin	40 mA
DC Current for 3.3V Pin	50 mA
Flash Memory	32 KB (ATmega32u4) of which 4 KB used by bootloader
SRAM	2.5 KB (ATmega32u4)
EEPROM	1 KB (ATmega32u4)
Clock Speed	16 MHz
Length	68.6 mm
Width	53.3 mm
Weight	20 g

2.3.4.3 Servo Motor

This is a low cost plastic gear RC servo with 1.80kg.cm holding torque (at 4.8V). It is a perfect solution for student robotic projects who build arms or linkages. The advantage of RC servo over the DC brush motor is the ability to control its rotation angle.

If you are building a system or project that use many RC servo motors, please consider getting the 8 Channels Servo Controller or 16 Channels Servo Controller. They will make your life easier.

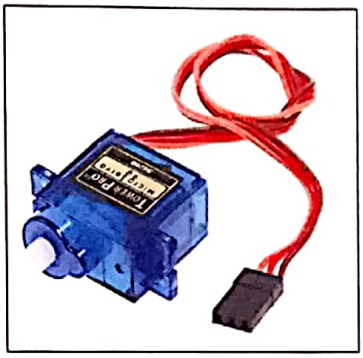


Figure 2.11 Servo Motor

Specification:

Table 2.6 Specification for Servo Motor

Compatible with	Arduino Servo library.
Operating Voltage	4.8 - 5VDC
Speed at 4.80V(no load)	0.12 s/60°
Torque at 4.80V	1.8 kg.cm (~0.1765 N.m)
Rotation angle	180 degree
Size	23.0 x12.2 x 29.0mm
Weight	9.0g
Wiring	Brown = GND RED = 5V Orange = Signal

2.3.4.4 Breadboard

A breadboard is a construction base for prototyping of electronics. Originally the word referred to a literal bread board, a polished piece of wood used for slicing bread[citation needed].[1] In the 1970s the solderless breadboard (a.k.a. plugboard, a terminal array board) became available and nowadays the term "breadboard" is commonly used to refer to these.

Because the solderless breadboard does not require soldering, it is reusable. This makes it easy to use for creating temporary prototypes and experimenting with circuit design. For this reason, solderless breadboards are also popular with students and in technological education. Older breadboard types did not have this property. A stripboard (Veroboard) and similar prototyping printed circuit boards, which are used to build semi-permanent soldered prototypes or one-offs, cannot easily be reused. A variety of electronic systems may be prototyped by using breadboards, from small analog and digital circuits to complete central processing units (CPUs).

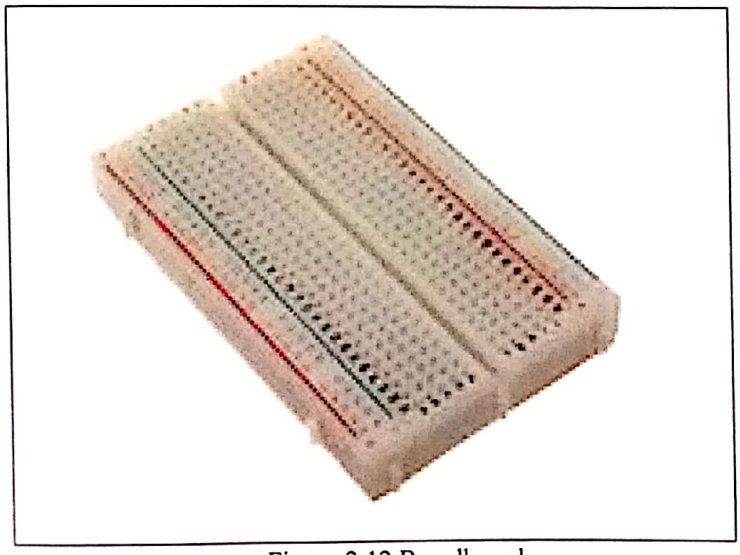


Figure 2.12 Breadboard

Specifications of Breadboard

Spacing

Most breadboards provide a grid of contacts where the spacing between contacts points is 1/10-inch square. This spacing matches the pins spacing of most integrated circuits and the pins of all transistor packages. This spacing facilitates connecting all the electronic components within the voltage, current, and frequency restrictions of common breadboards.

Number of Contacts

Breadboards provide a varying number of contacts. Depending on the manufacturer, a breadboard could contain as few as 75 or as many as 900 separate connection points. Manufacturers usually arrange the connection points in columns of 10 separated by a center median. This arrangement provides 56 connections for a standard 14-pin integrated circuit, four connections for each pin on the device. Voltage Many breadboards are rated for five volts at one amp. A second common option provides a 15-volt, one-third amp rating. Both specifications yield a power dissipation of five watts. Check the manufacturer's data sheet for specific information prior to purchasing the breadboard since these specifications vary per vendor and device. Current Most breadboards have a current limit of one amp or less, due to the nature of their contacts. Often breadboards can withstand only 1/3 amp.

Frequency Range

Most breadboards cannot withstand frequencies above 10 MHz. The nature of the contacts inside the breadboard creates stray capacitance on the order of 2 to 20 pF for each connection. These capacitances are random, unpredictable and difficult to reproduce. Removing and reinserting a component lead sometimes appreciably changes the contact capacitance at that point. These effects become a considerable part of the circuit behavior above 10 MHz, making circuit analysis impossible.

Stray Capacitance

Capacitance is defined as resistance to a changing current. Capacitance results from the action of two conductors separated by an insulator. When you insert a component lead into a breadboard, the connection is never perfect. The small imperfection results in some circuit.

2.3.4.5 Jumper

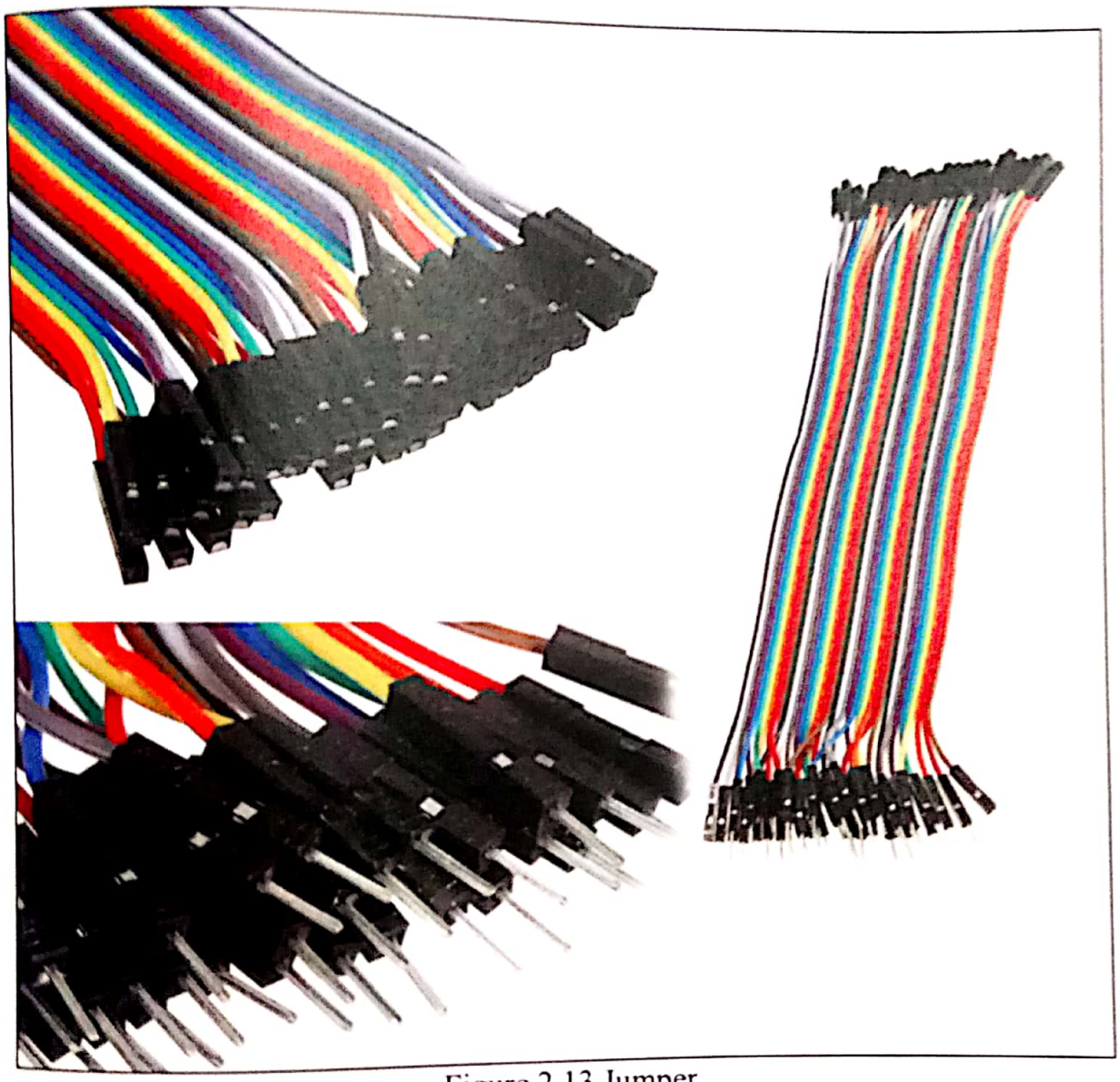


Figure 2.13 Jumper

A jump wire (also known as jumper wire, or jumper) is an electrical wire, or group of them in a cable, with a connector or pin at each end (or sometimes without them – simply "tinned"), which is normally used to interconnect the components of a breadboard or other prototype or test circuit, internally or with other equipment or components, without soldering.

Individual jump wires are fitted by inserting their "end connectors" into the slots provided in a breadboard, the header connector of a circuit board, or a piece of test equipment.

JUMPER WIRE 88 SPECIFICATIONS		
Cycle Rate	Max	33,000cph (0.109 sec. per insertion)
Reliability		75 ppm or better
Features		Zero-scrap Jumper Wire leads
Intrinsic Availability		95% Intrinsic Availability
Component Specs	Input Wire Diameter	0.51mm (0.020") to 0.81mm (0.032") tin-coated copper wire [0.6mm (0.024") is recommended]
	Input Wire Packaging	Preferred package is a drum that measures up to 405mm (16") high by 350mm (13.8") diameter, which may be placed on the floor next to the machine
	Hole Span	5.00mm (0.197") min to 33.00mm (1.300") max
Options	Board Handling	Manual or Automatic PCB load/unload
	Networking	Ethernet, TCP/IP
PCB Specifications		
Automated Bd Handling	Length x Width (minimum)	102 x 80mm (4 x 3.1")
	Length x Width (maximum)	483 x 406mm (19 x 16")
	Insertable Area	483 x 406mm (19 x 16")
	PCB Transfer Time	2.5 seconds
Manual Bd Handling	Length x Width (minimum)	51 x 51mm (2.0 x 2.0")
	Length x Width (maximum)	600 x 600mm (23.6 x 23.6") with Park Step
	Insertable Area	508 x 470mm (20 x 18.5")
	PCB Transfer Time	0 seconds (with 2-window board-holding fixture)

Figure 2.14 Jumper Specificatios

2.3.4.6 Battery

Figure 2.15 LiPO Batttery

Lipo Battery 2200mAh / 11.1V has three cells and outputs 11.1V storing 2200mAh of charge. This is a good Li-po battery for projects like small robotics and radio-controlled projects. It has high discharge rates and big capacity and can be used in RC airplane, RC helicopter, RC car, RC truck, RC boat, drone applications. This high power output battery has very special internal structure, which requires dedicated balance charger to charge. Li-Poly Battery Charger is a suitable mate. iMAX-B6AC Battery Charger can be used to recharge this module.

Specifications of Lipo Battery 2200mAh / 11.1V

Table 2.7 Specifications of LiPO Battery

Material	Li-polymer
Battery voltage	11.1 V
Nominal capacity	2200mAh
Max. Charge current	2.2A
Discharge	25C
Wire length	50 ± 5mm
Cell	3S

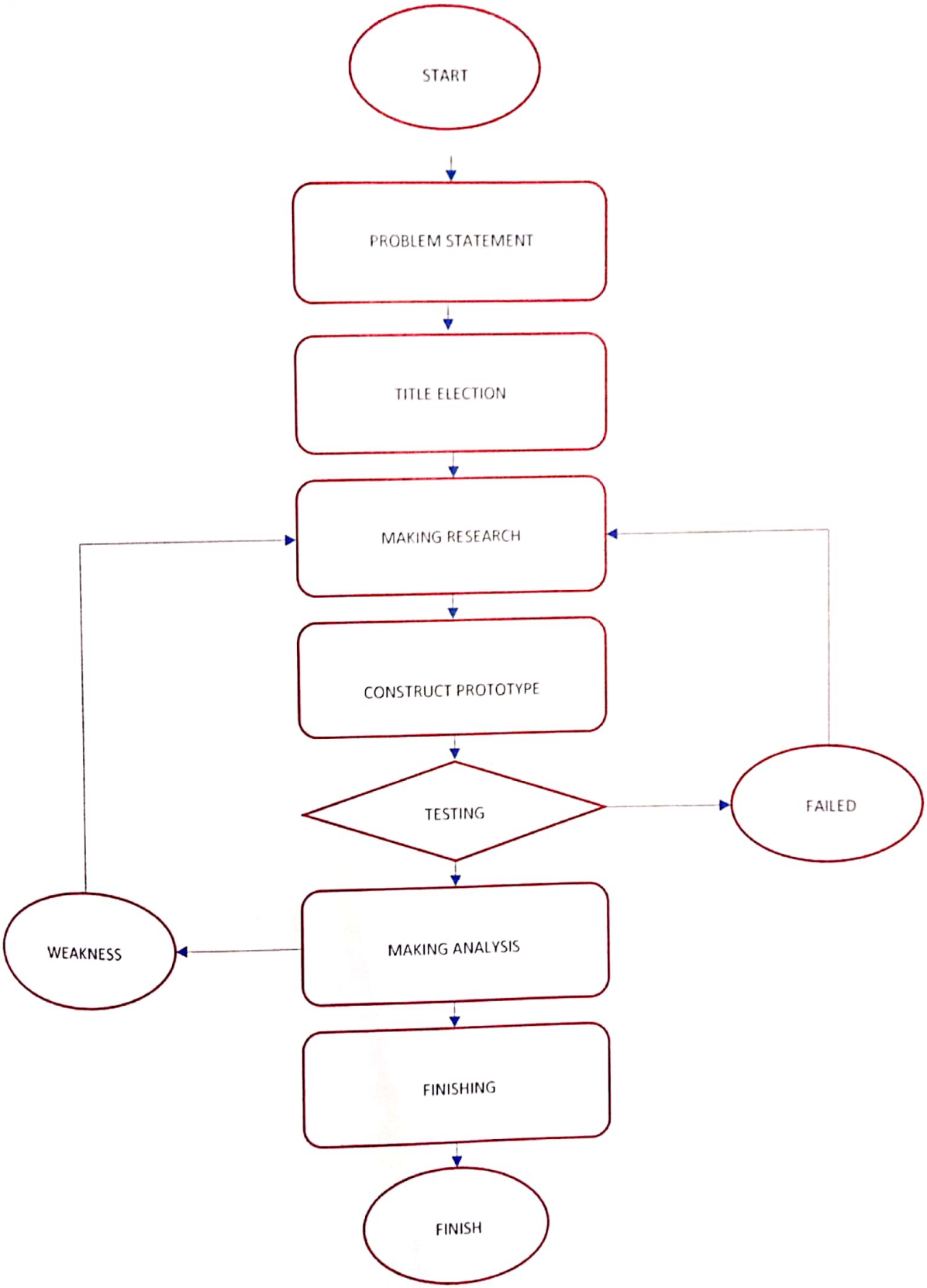
CHAPTER 3

METHODOLOGY

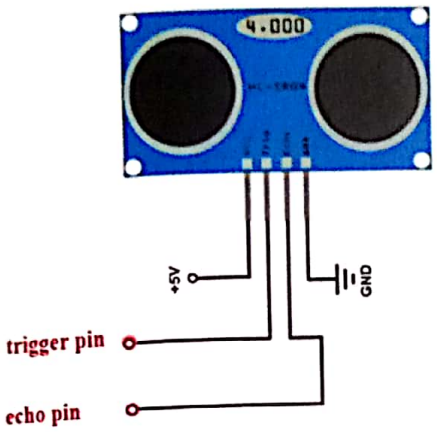
3.1 Introduction

At the parking spot, the system will be informed by an array of sensors that determine presence and proximity of a vehicle. An array of sensors will be used to overcome the vulnerabilities that come with using just one sensor leading to misinformation. At this level, accurate information is of high importance since it determines how the high-tech components of the system respond. The sensors proposed are: ultrasonic sensor. The data from these sensors will be amalgamated by an Arduino board. This board will do some data formatting and then send the data to the servo motor. The use of a microcontroller is proposed due to its high processing power. The information from the board will then be transmitted using jumper and to make the servo motor responses.

FLOW PROCESS



WORKING PROCESS

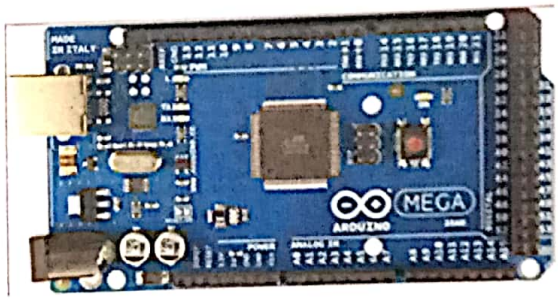


ULTRASONIC SENSOR

- It will be detect if there are any obstacle in front of it
- If there are any obstacle in front of it, it will send the signal to the Arduino board

ARDUINO BOARD

- The Arduino board will receives signal from the ultrasonic sensor
- After it receives the signal, it will send a command to servo sensor



SERVO SENSOR

- Servo sensor will receive a command from the Arduino board
- Then it will rotate 180 degree, so it will turn the board upside down

3.2 Research Design

3.2.1 Board

Figure 3.1 Polystyrene Board

Polystyrene Board

Strength

- Super light
- Easy to handle

Weakness

- Easily broke
- Cannot withstand wind

Figure 3.2 Corrugated Board - 2 Layer

Corrugated Board - 2 Layer

Strength

- Not easily broke
- Can withstand any weather

Weakness

- Heavy
- Can damage the servo

Figure 3.3 Corrugated Board - 1 Layer

Corrugated Board - 1 Layer

Strength

- Light
- Easy to handle

Weakness

- Cannot withstand heavy wind

3.3 Research Instrument

Expected Results

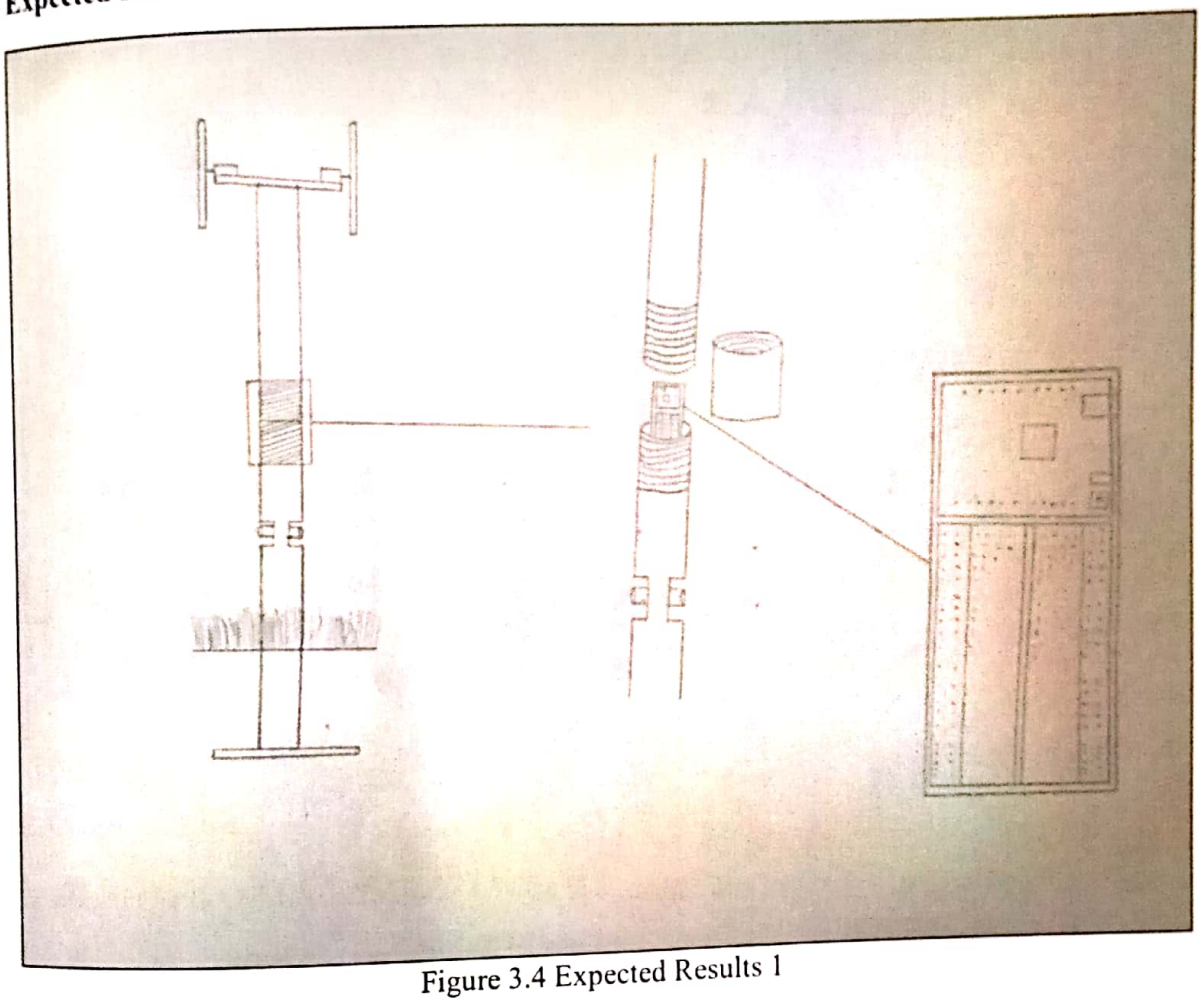


Figure 3.4 Expected Results 1

Specificatios

Round in shape

Dimension - 150 CM H x 3.5" D

Weight - 3 KG

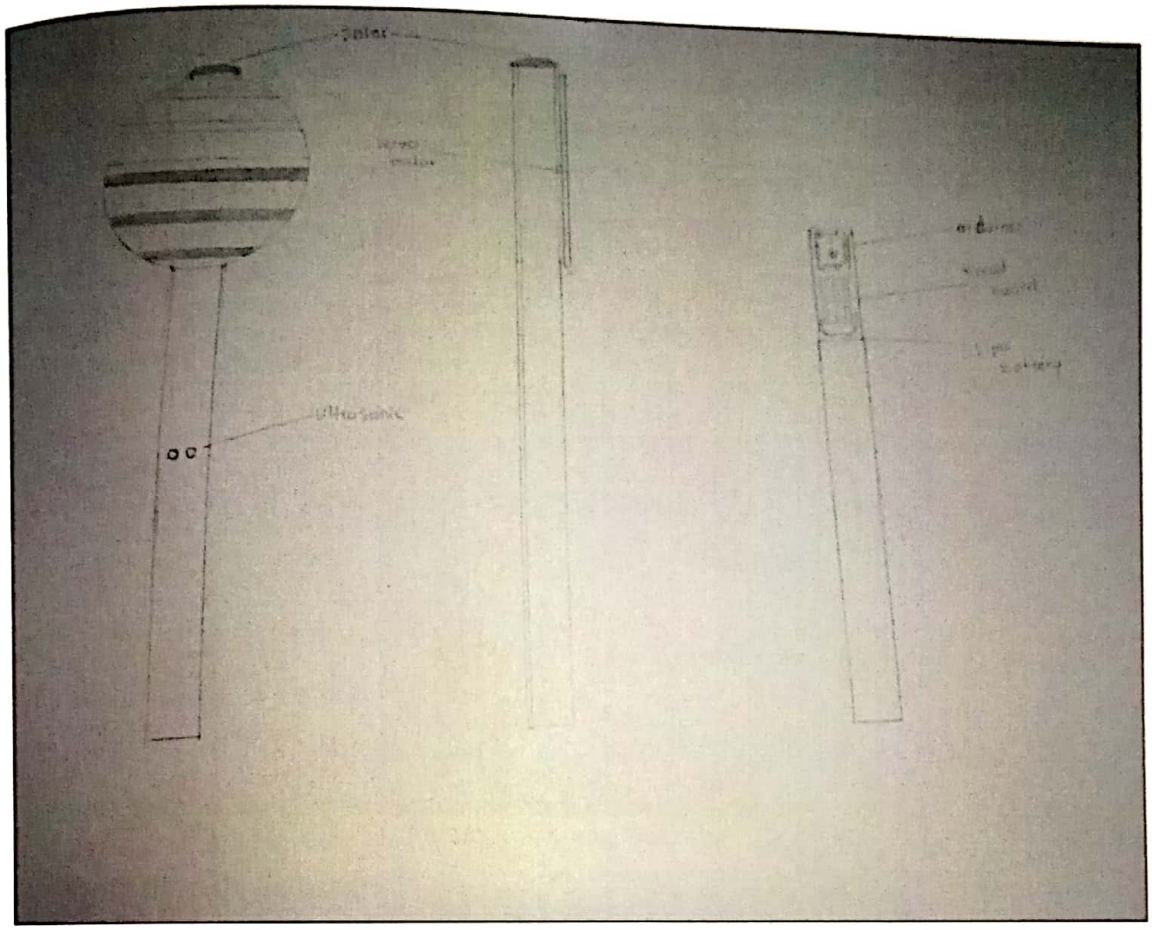


Figure 3.5 Expected Result 2

Specification

Rectangle in shape

Dimension - 150 CM L x 5 CM W x 7.5 CM H

Weight - 3.5 KG

3.4 Sampling Techniques

Testing prototype

Figure 3.6 Testing Prototype

Testing – Side parking

Figure 3.7 Testing – Side Parking

Testing – Reverse parking

Figure 3.8 Testing Reverse Parking

CHAPTER 4

RESULT AND DISCUSSION

4.1 Introduction

For this chapter, we can give the sketch of our product that will be our expected result and actual result. In the sketch, we can see that what component will be used to success our product.

4.1 Design Chosen

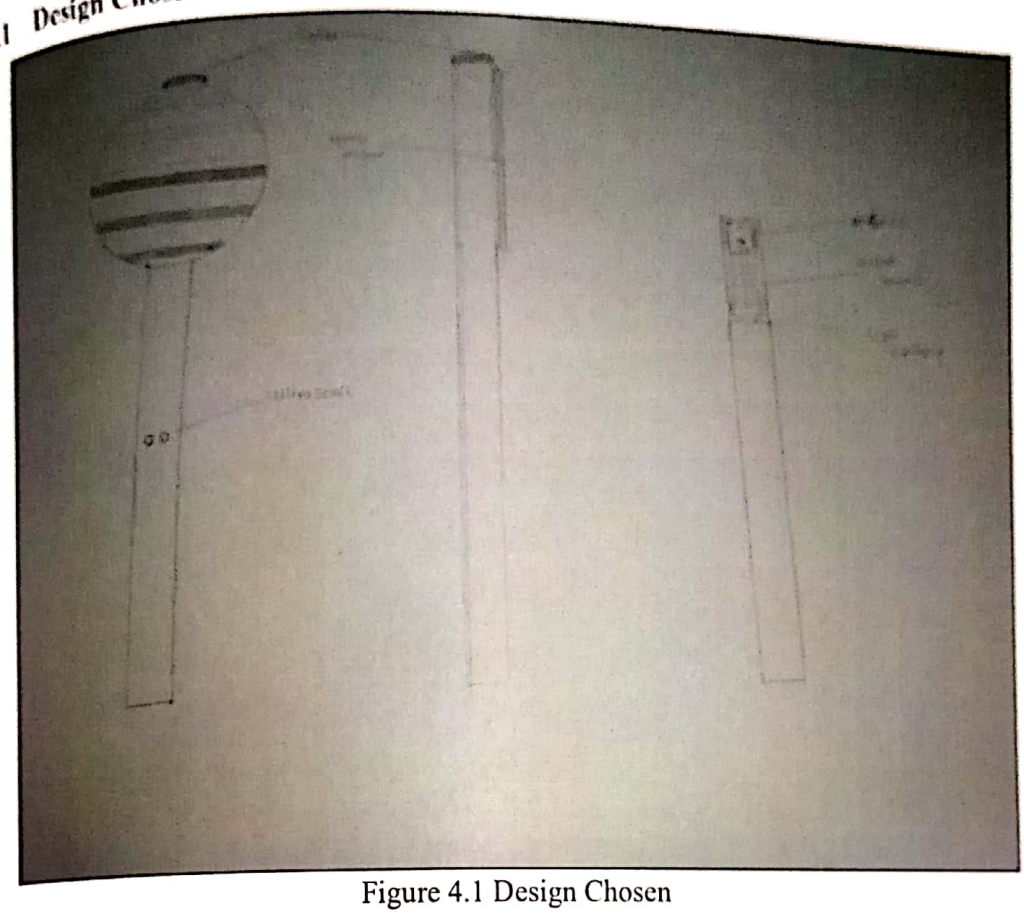


Figure 4.1 Design Chosen

Specificatios

Rectangle in shape

Dimension - 150 CM L x 5 CM W x 7.5 CM H

Weight - 3.5 KG

4.2 Research Findings

4.2.1 Actual Results

Figure 4.2 Actual Results

4.2.2 Circuit

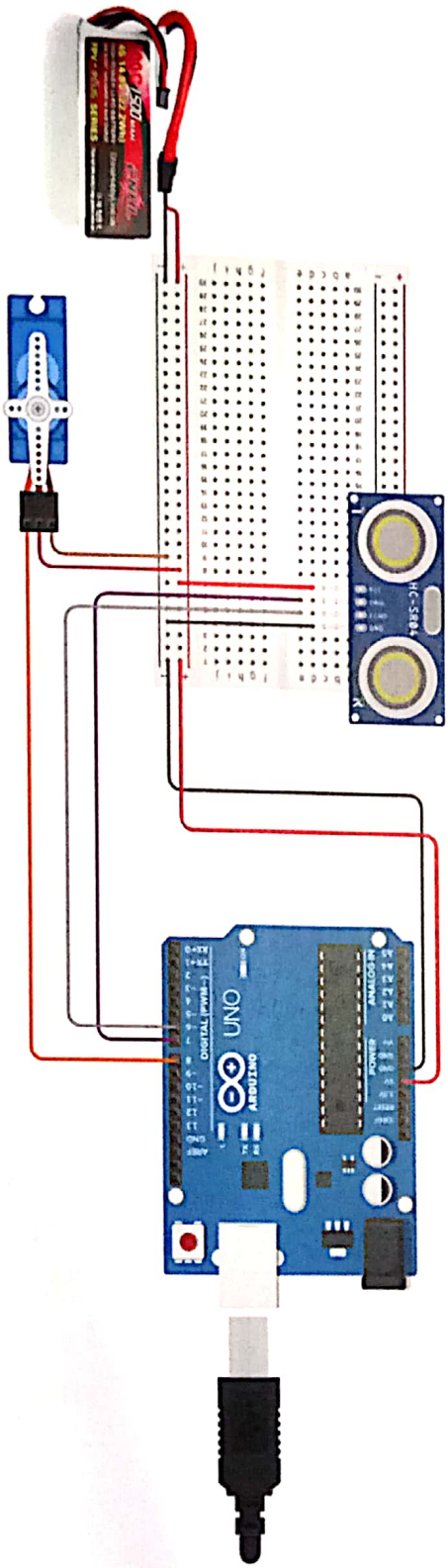


Figure 4.3 Circuit

4.2.3 Coding

```
#include <Servo.h>
#define trigPin 7
#define echoPin 6
Servo servo;
int sound = 250;
void setup() {
Serial.begin (9600);
pinMode(trigPin, OUTPUT);
pinMode(echoPin, INPUT);
servo.attach(8);
}
void loop() {
long duration, distance;
digitalWrite(trigPin, LOW);
delayMicroseconds(2);
digitalWrite(trigPin, HIGH);
delayMicroseconds(10);
digitalWrite(trigPin, LOW);
duration = pulseIn(echoPin, HIGH);
distance = (duration/2) / 29.1;
if (distance < 5) {
Serial.println("the distance is less than 5");
```

```
servo.write(90);

}

else {

servo.write(0);

}

if (distance > 60 || distance <= 0){

Serial.println("The distance is more than 60");

}

else {

Serial.print(distance);

Serial.println(" cm");

}

delay(500);

}
```

CHAPTER 5

CONCLUSION AND RECOMMENDATION

5.1 Introduction

This chapter presents the findings of the reported study on chapter four and its suitability addresses the objectives of the study. The discussion will be made by comparing the results hypotheses if it meet the objectives of the study. Through these discussions and conclusions of the research obtained, with some suggestions and recommendation we can also try to improve and upgrade our product for the future development.

5.2 Discussion

From the analysis of the data and discussion of the results that we have studied, we have identified some shortcomings that can be improved and upgraded our product for the future development such as:

• Low durability

We found that the material on the hull was made of PVC material, so it was lack of durability and the strength of the pole for bending also less, so in the event of any damage to the pole it would be easily to be broken and damaged.

• Less secure

We also find that the safety of mechanical and electronic items on the poles is also very low which makes it easy for irresponsible people to steal it. The mechanical and electronic items inside it will be damage due the heavy rain and storms.

• One pillar for one "parking assistant"

We have received several comments on this product about why a single pole employs only one assistant, this will increase the cost of the product due to the need to buy more poles to produce a parking assistant in a parking area. Generally, the open parking area is quite large so if you have one pole for one parking area it will need many poles to accommodate all the parking available.

5.3 Conclusion

As a conclusion, we can conclude that our product can help drivers reduce their time and energy they spend to locating an empty parking lots. With the improvements we will make to this product it will also be more effective and the durability of the poles will also increase while reducing the damage to the poles and theft to the mechanical and electronic item inside.

5.4 Suggestion

From the discussions we have had, we have come up with some suggestions to improve and upgrade this product for the future product development, such as:

• Strengthen the durability of poles material

We will replace the material used on the poles with stronger and more effective materials such as galvanized steel. It is a lightweight stainless steel with high durability. therefore, it will reduce the damage that the pole may cause if it is breached.

- Improve security

To enhance the safety of our products, we will add some safety features to our products to prevent theft and damage from rain or storms that will affect the components inside it. One of the safety features we added was to create a special lock to open and close the small door on the pole. We will also add an iron rod under the pole that was once planted to prevent thieves from removing it. We will also put electrical components in places where water is not exposed.

- Change the shape of the pole

We will change the shape of our product from one pole to one that is as long as the goalpost to place multiple assistants on one product.

5.5 Summary

In this chapter we discuss and do some improvements that can make this product to be more effective and also increase the durability of the poles to reduce the damage taken to the poles and theft to the mechanical and electronic item inside.

REFERENCE

Websites

- https://62e1a3e9-c5ed-4f1a-8182-14ebd7c76947.filesusr.com/ugd/22a975_7fc48286344544d2a2518c36943bd70f.pdf
- https://www.techexult.com/project-lessn
- https://en.wikipedia.org/wiki/Automated_parking_system
- https://www.arduino.cc/
- https://trid.trb.org/view/901204
- https://www.projectsof8051.com/automatic-car-parking-indicator-system/
- https://www.edgefxkits.com/blog/making-automatic-car-parking-system/
- file:///C:/Users/Diggrix/Desktop/FYP/BP%20PROJEK%202016%2016062016_Final.pdf

Books

- The Parking Garage: Design and Evolution of a Modern Urban Form
  Book by **Shannon Sanders McDonald**

- Parking Management for Smart Growth
  By **Richard W. Willson**

- Parking Reform Made Easy
  By **Richard W. Willson and Donald C. Shoup**

APPENDIX A: GANTT CHART