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This project report title "Ping Pong Collector" has been submitted, reviewed and confirmed as meeting the conditions and requirement of writing projects as required.

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ABSTRACT

The main objective of the ping pong product is to design and develop a ping pong collector. This ping pong ball collector is designed and produce mainly to collect the standard ping pong balls all around the world. This ping pong collector is very useful for all the trainer and trainee as this could save the time and energy to pick the ball. This ping pong ball collector is handle by an arduino via Bluetooth, relay and vacuum to suck the ping pong ball. After being suck it will keep it in itself. By using this ping pong collector, human can avoid having a backache which is caused by bending while picking up the ball. Furthermore, we can save money by using this ping pong collector rather than hiring a worker/ employee to collect the balls. This product is able to collect 5 ping pong balls in a round. This collector can be enhanced and useful functions with admin and user. Colour sensor can be added to detect the ball via its colour together with ultrasonic sensor where it can be an autonomous collector. As a conclusion, this ping pong collector is very useful for the teenagers and adults especially to the trainer and trainee who play ping pong games as it reduce their burden by collecting the balls.

ABSTRAK

Objektif utama produk ping pong adalah untuk mereka bentuk dan membangunkan pengumpul ping pong. Pengumpul bola ping pong ini direka dan dihasilkan untuk mengumpul bola ping pong standard di seluruh dunia. Pengumpul ping pong ini sangat berguna untuk semua jurulatih dan pelatih kerana dapat menjimatkan masa dan tenaga untuk mengutip bola. Pengumpul bola ping pong ini dikendalikan oleh arduino melalui Bluetooth, geganti dan vakum untuk menyedut bola ping pong. Selepas menyedut ia akan menyimpannya sendiri. Dengan menggunakan pengumpul ping pong ini, manusia dapat mengelakkan sakit belakang yang disebabkan oleh lenturan apabila mengutip bola. Tambahan pula, kita dapat menjimatkan wang dengan menggunakan pengumpul ping pong ini dan bukannya membayar seorang pekerja / pekerja untuk mengumpul bola. Produk ini dapat mengumpul 5 bola ping pong. Pengumpul ini boleh dipertingkatkan dan berfungsi dengan fungsi admin dan pengguna. Sensor warna boleh ditambah untuk mengesan bola melalui warna bersama sensor ultrasonik di mana ia boleh menjadi pemungut autonomi. Sebagai kesimpulan, pengumpul ping pong ini sangat berguna untuk remaja dan orang dewasa terutama kepada jurulatih dan pelatih yang bermain permainan ping pong sambil mengurangkan beban mereka dengan mengumpul bola.

APPRECIATION

First and foremost, we would like to take this opportunity to be grateful to the Almighty and at the same time we would like to express our sincere appreciation and gratitude to our project supervisor, Pn Azlina Binti Abdul Aziz for her invaluable guidance, encouragement, advice, critics, support given and also time spent throughout the progress of this project.

We also would like to say thanks to our parents and family members and our friends who took initiative to support us and show interest in everything especially when it comes to financial matter. They also help us to verify the accuracy of the content in this report by giving us some useful ideas. They have spend their considerable time with us to complete this project and report.

Last but not the least, we would like to thank each and every single individual who are involved in supporting and helping us to complete this project whole heartly. In preparing this report, I was in contact with many people, researchers, academicians and practitioners. Without their continued support and interest, this project would not have been the same as presented here. They have contributed toward my understanding and supports us all these years. Thanks for their encouragement, love and emotional supports that they had given to us.

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CHAPTER 1

INTRODUCTION

1.0 Introduction

Before starting this project, we have made the observation and study of all aspects available on relay, vacuum, arduino and bluetooth. There are various aspects that need to be addressed so that the products have a high capacity as well as cost savings. Among the things that are concern is the selection relay, vacuum and arduino analyze the existing design, along with advantages and disadvantages of each tools and combination of relay, arduino and bluetooth. Below we have mentioned some of the study and research that we can do.

1.1 Problems Statement

Nowadays, people are facing kinds of health problem and backache is one of the highest problem face by all the teenagers and adults. Especially for those who are playing table tennis game. When playing this game, all the trainer and trainee always have to waste their time and energy to pick the table tennis ball up during practice and game. In the meantime, some people do hire an employee to work only and only for collecting the ball where they have to pay them a high salary.

1.2 Objective

The main objective of this project is to make a ping pong collector that can carry out a task.

The objective of this product are,

- i. To design and develop a ping pong collector.
- ii. To able the product to collect the standard ping pong balls.

1.3 Scope and Limitation of Project

Scope project are important element in this project. It can make sure the project can be finished on the time. Because to make a good project there must have a scope.

- i. Able to collect only 5 ping pong balls with a specific weight range of (37.0g – 39.0g) with a diameter around 65mm and a width of 27mm.
- ii. The length of the court is 11.885 metres long. Its width is 4.115 metres for singles matches and 5.485 metres for doubles matches. The service line is 3.20 metres from the net

1.4 Definition of Term

There are several definition that are explain more deeply about the equipment that are used in this project.

I. Definition Arduino Uno

We use arduino Uno is a microcontroller board based on the Atmega328P. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz quartz crystal, a USB connection, a power jack, an ICSP header and a reset button. 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. You can tinker with your UNO without worrying too much about doing something wrong, worst case scenario you can replace the chip for a few dollars and start. This type arduino is cheap and easy to programmable to this project.

II. Definition Relay

Relay is an electromagnetic device for remote or automatic control that is actuated by variation in conditions of an electric circuit and that operates in turn other devices (such as switches) in the same or a different circuit.

III. Definition (PCB) Layout

We use a printed circuit board [PCB] because it can mechanically supports and electrically connects electronics components using conductive tracks, pads and other features etched from copper sheets laminated onto a non- conductive substrate.

IV. Definition Cable and Wire

Cable and wire is commonly should be used in project to transmit electricity to the project to power up.

V. Definition Motor Driver

A motor driver is a little current amplifier; the function of motor drivers is to take a low-current control signal and then turn it into a higher-current signal that can drive a motor. There are many different kinds of motor drivers. At Future Electronics we stock many of the most common types categorized by maximum supply voltage, maximum output current, rated power dissipation, load voltage, packaging type and number of outputs. The parametric filters on our website can help refine your search results depending on the required specifications. The most common values for maximum supply voltage are 36 V and 52 V. We also carry motor drivers with supply voltage up to 450 V. The number of outputs can be between 1 and 12, with the most common motor drivers having 1, 2 or 4 outputs

VI. Definition DC Motor

A DC motor is any of a class of rotary electrical machines that converts direct current electrical energy into mechanical energy. The most common types rely on the forces produced by magnetic fields. Nearly all types of DC motors have some internal mechanism, either electromechanical or electronic, to periodically change the direction of current flow in part of the motor.

DC motors were the first type widely used, since they could be powered from existing direct-current lighting power distribution systems. A DC motor's speed can be controlled over a wide range, using either a variable supply voltage or by changing the strength of current in its field windings. Small DC motors are used in tools, toys, and appliances. The universal motor can operate on direct current but is a lightweight motor used for portable power tools and appliances. Larger DC motors are used in propulsion of electric vehicles, elevator and hoists, or in drives for steel rolling mills. The advent of power electronics has made replacement of DC motors with AC motors possible in many applications.

VII. Definition Battery & Battery Holder

A battery holder is one or more compartments or chambers for holding a battery. For dry cells, the holder must also make electrical contact with the battery terminals. For wet cells, cables are often connected to the battery terminals, as is found in automobiles or emergency lighting equipment.

VIII. Definition Bluetooth

Bluetooth is a telecommunications industry specification that describes how mobile devices, computers and other devices can easily communicate with each other using a short-range wireless connection.

CHAPTER 2

LITERATURE REVIEW

2.0 Introduction

Before starting this project, we have made the observation and study of all aspects available on relay, vacuum, arduino and bluetooth. There are various aspects that need to be addressed so that the products have a high capacity as well as cost savings. Among the things that are concern is the selection relay, vacuum and arduino analyze the existing design, along with advantages and disadvantages of each tools and combination of relay, arduino and bluetooth. Below we have mentioned some of the study and research that we can do.

2.1 Materials

There are some materials that are used in our project such as:

I. ARDUINO UNO

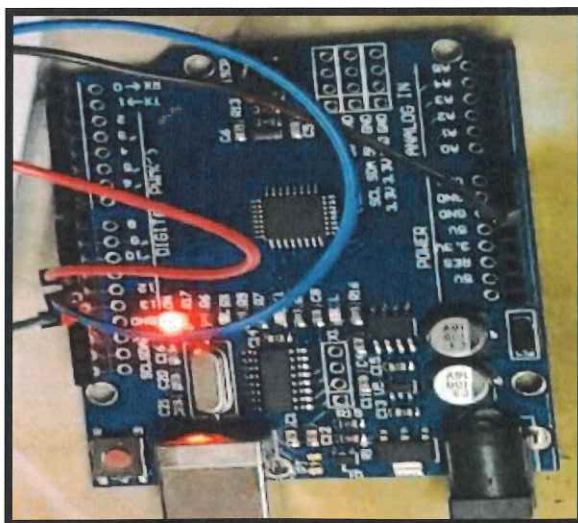


Figure 2.1 Arduino Uno

We use arduino Uno is a microcontroller board based on the ATmega328P. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz quartz crystal, a USB connection, a power jack, an ICSP header and a reset button. 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. You can tinker with your UNO without worrying too much about doing something wrong, worst case scenario you can replace the chip for a few dollars and start. This type arduino is cheap and easy to programmable to this project.

II. (PCB) LAYOUT

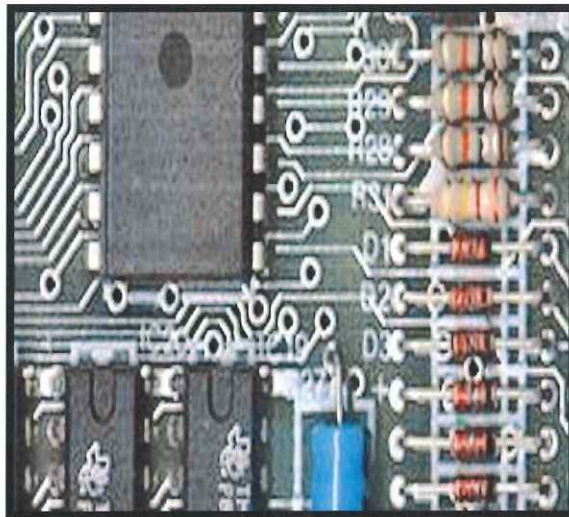


Figure 2.2 PCB Layout

In this project we use printed circuit board (PCB) because mechanically supports and electrically connects electronic components using conductive tracks, pads and other features etched from copper sheets laminated onto a non-conductive substrate. PCBs can be *single sided* (one copper layer), *double sided* (two copper layers) or *multi-layer* (outer and inner layers). Multi-layer PCBs allow for much higher component density. Conductors on different layers are connected with plated-through holes called vias. Advanced PCBs may contain components - capacitors, resistors.

III. RELAY

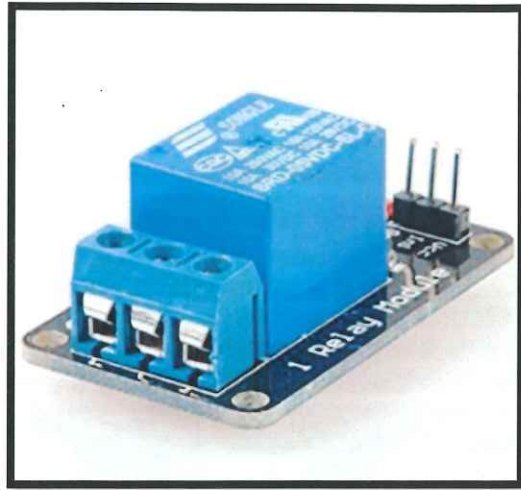


Figure 2.3 Relay

A relay is an electromagnetic switch operated by a relatively small electric current that can turn on or off a much larger electric current. The heart of a relay is an electromagnet (a coil of wire that becomes a temporary magnet when electricity flows through it). You can think of a relay as a kind of electric lever: switch it on with a tiny current and it switches on ("leverages") another appliance using a much bigger current. Why is that useful? As the name suggests, many sensors are incredibly *sensitive* pieces of electronic equipment and produce only small electric currents. But often we need them to drive bigger pieces of apparatus that use bigger currents. Relays bridge the gap, making it possible for small currents to activate larger ones. That means relays can work either as switches (turning things on and off) or as amplifiers (converting small currents into larger ones).

IV. DC MOTOR

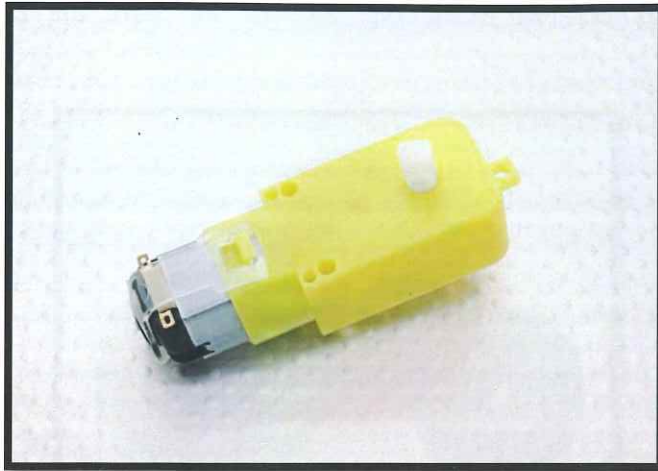


Figure 2.4 DC Motor

A DC motor is any of a class of rotary electrical machines that converts direct current electrical energy into mechanical energy. The most common types rely on the forces produced by magnetic fields. Nearly all types of DC motors have some internal mechanism, either electromechanical or electronic, to periodically change the direction of current flow in part of the motor.

DC motors were the first type widely used, since they could be powered from existing direct-current lighting power distribution systems. A DC motor's speed can be controlled over a wide range, using either a variable supply voltage or by changing the strength of current in its field windings. Small DC motors are used in tools, toys, and appliances. The universal motor can operate on direct current but is a lightweight motor used for portable power tools and appliances. Larger DC motors are used in propulsion of electric vehicles, elevator and hoists, or in drives for steel rolling mills. The advent of power electronics has made replacement of DC motors with AC motors possible in many applications.

V. WHEELS

These wheels are made for robotics applications and can mount easily onto our motors.



Figure 2.5 Wheels

VI. L239D

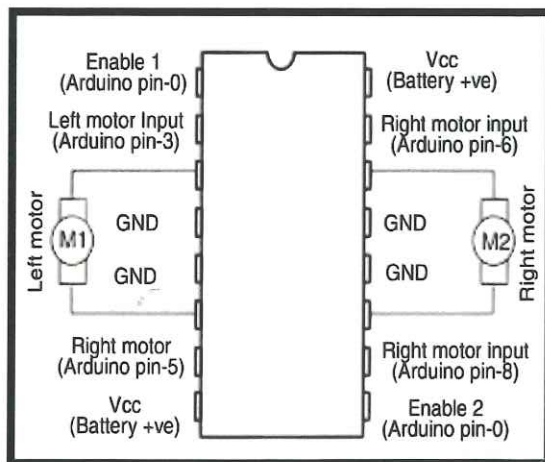


Figure 2.6(a) the IC L239D configuration

The L239D is an integrated two-circuit H-bridge in a 16-foot package. All circuits, bridges are integrated. The L239D has a high nominal voltage (maximum 36V) and a nominal nominal current of 1.2A, which is suitable for small power applications such as small and medium DC motors. Because it is "all in one" should be the perfect choice for

those who do not have much experience in making electronic circuits. There are two H-bridges on each L298D, so you can control two objects with just one chip. Each circuit consists of a source line verse (actually a common line for two bridges), a current sensing line, the end of the H circuit is not connected to the GND but left empty for the user to connect one a small resistor called a sensing resistor. The engine will be connected to OUT1, OUT2 (or OUT3, OUT4 if the bridge is right). An En (EnA and EnB for two bridges) allow the bridges to operate, when En's legs are pulled high, the bridges are ready for operation.

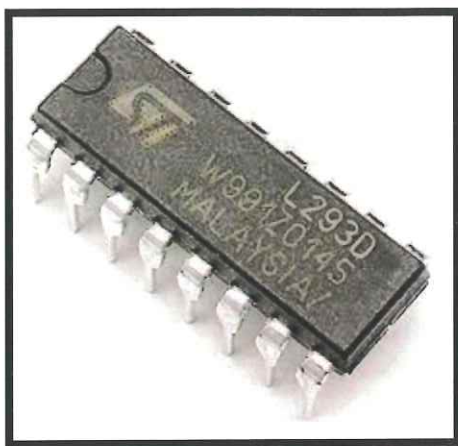


Figure 2.6(b) IC L239D

VII. MALEFEMALE WIRE

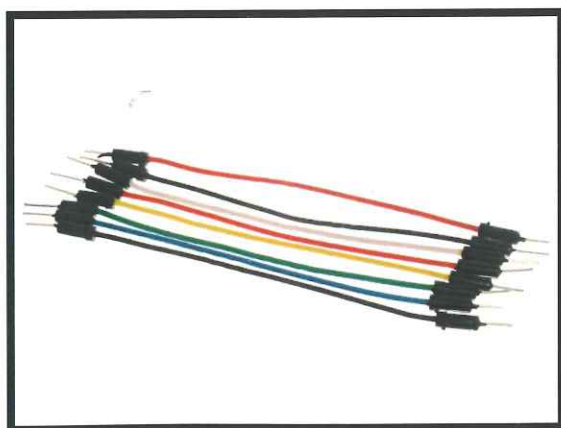


Figure 2.7 The Jumper Wire

A **jump wire** (also known as jumper, jumper wire, jumper cable, DuPont wire, or DuPont cable – named for one manufacturer of them) 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.

VIII. FAN

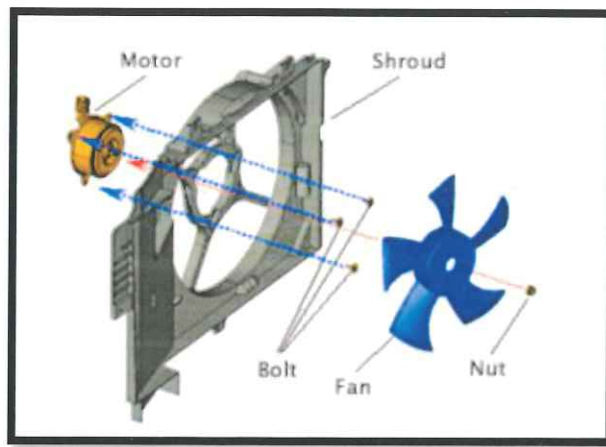


Figure 2.8 Fan

Fan and shroud are made of resin whose cost is low for weight and cost saving.

There are different variations of motor from low capacity one (cylinder type) to high capacity one (flat type). The fan specification and motor capacity are determined by engine required performance. In addition, we are developing and producing PWM which aims for electric power saving, low noise, increase of motor durability and soft starting (reduction of rush current).

CHAPTER 3

METHODOLOGY

3.0 Introduction

This chapter is discussed about the methodology that has been used to complete this project. It was planned properly by getting the correct information from various sources from references book, journal, articles, internet and others. It also include interview session with our supervisor to get the information, advices and guidelines to complete this proposal report. All of the data and useful information were determined to analyze to get the best result. Generally there are several level to reach the complete product analysis which is

- 1) Design analysis to the available product.
- 2) Design concept based on the sketching and analysis drawing.
- 3) Produce the product concept.
- 4) Produce the real concept.

FIGURE 3.1: BLOCK DIAGRAM FOR PING PONG COLLECTOR

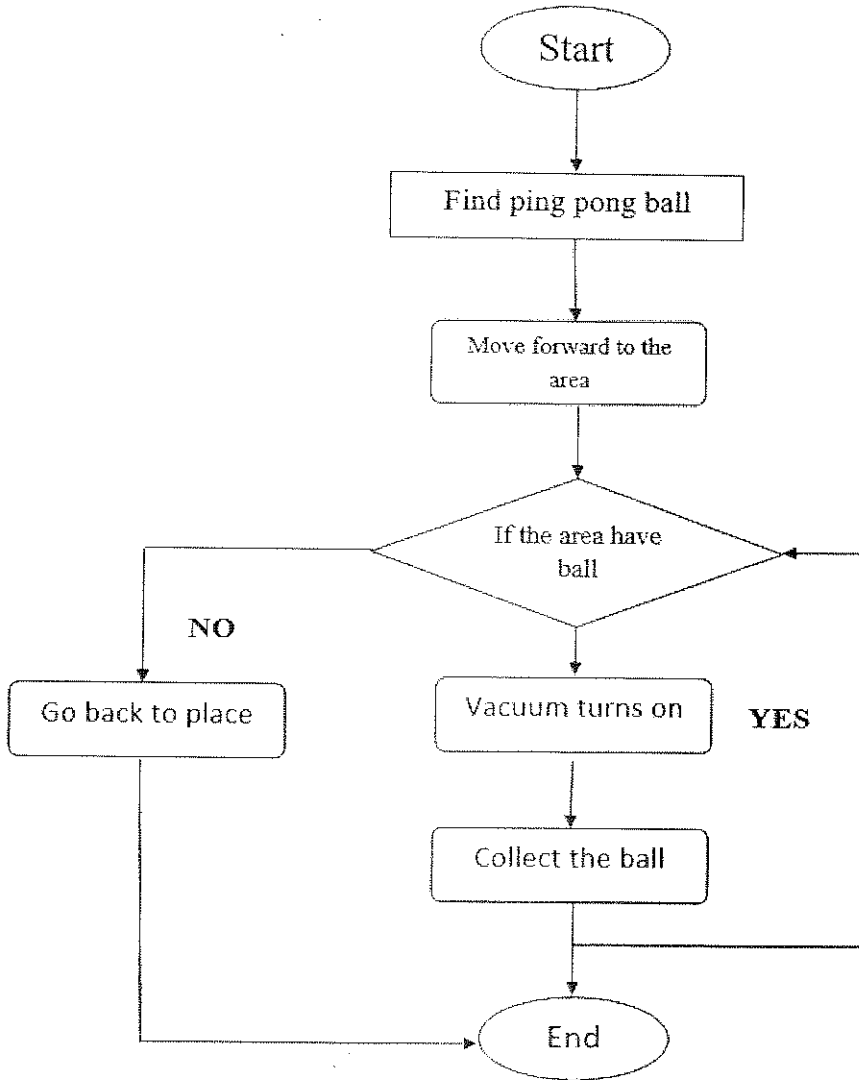
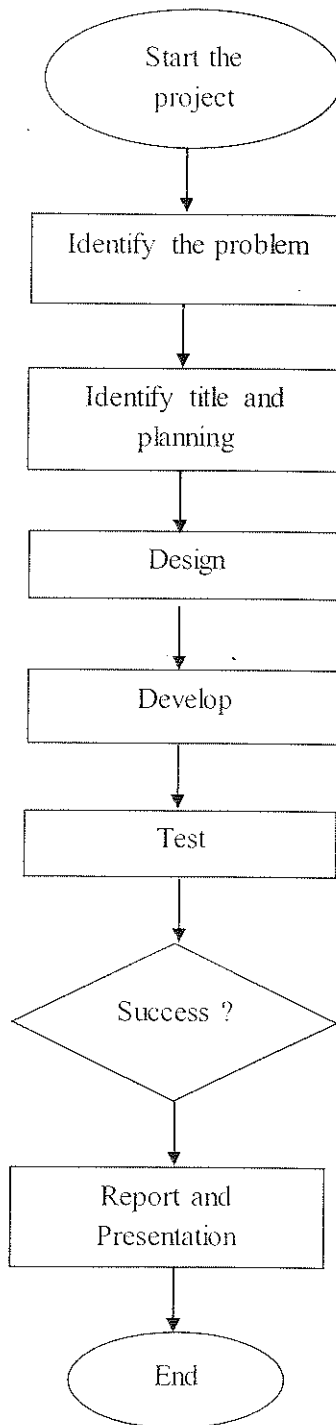
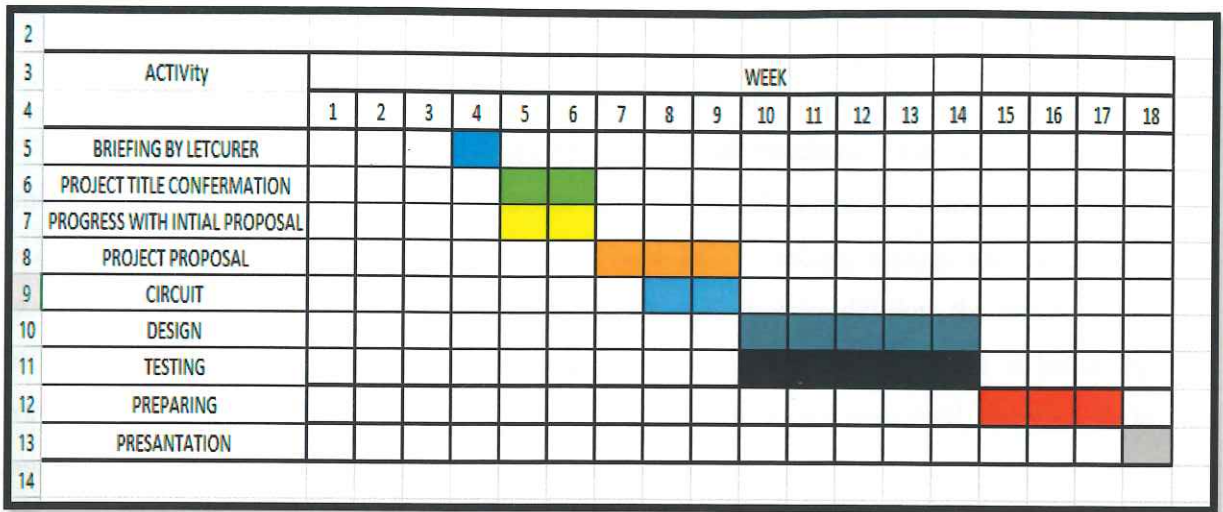


FIGURE 3.2: PROJECT FLOW CHART



3.3 GANTT CHART



3.4 PROJECT COST TABLE

Component	Cost
Arduino UNO	RM 130
Relay	RM 10
M-F Rainbow Cable	RM 11
DC Motor	RM 30
Basic Electrical Components	RM 10
Spacer	RM 20
Ping Pong Balls	RM 9
Hot Glue Gun	RM 15
Perspex	RM 60
Batteries	RM 20
TOTAL	RM 315

Table 3.4.1 Estimated Cost

3.5 Draw Schematic Diagram of circuit using PROTEUS.

PROTEUS V8.4 allows professional engineers to run interactive simulation of real designs, and to reap the reward of this approach to circuit simulation. And then, a range of simulator models for popular micro-controller and a set of animated models for related peripheral devices such as CT-ARDUINO UNO and LCD displays, resistor and more. IT is possible to simulate complete micro-controller system and thus to develop the software for them without access to a physical prototype. IN a world where time to market is becoming more important his is a real advantage. Structurally, 6 Professional separated into two main components, which is ISIS 7.

Professional and ARES 7 Professional. ISIS 7 Professional mainly involved on circuit designing and simulation. In our project we use Proteus to design a schematic diagram.

3.6 Simulate the Circuit Using Proteus

After completing the circuit assembly and configuration, now it's time to verify whether the source code compiled is virtually accurate or not. Proteus offer a whole lot variety virtual devices. IN fact, simulation using oscilloscope and function generator can be done using Proteus. Even virtual hyper terminal is provided to demonstrate how your code perform in real world without really doing the hardware section yet.

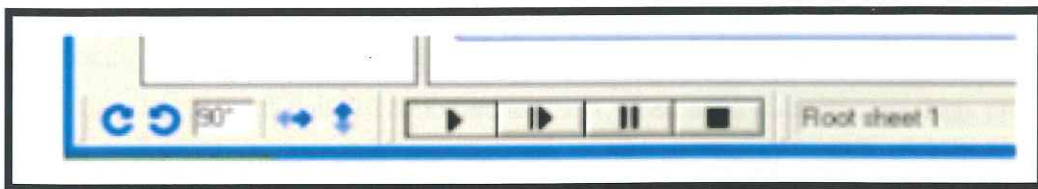


Figure 3.6.1 Toolbar of Proteus simulation.

3.7 Process of Circuit Design.

Design the circuit diagram.

After decide what kind of project that we want to build .We need to make a research about the circuit, electronic component that we need to used, hardware and so on .These things actually can help us to make a better in designing circuit .For example, we need to know the size, foot of component, polarity of the component, the component method compilation and etc. to make a circuit diagram.

In the first step in Circuit Designing process is make a circuit diagram that can be used in the next process. Among steps in the circuit diagram are:

- i. Before the circuit is produced the things that we need to be emphasized are the position of symbols and components used in the schematic circuit. Once we know the entire production circuit, the circuit can be drawn using software, namely Proteus ISIS Professional.
- ii. Then make sure that the connection of the components is correct.

3.8 Etching

Etching is a "subtractive" method used for the production of printed circuit boards. Acid is used to remove unwanted copper from a prefabricated laminate. This is done by applying a temporary mask that protects part of the laminate from the acid and leaves the desired copper layer untouched .Etching is where the excess copper is removed to leave the individual tracks or traces as they as they are sometimes called. Buckets, bubble tanks, and spray machines lots of different ways to etching, but most firms currently use high pressure conveyerised spray equipment .Many different slow controlled speed etches used for surface preparation to the faster etches used for etching the tracks. Some are best used in horizontal spray process equipment while others are best used in tanks.

3.9 Risk of Etching

- i. There is a risk of injuries due to the chemicals involved.
- ii. The quality of the result depends on several factors which you won't be able to master completely by using good machinery.
- iii. There is the problem of waste disposal. Toxic chemicals require a proper disposal service.

3.10 Safety

Since the work involve dangerous chemical and power tools, we will need to take the necessary safety precautions:

- i. Wear safety equipment during the whole process-gloves, protection glass and an apron.
- ii. Work near an emergency eyewash station a first aid box and a phone.
- iii. Familiarize yourself with the proper use of all equipment and tools in the lab-if you are unsure of anything, ask a supervisor of the project.

3.11 Etching Process

Etching is the process of using acid to remove coppers that not need on the PCB (PRINTED CIRCUIT BOARD).This acid is Acid Ferric Chloride III. is used to remove that coppers



Figure 3.11.1 (PCB) Developer and is Acid Ferric Chloride

The steps of the etching process are:

- i. Print the schematic onto photo paper and cut it with the same size of PCB board.

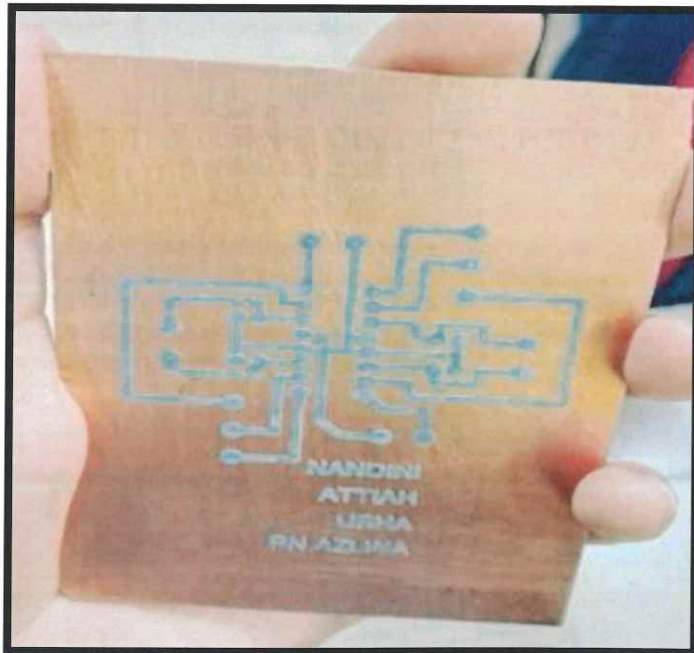


Figure 3.11.2 Etching process