

ECO FRIENDLY TRASH BIN

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DIPLOMA ELECTRONIC ENGINEERING (COMMUNICATION)

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ABSTRAK

Robot tong sampah ini adalah alternatif bagi mengelakkan sampah di dalam sesuatu tempat sesuai daripada berbau busuk. Robot ini direkabentuk daripada gabungan beberapa blok litar iaitu litar pemandu motor, arduino, litar keluaran yang menggunakan penderia sebagai suis yang akan memberitahu bahawa tong sampah sudah penuh atau berat dan hanya perlu mengawalinya melalui telefon pintar dengan "Bluetooth" untuk menggerakkan tong sampah ke tempat pembuangan sampah. Perbezaan terbesar antara model-model lain ialah tong sampah ini bergerak secara menyeluruh atau nama saintifiknya "Mobile Robotic". Robot ini dijangka mampu menyelamatkan tempat daripada berbau busuk dan berulat serta mengurangkan tenaga kerja. Robot tong sampah ini amat sesuai dan berfungsi dengan baik di rumah, pejabat, kedai dan taman rekreasi. Dengan mempunyai tong sampah secara automatik boleh mengetahui bahawa ia penuh dan hanya perlu mengawalinya ke tapak pelupusan. Selain itu, aspek pelayaran boleh diperluaskan untuk digunakan di rumah pinggir bandar di mana pickup sisa berlaku pada hari yang sama setiap minggu. Berdasarkan masalah itu, tong sampah sedia ada tidak mempunyai petunjuk untuk menunjukkan sama ada sampah tong penuh atau tidak begitu tanpa pemantauan yang betul, sisa boleh bertahan dalam tin sampah kami, yang membawa kepada bau yang tidak menyenangkan yang tersebar di seluruh isi rumah. Tong sampah boleh mengelakkan bau yang tidak menyenangkan yang akan menyebar ke seluruh isi rumah dan juga untuk mengurangkan masa untuk mengeluarkan sisa. Projek Eco Friend Trash Bin ini adalah hasil pemerhatian kami terhadap masalah mengendalikan sampah berat dan sukar untuk mengangkatnya.

ABSTRACT

This trash bin robot is an alternative to preventing rubbish in a suitable place from stinking. This robot is designed from a combination of several circuit blocks - motor driver, arduino, output circuit using sensors as switches that will tell the trash can be full or heavy and just need to control it via smart phones with "Bluetooth" to move the trash bin to the dump garbage. The biggest difference between the other models is that the trash can move completely or its scientific name "Mobile Robotic". The robot is expected to save the place from stinking and wrinkling and reducing the workforce. Robot trash is very suitable and works well in homes, offices, shops and recreational parks. By having the trash can automatically to know that it is full and just have to control it to the landfill. Furthermore, the navigational aspect can be expanded for use in suburban homes where waste pickup occurs the same day every week. Based on the problem, existing trash bin have no indicator to indicate whether the trash bin is full or not is so without proper monitoring, waste can stagnate in our trash cans, leading to unpleasant odours that spread throughout the household. The trash bin can avoid unpleasant odours that will spread throughout the household and also to reduce the time to take out the waste. This Eco Friend Trash Bin project is the result of our observation of the problem of handling heavy trash and hard to lift it.

APPRECIATION

Alhamdulillah, thank God with His grace that gives good health throughout the implementation of this project, Thank you for the support of your friends, family members for providing encouragement throughout the duration of the project.

The highest appreciation was given to our project supervisor Mr Faizal Bin Mohamad Twon Tawi for his guidance and guidance, we completed and produced this project, starting from project 1 until this final project.

Not forgetting is also a great thank-you to our fellow partners who have been involved in implementing this project, which has not shared the information and experience during the implementation and completion of this project, as well as to our two parents who always provide support and enthusiasm and financial assistance to ensure success we

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Chapter 1

INTRODUCTION

1.1 Introduction

In these four and five semesters we are required to make one project as one of the requirements for obtaining a Diploma in their respective fields. This project is a major component of the learning curriculum in Polytechnic. This project is a result of its own creation and it should also relate to what has been learned so far. The proposed project title is "Eco Friendly Trash Bin".

1.2 Background Project

The trash bin is used to remove rubbish or items that are not used anymore. It commonly can be found at homes, hostel, offices and recreational park. Trash bin also usually made of plastic or metal and it's a bit heavy to be carried by humans to lift the garbage that has been much in the trash. Moreover, normal trash bins will we renew the trash that can facilitate the public. The trash bin that we would like to renew have a tires and can move it by just controlling it through smart phones.

The title of this project is "Eco Friendly Trash Bin". Our aims are to be more readily available to an average consumer. Likewise, our focus shifts towards improving the weight sensor by using buzzer. By having the trash can automatically to know that it is full and just have to control it to the landfill. Furthermore, the navigational aspect can be expanded for use in suburban homes where waste pickup occurs the same day every week. Our system could potentially be configured to automatically move itself to the curb prior to pick up and move itself back afterwards. This completely removes the need to manually do a weekly task for suburban homeowners.

1.3 Problem Statement

Based on the problem, existing trash bin have no indicator to indicate whether the trash bin is full or not is so without proper monitoring, waste can stagnate in our trash cans, leading to unpleasant odours that spread throughout the household. Manually taking out the trash frequently may be wasteful if the trash bin is mostly empty. Moreover, since the average person generates roughly 4.6 pounds of trash a day, the frequency in which need to be checked and maintain our trash cans becomes greater.

1.4 Objective

The objective is to improve the trash bin by automating parts of the trash management process. Besides that, they need to constantly check the trash and provide a convenient reminder when the trash is full. The trash bin can avoid unpleasant odours that will spread throughout the household and also to reduce the time to take out the waste.

1.5 Scopes Of Study

The scope of this project are understanding the overview concept motor driver, because our project design base using a motor, by understanding it operation and knowledge, we have created the mini sumo robot in order to learn a basic concept motor driver. This project using a Weight Sensor 0-5kg, Bluetooth Module HC-06, L293D, Capacitor and Arduino UNO.

Chapter 2

LITERATURE REVIEW

2.1 Introduction

A literature review is a body of text that aims to review the critical point of current knowledge and or methodological approaches on a particular topic. Literature review are secondary source, and as such, do not report any new or original experimental work.

Most often associated with academic-oriented literature, such as these, a literature review usually precedes a research proposal and results section. Its ultimate goal is to bring the reader up to date with current literature on a topic and forms the basis for another goal, such as future research that may be needed in the area. A well-structured literature review is characterized by a logical flow of ideas, current and relevant references with consistent, appropriate referencing style, proper use of terminology and unbiased and comprehensive view of the previous research on the topic.

The report that we want to be produced needed a few factors that should be taken consideration until that project implemented. To get a quality project result we need to study about the type of material, design, component that we used, frame work installation, installation method and maintenance, level of product safety, structural strength, project size and so on that we need make it and consider the result that we get. This is all ensure that no any problems would arise during the completion or even when presenting the project.

Besides that, systematic and detailed planning must be arranged for produce a complete and prefect project. First step we need made it, was design (sketching) to get the real image of project that we want to be produced. Finally, the work design and study that we made is a continuing process and it involving problem solving activity creatively namely which is known as literature study.

2.2 Concept / Theory

2.2.1 L293D

L293D is a motor driver. As its name suggests it can drive a motor (normally DC motors up to certain range). Since the output voltage of 8051 is limited to 5V only thus motors with higher required voltage need some drivers to provide them their desired input voltage. L293D is a 16-pin IC which can control a set of two DC motors simultaneously in any direction. It means that you can control two DC motor with a single L293D IC. The l293d can drive small and quiet big motors as well. It works on the concept of H-bridge. H-bridge is a circuit which allows the voltage to be flown in either direction. As you know voltage need to change its direction for being able to rotate the motor in clockwise or anticlockwise direction, Hence H-bridge IC are ideal for driving a DC motor. There are two Enable pins on l293d. Pin 1 and pin 9, for being able to drive the motor, the pin 1 and 9 need to be high. For driving the motor with left H-bridge you need to enable pin 1 to high. And for right H-Bridge you need to make the pin 9 to high. If anyone of the either pin1 or pin9 goes low then the motor in the corresponding section will suspend working. It's like a switch. There are 4 input pins for this l293d, pin 2, 7 on the left and pin 15, 10 on the right. Left input pins will regulate the rotation of motor connected across left side and right input for motor on the right hand side. The motors are rotated on the basis of the inputs provided across the input pins as LOGIC 0 or LOGIC 1.

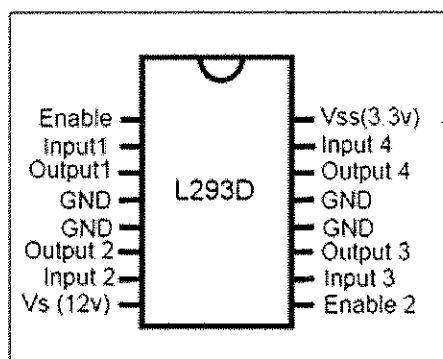


Diagram 1 Pin of Motor Driver

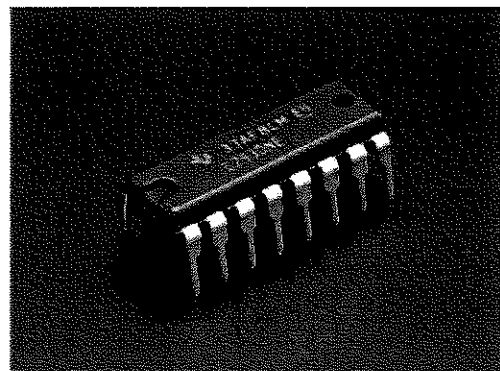


Diagram 2 Motor Driver

2.2.2 Arduino

Arduino is an open-source electronics platform based on easy-to-use hardware and software. Arduino boards are able to read inputs - light on a sensor, a finger on a button, or a Twitter message - and turn it into an output - activating a motor, turning on an LED, publishing something online. You can tell your board what to do by sending a set of instructions to the microcontroller on the board.

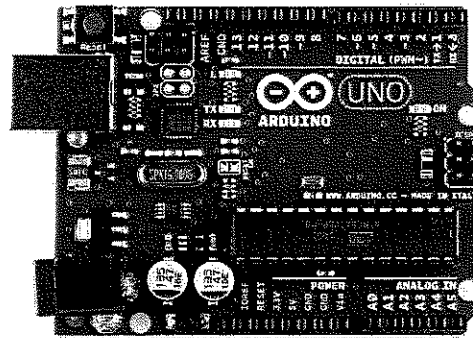


Diagram 3 Arduino Uno

2.2.3 Direct Current Motor

DC motors are often built with rotor belilit and stator consisting of wire or permanent magnet winding. A compact DC motor. During the electric current through the loop, a magnetic field is generated around the armature. The left side of the armor is pushed away by the left-handed magnet to the right, causing the rotation. Armatur continues to spin. When armature is horizontally armed, the modifier converts the current flow direction through the loop, reversing the magnetic field. Repeat process.

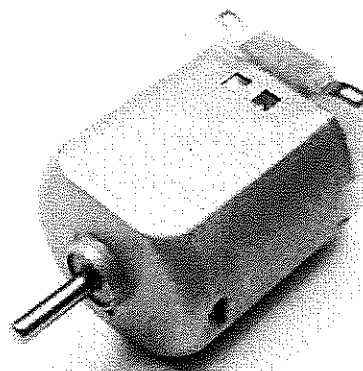


Diagram 4 DC Motor

2.2.4 Bluetooth Module HC-06

Bluetooth module HC-06 - The **HC-06** module only can be a slave. This makes it only useful for say connecting a notebook as a master to a robot with a slave module for a wireless serial bridge.

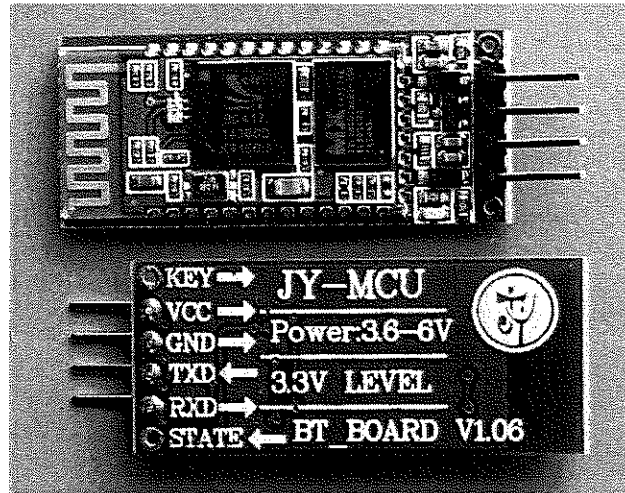


Diagram 5 Bluetooth Module HC-06

2.2.5 Capacitor

Capacitors come in different shapes and kind. Their value, capacitance (C) is expressed in Farads (F) and submultiples like microfarads (uF), nanofarads (nF) and picofarads (pF). Polarized capacitor like resistors they can be mounted without observing a specific orientation. Example ceramics, metal film, electrolytics not polarized and etc. With metal film and ceramics a 3 or 2 digits code it's most used to indicate the value which is expressed in picofarads (pF). Third digit is just how many zero you have to add to the first two digits, so:

$$100 = 10\text{pF}$$

$$101 = 100\text{pF}$$

$$104 = 100000\text{pF} = 100\text{nF}$$

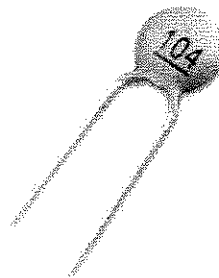


Diagram 6 Capacitor

2.2.5 Straight Bar Load Cell (Weight Sensor 0-5kg)

This straight bar load cell can translate up to 5kg of pressure (force) into an electrical signal. Each load cell is able to measure the electrical resistance that changes in response to, and proportional of, the strain (e.g. pressure or force) applied to the bar. With this gauge you will be able to tell just how heavy an object is, if an object's weight changes over time, or if you simply need to sense the presence of an object by measuring strain or load applied to a surface.

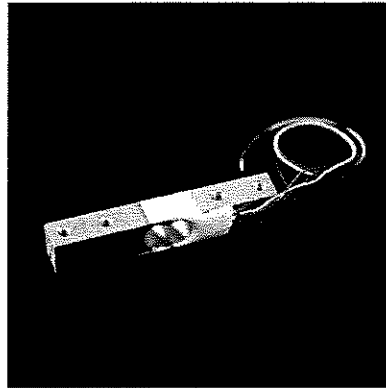


Diagram 7 Straight Bar Load Cell 0-5kg

2.3 Previous Research

"Bluetooth Mobile Robot" project is a project that control the robot using a smart phone via Bluetooth. This project uses Android Apps are already available on the Google Play store Arduino BT Joystick Free (<http://shahrulnizam.com/project-bluetooth-mobile-robot/>). The next title is "Simple Line Follower Robot" is a machine that follows a line, either a black line on white surface or vise-versa. For Beginners it is usually their first robot to play with (<http://playwithrobots.com/simple-line-follower-robot/>) Then, the next project is "water level indicator" there are 3 LED available to indicate the different level of water in water glass. This circuit expresses the level through the lighting of LED. This kind of circuit is not used more because of its silent features. Generally we used buzzer type circuit. (<http://wattrup.blogspot.my/2014/12/project-2-water-level-indicator.html>)

Based on three literature review, there are same specifications of the project using a Bluetooth module hc-06. Besides, there are also differences and similarities between all of the projects, some projects have been using arduino, dc motor and a apps using android hand phone. Based on the above project, we propose a new project with arduino, dc motor and android apps. Thus, when the android apps is used to controlled the conveyor in order to pick up things from one place to another. This will help the human to cut down the time of working.

Chapter 3

RESEARCH METHODOLOGY

3.1 Introduction

Methodology can be the 'analysis of the principles of methods, rules and postulates employed by a discipline', 'the schematic study of methods that are, can be, or have been applied within a discipline' or 'a particular procedure set of procedures'.

Methodology includes a philosophically coherent collection of theories, concepts ideas as they relate to a particular discipline or field of inquiry. Methodology refers to more than a simple set of methods rather it refers to the rationale and the philosophical assumption that underlie a particular study relative to the scientific method. This is why scholarly literature often includes a section on the methodology of the researches.

Each step of project is a process to complete the project. Every step must be followed one by one and must be done carefully. If some error occurs it can make.

A project probably could not operate or do not look neat and perfect. Before the project finish, various processed needs to be done according to proper procedures to ensure that projects do not have any problem. Among the measure the work done in prepared this project is:

- Process of designing circuit.
- Circuit board trace.
- Soldering process in circuit board.

3.1.1 Flow Chart

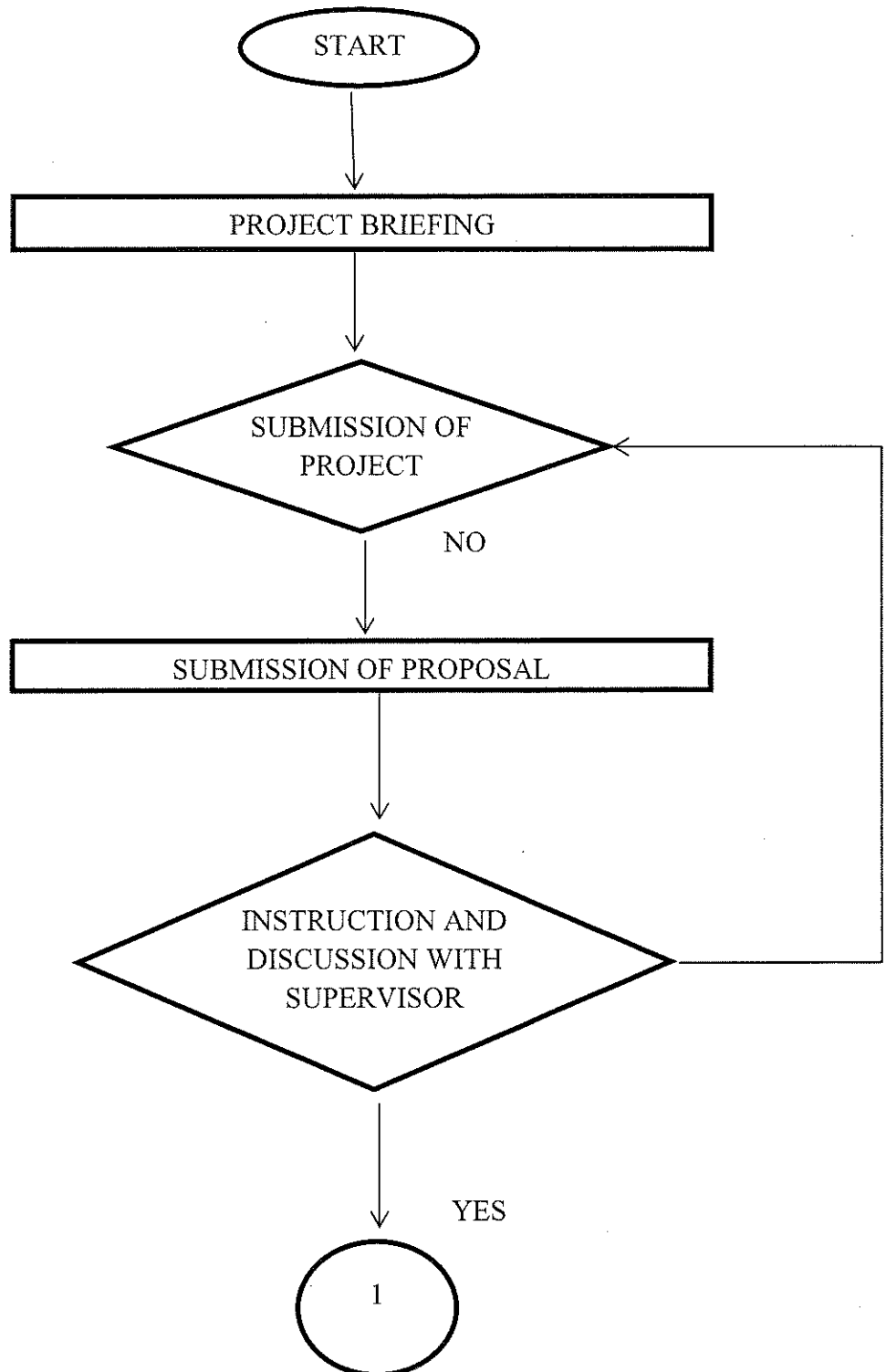


Diagram 8 Plan for Project Briefing

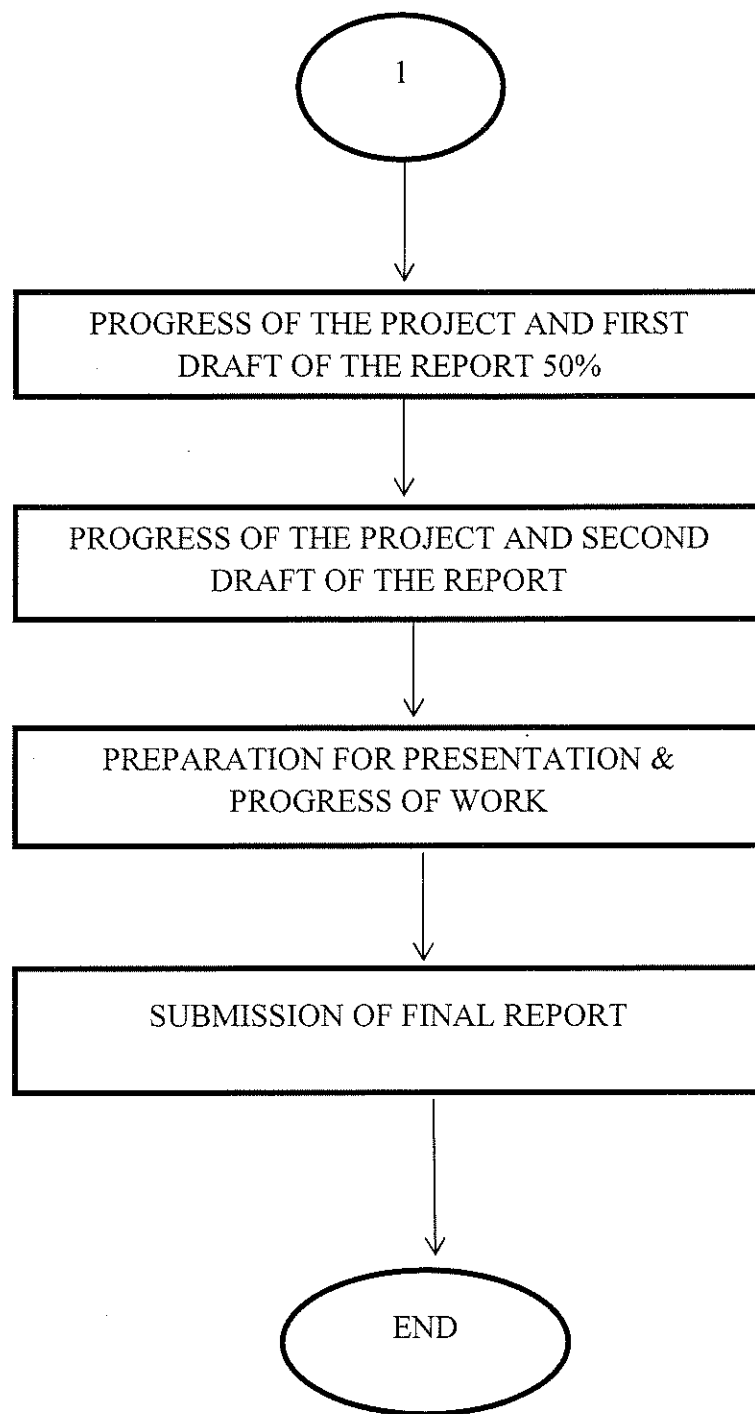


Diagram 9 Plan for Final Project

3.1.2 Gantt Chart

Table 1 Gantt Chart

[illegible]

3.2 Research Design

Designing a model is the second process in forming a model. Design of the model should be in line with the project title to be implemented. This design also needs to conform to tastes as desired.

Initially, the design of a model will be made on a piece of paper and made as a sketch. It is made again to reveal a model that is to be implemented. At the moment the size of a model can be ignored.

The design should be painted in three dimensions to reveal the exact shape of the design. Each section hidden in the main drawing should be painted. Design drawings should also be drawn from some point of view, from the front, the upper view and the side view of the design of the model.

3.3 Instrument Of Study

3.3.1 Schematic Drawing Using Proteus

Proteus 7 allows professional engineers to run interactive simulations of real designs, and to reap the rewards of this approach to circuit simulation. And then, a range of simulator models for popular microcontrollers and set of animated models for related peripheral devices such as PIC and LCD display, resistor and more. It is possible to simulate complete microcontroller systems and thus to develop the software for the without access to a physical prototype. In a world where time to market is becoming more and more important this is real advantage. Structurally, Proteus 6 Professional separated into two main components, which are ISIS 7.

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

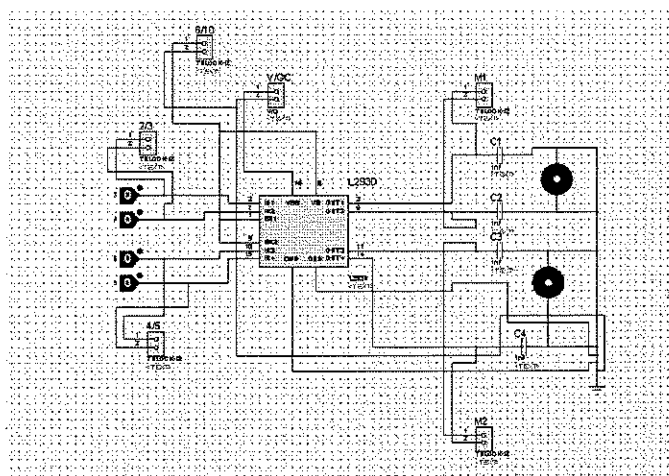


Diagram 10 DC Motor Circuit

3.3.2 Simulate the circuit using Proteus

After completed the circuit assembly and configuration, now it's time to verify whether the source code complied is virtually accurate or not. Proteus offer a whole lot of variety virtual devices.

In fact, situation using oscilloscope and function generator can be done using Proteus. Even virtual hyper terminal is provided to demonstrate how your code performs in real world without really doing the hardware section yet.

3.3.3 Designing the circuit diagram

After decide what kind of the project that we want to build. We need to make a research about the circuit, electronic component that we need to used and hardware. 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 etching to make a circuit diagram. In the first step in circuit designing process is make a circuit diagram that can be use 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 special software, namely 123dapp and Proteus ISIS Professional.
- II. Then, make sure that the connection of the component is correct.

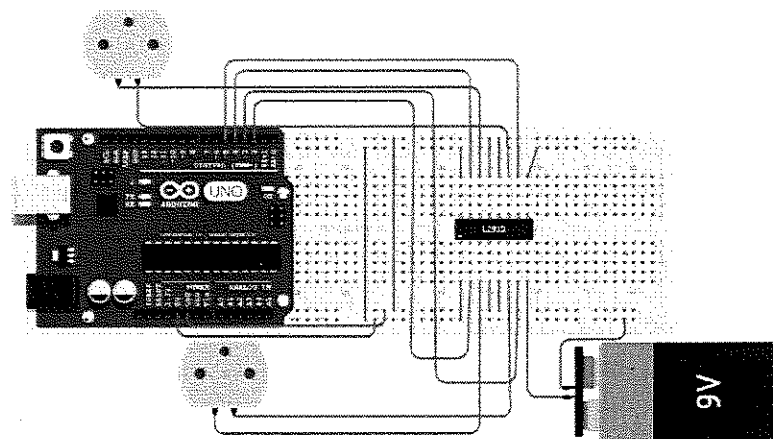


Diagram 11 Schematic Circuit

3.4 Sampling Techniques (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 parts 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 are sometimes called. Buckets, bubble tanks and spray machines are lots of different ways to etching, but most firms currently use high pressure conveyerised spray equipment. Many different chemical solutions can be used to etching circuit boards. Ranging from 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.

3.4.1 Risk of etching

- I. There is a risk of injuries due to the chemicals involved.
- II. The quality of the results depends on several factors which you won't be able to master completely the first time. This can be somewhat compensated by using good machinery.
- III. There is the problem of waste disposal. Toxic chemicals require a proper disposal service.

3.4.2 Safety

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

- I. Wear safety equipment during the whole process-gloves, protection glasses, 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.

3.4.3 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 3 is used to remove that coppers.

The steps of the etching process are:

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

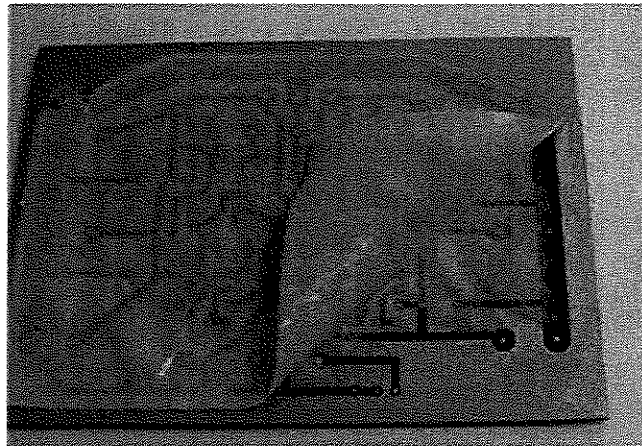


Diagram 12 Stick Schematic

- II. Stick the schematic diagram on PCB board.
- III. Paste the etching circuit onto transparent paper with UV board using expose machine. It's to make PCB paper joined with board.
- IV. This process takes about 30 second.

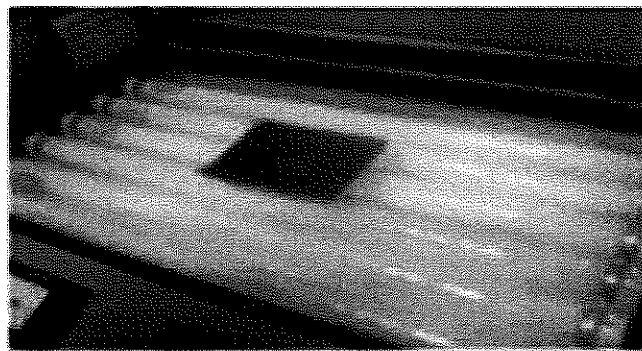


Diagram 13 UV Expose Process

- V. Dilute the acid with a little hot water and make sure that the mixture is not too liquid and too concentrated.
- VI. Then, put the board into the mixed (Acid Ferric Chloride 3 + hot water) to remove the useless copper.



Diagram 14 Ferric Chloride



Diagram 15 Process To Unused Copper

- VII. When PCB was soaked into this mix, we must always shake the container with the acid so that the unwanted copper will remove.
- VIII. After acid remove unused copper, take the PCB to wash with clean water.
- IX. Then, use sand paper to rub the lines colors. IN addition, detergent powder can also be used to remove the ink. Next, just leave only the desired circuit PCB only.

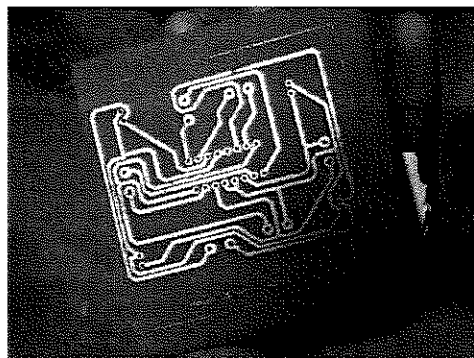


Diagram 16 Result of Etching

3.4.4 Drilling process

Material and equipment:

- Bench clamp or support.
- Dot punch or sharp tool.
- Drilling machine or hand drill,
- 1mm bits.

3.4.5 Introduction of drilling process

After etching process finished, the PCB will be punched using hand drilling machine. Hole is necessary to mount component (example: capacitor, L239D and terminal blocks). Before drilling, a dot punch is used to mark the holed position. This serves as a shallow guide for the drill bit to align easily while drilling. Any other sharp pointed tool can be used must be appropriate to the hole to be punched between 0.75 to 1.0 mm.

The purpose of this process is to facilitate the installation work on the circuit components of the PCB. During drilling, do not be pressed too strong because it may cause eye drill broken up and dangerous for the people around. Hold the drill steady and drill in straight slowly. The hole will be drilled with little force applied.

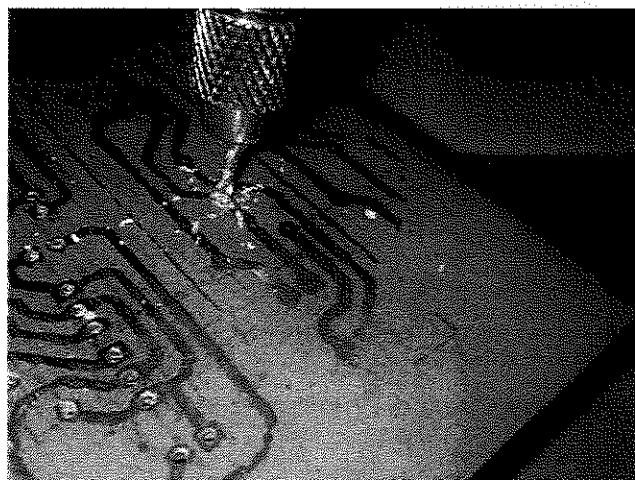


Diagram 17 Drilling PCB Board Process

3.4.6 Insert the component

Foot of component was inserted into the drilled hole that has been completed. It is easier if started with the low component first. Components that are installed must be inspected prior to use multimeter to find out whether these components are in good condition or not. This process is quite important because we should insert the component correctly to avoid from circuit failure. Besides, some components have their own pole like capacitor, L293D and terminal blocks. After finished the inserting process, we check it once again with the schematic to make sure all the component were at the position or holes.

3.4.7 Soldering process

Soldering is defined as “the joining of metals by a fusion of alloys which have relatively low melting points”. In other words, we use a metal that has a low melting point to adhere the surfaces to be soldered together. Soldering is more like gluing with molten metal than anything else. Soldering is also a must have skill for all sorts of electrical and electronics work. It is also a skill that must be taught correctly and developed with practice.

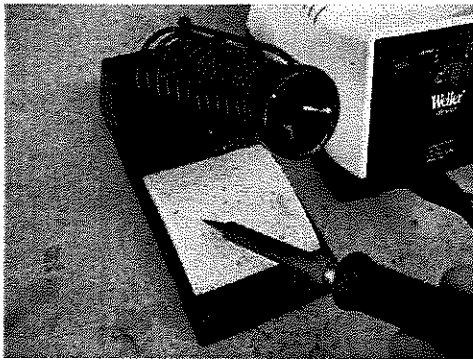


Diagram 18 Soldering Iron



**Diagram 19 Solder the Component
On PCB Board Process**

Step to solder:

- I. Quickly remove the tip of the soldering iron from heat up the soldering iron for 5 to 10 minutes, allowing iron to reach maximum operating temperature. If the soldering iron has two temperature settings selectable with a switch, select lower temperature when soldering small electronic components to a board and select the higher temperature when soldering heavier wires. Apply a small amount of solder to the tip and rotate so the entire tip becomes lightly covered with a thin layer of solder. This is called “tinning” the tip.
- II. Connect the two surfaces to be soldered together so the metal parts are touching. If soldering wires, simply twist the two wire ends together so they don't pull apart while being soldered. If soldering electronic components, simply seat the components wires into the holes of the circuit board where the components is to be placed.
- III. Touch the hot tip of the soldering iron to all metal parts touching together so they are evenly heated. Allow the surface to heat for just 3 to 5 seconds, the touch the tip of the solder to the heated metal objects, not directly to the tip of the soldering iron. Allow a small amount of solder to flow onto the metal components or wires until just enough solder has been applied to cover the entire surface of the wires or components.
- IV. The soldered surface and wipe the tip of the iron on a wet sponge immediately to remove solder. Wiping the solder off the tip will prevent it from burning and forming a black coat on the soldering iron tip.

- V. Allow the solder joint to cool for several minutes before applying power to the wires or the device soldered.

3.4.8 Circuit testing

For testing improvement process, we took almost four weeks to make it work. In the calendar project activities, we were given four weeks to settle all the testing and improvement process. The purpose of testing the electric was to determined and located any of the following condition:

1. An pen circuit
2. A short circuit with another conductor in the same circuit.
3. A ground, which is a short circuit between the conductor and circuit.
4. Leakage (a high resistance path across a portion of the circuit, to another circuit, or to ground).
5. A cross (a short circuit or leakage between conductors or different circuit).

As a first step, we have done the short circuit testing using an analog multimeter. Before use multimeter, we set up the multimeter to zero. To pointer the meter exactly on the zero line, we rotate the adjusting screw, then we connect the multimeter probes to the circuit being tested. After that, we observed the meter needle movement. Luckily the needle does not move, this means circuit was not short. Then we move on the second step, which is testing an open circuit. Open circuit test, sometimes called no – load test, is one of the method in electrical engineering older to determine a break exists in a complete conducting pathway. Open circuit can cause by excessive current. Again, multimeter was used to check whether the circuits are open in normal condition. We only gave the required current to the circuit, so we did not face an open circuit problem. This mean our circuits were in normal condition.

3.4.9 Troubleshooting

The most problems like the fault soldering. Check all the soldering joint suspicious. If you discover the short track or the short soldering joint, re-solder at that point and check other the soldering joint. Check the position of all components on the PCB. See that there are no components missing or inserted in the wrong places. Make sure that all the polarized components have been soldered the right way round.

3.5 Data Analysis Method

3.5.1 Research and analysis project

Research is important to ensure the project that is yet to progress can have a good start so that it would not cost any problem during the project development. So, the vital information such as the circuit, the component usage, the commercial needs and much are indeed important. It is as the circuit, ensure the can understand more on how important is the project. The source can be obtained from lectures, books and also internet.

3.5.2 The project reformation

We must read and understand all data we have. Data and information have to be compiled and all information we had got had to be arranged systematically for progress. From time all information and data must upgrade for information and follow the project's progression.

3.5.3 Session discussion and problem settle

Discussion session was held every week to discuss the project development. All problems are discussed so that it can be solved quickly. Problem that can't be handled were too addressed quickly to the project supervisor. To make the project difficult everything that is going to be done must be planned (proper planning). This can ensure the project flow is without any interruptions.