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**SEBERANG PERAI**

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**POLITEKNIK SEBERANG PERAI**

**MINI VACUUM ROBOT**

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## ABSTRACT

Mini vacuum robot is a one of the concept that vacuum tiny things in the smooth surface, especially to the study table. Mini vacuum robot is designed to make sucking process become easier rather than by using manual vacuum. By using this robot, 98% tiny things are removed. The main component of this project are Arduino Uno (Microcontroller). The idea is basically by having the sensor to detect any obstacles and send the output to Arduino that will control the mini vacuum robot movement. By using mini vacuum robot, user can just turn on to suck out without having to operate the vacuum. The methodology and scope of study are performed by doing literature reviews and research on various sensors, motor, Arduino, and the programming of the Arduino. Mini vacuum robot will have several criteria that are efficient, organized and user-friendly, which meets human needs. After do some observation toward current development facility is people always wanted. So, mini vacuum robot is the one of facility that give comfortable environment to the user.

## ABSTRAK

Mini robot vakum adalah salah satu konsep untuk vakum bahan-bahan kecil di permukaan lantai.. Mini robot vakum direka untuk membuat proses pembersihan menjadi lebih mudah berbanding dengan menggunakan vakum manual. Dengan menggunakan robot ini, 98% debu dicucikan. Komponen utama projek ini adalah Arduino Uno (mikro). Idea ini adalah pada dasarnya dengan mempunyai sensor untuk mengesan apa-apa halangan dan menghantar pengeluaran untuk Arduino yang akan mengawal pergerakan mini robot vakum. Dengan menggunakan mini robot vakum, pengguna hanya boleh menghidupkan mini robot vakum untuk membersihkan tanpa perlu beroperasi vakum. Metodologi dan skop kajian dilakukan dengan melakukan tinjauan literatur dan kajian terhadap pelbagai sensor, motor, Arduino, dan pengaturcaraan Arduino. Mini robot vakum akan mempunyai beberapa kriteria yang cekap, teratur dan mesra pengguna, yang memenuhi keperluan manusia. Selepas melakukan beberapa pemerhatian ke arah kemudahan pembangunan semasa orang sentiasa mahu. Jadi, mini vakum robot adalah salah satu kemudahan yang memberikan persekitaran yang selesa kepada pengguna.

## APPRECIATION

I would like to express my gratitude and appreciation to all those who gave me the possibility to complete this report. A special thanks to our project coordinator, Madam Nasrolayuze Binti Md Saad, who helps, stimulating suggestions and encouragement, helped me to coordinate my project especially in writing this report. Madam was always supported us, teach us, give a good cooperation at all times, and also a great advisor for us from beginning project until end of the project. Thanks to the God for using her to touch my life, may Madam Nasrolayuze Binti Md Saad forever remain in God's blessings and may continue to be a light in people lives.

Appreciate also goes to Mr Hamadi Bin Ahmad that willing to help us to solve, check, manage our circuit to get the precisely results. Kindness is a language which the dumb can speak and the deaf can understand. I would to appreciate the guidance given by other supervisor as well as the panels especially in our project presentation that has improved our presentation skills by their comment and tips.

Other than that, I would like to express gratitude towards my parents, and my colleague for kind encouragement, co-operation and their willingness to help me out which help better in completion of this project. It would not have been possible without the kind support and help of many individuals and organizations. I would like to extend our sincere thanks to all of them.

## VERIFICATION

We hereby declare that this report is the effort of our own to make successful project with information retrieved from the sources that were mentioned in the accreditation. This project report titled "Mini Vacuum " has been submitted, reviewed and confirmed as meeting the conditions and requirements of writing projects as required.

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# **CHAPTER 1**

# **INTRODUCTION**

## 1.1 INTRODUCTION

The target of the project that designed by us is mainly to increase student knowledge, easy to understand and easy to use for all the future graduates Polytechnic. Then, the results of our project is to lighten to the lecturers who teach in **MINI VACUUM ROBOT**. Therefore, for this project, what we have learned in theory and practical starting from semester 1 to semester 4 and the reference material available resource are fully utilized to complete this project successfully.

There are various machines that are used in our daily life. The main reason for this project is to facilitate or save manpower in the present age. In addition, we completed our project also to save the time and follow the latest technology circulation. Users also can save the time and ease of use with the creation of the “**MINI VACUUM ROBOT**”. This project will make everyone’s life easier.

## 1.2 PROJECT BACKGROUND

For final year project, we decide to make **MINI VACUUM ROBOT**. It is a simple yet good concept. It uses dc motor mini turbine as a tiny things sucker. By using this method, the manual system usage is removed. It will be automatically suck out the tiny things on the surface. Once it detects the obstacles on surface, it will move to the right side and start to suck out by the right side. Moreover, when it detects any surface like a drain it will automatically stop and turn to the right to start the vacuum sucking process. This is because of the sensor. It follows according to the right side of the obstacle placed such as laptop, pencil box and etc.

### **1.3 PROBLEM STATEMENT**

In fact, most of us usually using sweep for cleaning. From time to time technology come up and need to upgrade for easier human task. In addition, most of the people are working and they did not have enough time to clean. Furthermore, most of the designations of vacuum robot in the market are expensive and large in size. So it is difficult to clean anywhere, under beds, as well as kitchen baseboards. Moreover, Problem that we might face is, heavy usage of the robot might decrease the charge of batteries. The robot has to be carried around the places where the tiny things to be cleaned. The sensors might be spoilt for the amount falls. Therefore, this project is built to be one of the advantages for human to clean the floor within small period and more effective.

### **1.4 OBJECTIVES**

With the high expectation for this project, may it able to achieve the goal with a great understanding for all the students. The objective can be summarized through research and the result of this product as below:

- To ensure user friendly vacuum robot.
- It is moveable and portable
- To save electricity
- To give the best tiny things clean for the surface that might be tiny things.
- Robotic vacuum cleaner saves time and effort to get your floor cleaned.
- Robotic vacuum easy to maintain and it can be affordable to anyone
- It can be easily carried to anywhere you wanted because its small and very light weight.

## **PROJECT SCOPE**

In execution of a project, it must have a particular scope to ensure the project can be carried out as planned and accordance with what you want to reach. So, here is the scopes set for the “Mini vacuum robot ”.

- Search detail about Mini vacuum robot and then, ask to the lecture’s opinion about it.
- Identify correctly and list down all the components to avoid from buying the wrong components.
- Help people to clean the tiny things on the surface of the table.
- Do some research about Mini vacuum robot and also learn more about it so it will easier to make the project.

### **1.6 IMPORTANCE AND IMPACT OF PROJECT**

The importance of this project is to help people main for those who are old and also children. The impact that we will receive is it will help to bring a change in each and everyone’s life. We will also try to aid them in a way where they need a tiny things clean due to tiny things allergic or even asthma patient. Certain people who are heaving more important stuffs. So when this happens, the people can easily on the mini vacuum robot and let it to clean the tiny things while they can continue with other important stuffs. Furthermore, it is also portable and light weighted.

## 1.7 SUMMARY

We have chosen this project in a thought of it will bring advantage to people who really need it and this will also give them to get the thing they want. Since semester 1 to semester 4 we have learned a lot of coding and also practical. We feel that all this while what we have been learning will be utilized fully and it will help us to do the project well. By doing this project, it actually helped us to think out of the box especially from the view of pros and cons of this project. It also helped us to analyse what are the problem we might see just to make the project perfect. We have learnt what are the things we should use to build this project just to make it in to a success. We have also learnt what kind of pros and cons we can observe through the analyzation when we were doing our *final proposal*.

**CHAPTER 2**  
**LITERATURE**  
**STUDIES**

## **2.1 INTRODUCTION**

This chapter describes in detail about the operation of each circuit used in this project "Mini vacuum robot". Actually, this is the concept of electronic. The Mini vacuum robot is to believe a robot where it will ease a lot of people's problem and also aid people when they are in difficulties. Furthermore, this project has been chosen by us after analysing the pros and cons of the project and to see whether it will give advantage to those who wish to use this especially for those who are in need of this help.

## **2.2 CONCEPT/TEORY**

The concept of this project is chosen with the help of our supervisor. We were influenced by peoples thought and also some brainstorm where it made us to take up this project. Furthermore, this theory has all kind of advantages. This project need manual operation for switching ON and OFF when there is need of tiny things. It cleans by sucking the tiny things by itself. When there is a tiny things, people can use this robot to make suck out by just switching on the robot. Thus, the tiny things sucking performance started. In the project we use ultrasonic sensor to detect the obstacles and empty surface & NAND gate for detection of high level or low level of voltage to energize the RELAY coil which is used to interface the control circuit with the external dc motor source. Wastage of power is not desirable in any system. Thus, it is very much economic to have this arrangement so that power is not wasted during the robot is in Off mode where manual operation is not possible. Though we can use it in our daily life also for the betterment of our system.



## 2.3 PREVIOUS RESEARCH

The robot below shows the characteristic of previous robot that have been similar with this robot project and used in the literature reviews :

### 1) **DIY smart vacuum cleaning robot by B. Ashwinth Raj**



Figure 2.3.1

This robot is simple four wheeled Vacuum Cleaner which could smartly avoid obstacles and vacuum the floor at the same time. The Vacuum Cleaner is the most crucial part in placement of Robot. It has to be placed at tilted angle as shown in the picture, so that it can provide proper vacuum action. The vacuum cleaner is not controlled by the Arduino. Once you power on the robot the vacuum is also turned on. One tiring process of building our Robot is the wooden works. We have to carve our wood and drill some holes to place the sensors and vacuum cleaner. It is recommended to Test Ride your Robot with the following code once you arrange the Motor and Motor driver, before connecting the Sensors.

## 2) Floor vacuum cleaner robot by Revrekad



Figure 2.3.2

This simple robot does not have a spinning brush, so acoustic sensor would not be a choice, probably. Optical sensor - that might be an interesting task to measure if it can be implemented to detect such small dust particles, which the turbine alone gets into the dustbin. It is able to change direction upon encountering obstacles, to detect dirty spots on the floor, and to sense steep drops to keep it from falling down stairs. It uses two independently operating wheels that allow 360° turns in place.

### 3) Autonomous vacuum cleaner robot by Marnix

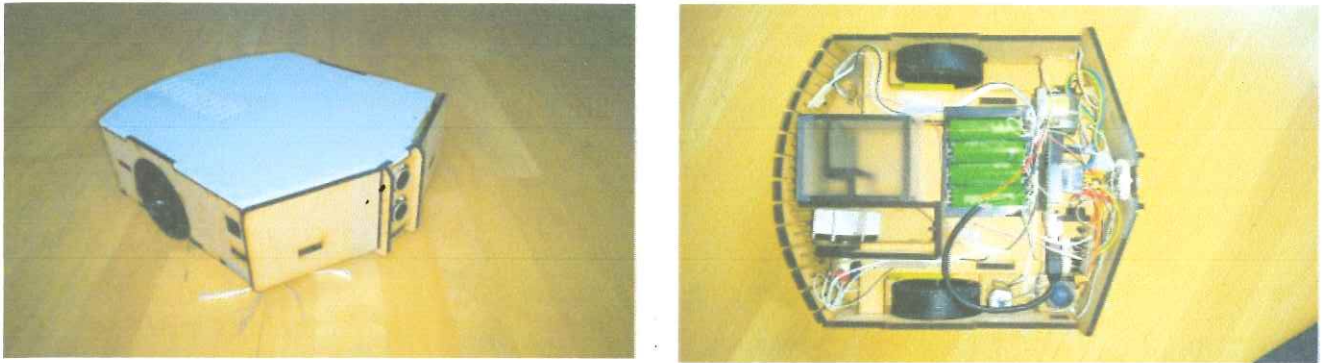


Figure 2.3.3

The robot is made out of laser cut MDF and PMMA. The wheels and gearboxes are from Dagu. I took apart a small RC car for some motors and an H-Bridge. It has five motors; 2 for the wheels, 2 for the bristles, and one for the vacuum pump. In the rear end of the robot you can see a small container with a transparent lid on it, this is where the dust is collected. there is a little bit of filter media which keeps the dust from blowing back out. you can also see the fan next to the dust container. Next to the right wheel there is a motor that drives the front sweeper via a pulley. you can see the Arduino and H-bridge in the front of the robot. and the batteries of course.

## 2.4 Component that used are such as:

- Arduino
- DC motor
- Wheel
- Sensors
- Mini turbine
- Base board
- Switch

### 2.4.1 Arduino



Figure 2.4.1

- Arduino is a microcontroller board based ATmega328(datasheet).
- It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with AC-TO-DC adapter or battery get started.
- Uno board has a resistor puling the 8U2 HWB line to the ground, making it easier to put in to DFU mode.

### 2.4.2 DC Motor



Figure 2.4.2

- Convert electrical energy into mechanical energy.
- Used in majority of household applications and electronic devices.
- Compare to the AC Motor it is more controllable

### 2.4.3 Wheel



Figure 2.4.3

- An electric motor that is incorporated in to the hub of a wheel and drives it directly.

#### 2.4.4 Sensors

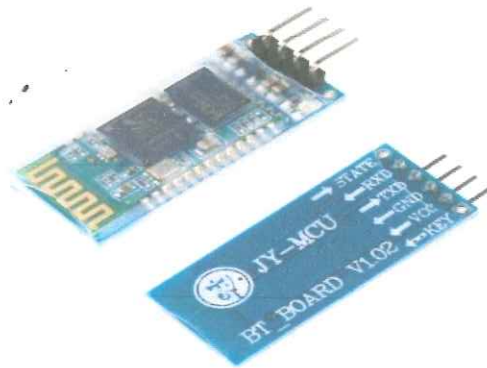


Figure 2.4.4

- *Electronic component module.*
- To detect events or changes in its environment, frequently a computer processor.
- Used with other electronics, whether as simple as light or as complex as a computer.
- Used in everyday objects such as touch-sensitive elevator buttons and lamps which dim or brighten by touching the base.

#### 2.4.5 Mini Turbine



Figure 2.4.5

- It is a mini wind turbine used to suck the tiny things into the robot.

### 2.4.6 Base board

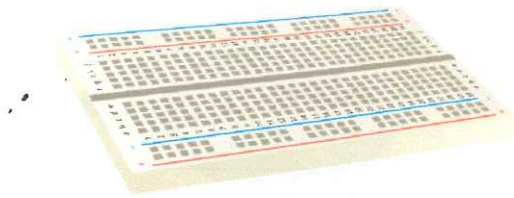


Figure 2.4.6

- It is a board where we put jumpers and the IC
- It acts as a holder to keep all the chips while testing it.
- It also has connection within the board and it helps to supply connection.

### 2.4.7 Battery Holder Casing + On/Off Switch

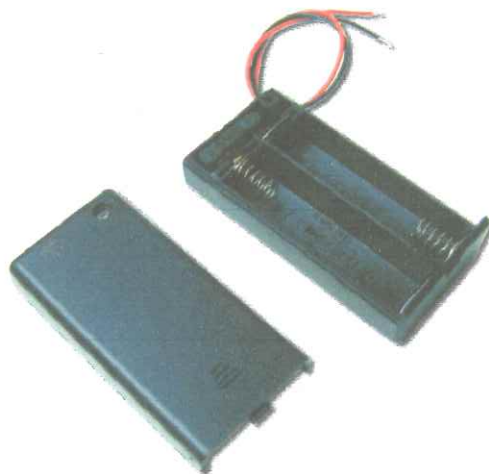


Figure 2.4.7

- It acts as battery holder where it holds 9V battery.
- It also has the on / off switch

## 2.4.8 Lithium Batteries



Figure 2.4.8

- It is lithium batteries with 3.7 volts and 2200mA
- Its create a flow of energy to any device to function or work
- It is rechargeable

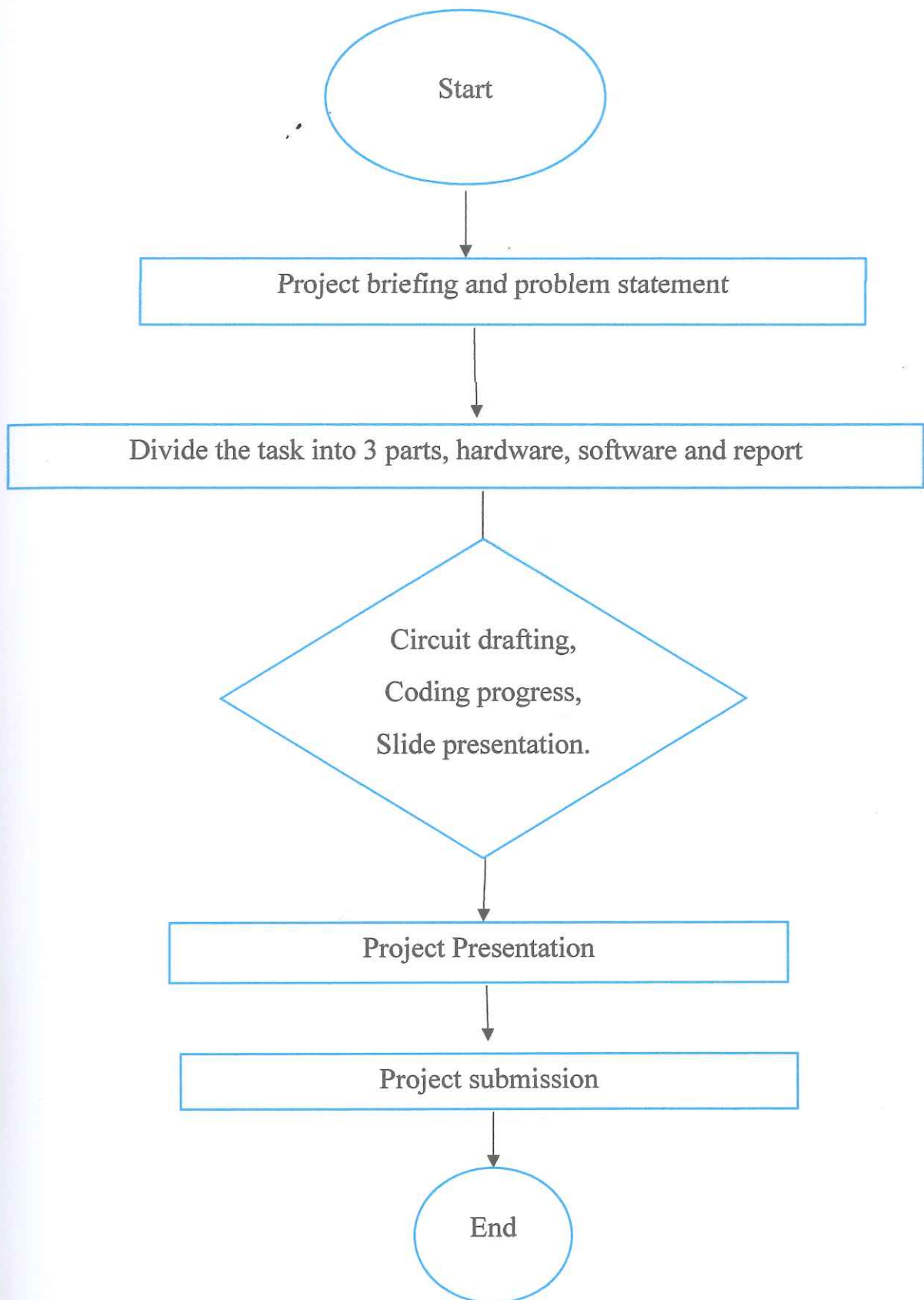
## 2.5 SUMMARY

As a summary, we use this components to build a Mini vacuum robot which help us to suck out the tiny things. From this, we learned more about the component functions and we gain more experience during this project. This project need manual operation for switching ON and OFF when there is need of tiny things. It cleans by sucking the tiny things by itself. When there is a tiny things, people can use this robot to make clean by just switching on the robot. Thus, the tiny things sucking performance started.



**CHAPTER 3**  
**METHODOLOGY**

### 3.1 FLOWCHART OF THE PROJECT



### **3.2 SUMMARY OF FLOWCHART**

We have our own target for the completion of this project and we have done some advance planning before starting this project. By doing this flow chart as shown above, shows our plan or target step by step in making this project. A flow chart have been created for smooth project start off to ensure the problems solved take place following procedure step by step. The flow chart will be used in further analysing, designing and management of process or improving the overall program.

Among the item that listed are need to be used and looking for ideas to design the great project and also designing the exact circuit. Furthermore, we also estimated the cost of the project, cost of each components and also overall of the project. The circuit testing is performed to ensure that the system function properly.

### **3.3 IDEA AND TYPE OF PROJECT**

After receiving a briefing from the Chief Coordinator of the Project, we had a discussion and some planning together to create the useful project to society and especially for engineering students. We planning to come out the great project for engineering student but also can be used by other students, which is the project can gives many benefits for students, enhances the knowledge and improving the skills for the engineering students. Next, with the help of our supervisor, we had planning to nominate a suitable title for our project. The purpose of the discussion was done to facilitate the further implementation of our project in order to complete this project within the stipulated time. Here are some of the procedures need to be considered:

- Duration to complete the project
- Access to components
- Estimated costs of the project
- The relationship between the theory and practical

### 3.4 USAGE OF PROTEUS SOFTWARE

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 micro-controllers and a set of animated models for related peripheral devices such as PIC and LCD displays, resistor, and more. It is possible to simulate complete micro-controller systems and thus to develop the software for them without access to a physical prototype. In a world where time to market is becoming more and more important this is a real advantage. Structurally, Proteus 7 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 my project I use Proteus to design a schematic diagram.

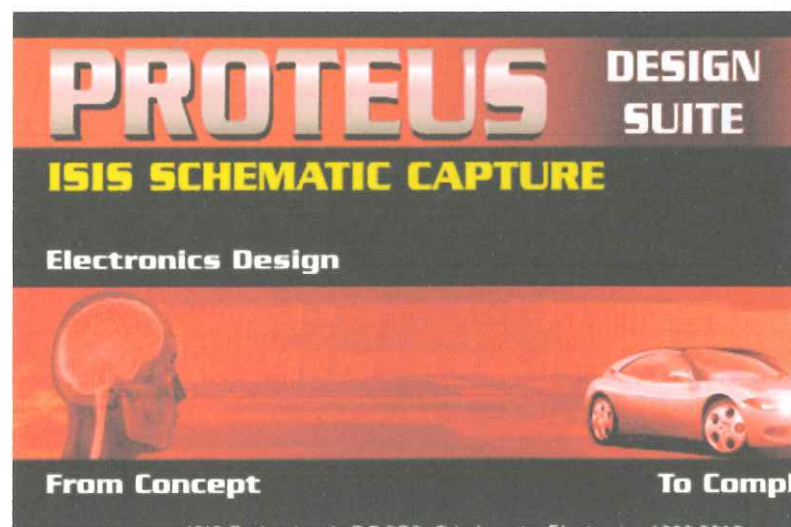


Figure 3.4 shows the software of Proteus

### 3.4.1 Design of the block diagram

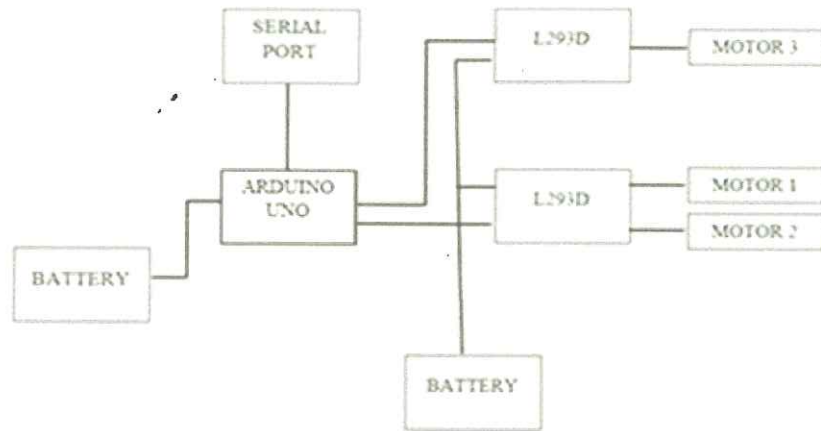


Figure 3.4.1 shows the Block diagram of vacuum robot

### 3.4.2 Design of the circuit diagram

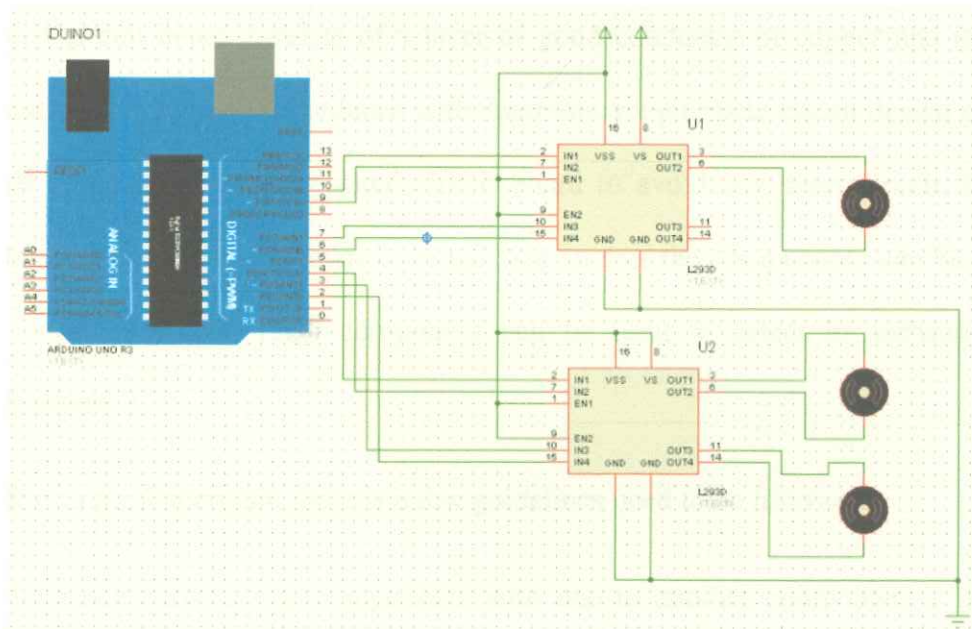


Figure 3.4.2 shows the circuit diagram of vacuum robot

### **3.5 PROCESS OF MAKING ARES IN PCB**

Method of making power supply there is many step by step need to achieve the process such as print out the circuit, implementation, PCB mount using UV light, process of developer, process of etching, process of soldering and process of drill the PCB to make the hole to the components.

#### **3.5.1 Print circuit**

The process of drawing of printed circuit is by using the ISIS Professional 7 and ARES. It must draw with caution because if there is any small mistakes, it will effect overall the operation of circuit. After obtaining the circuit schematic, then it must convert to a printed circuit before being transferred to be printed circuit board. Printed circuit board consists of a layer of good conductor of copper and layer of insulating materials. In accordance with diagrams, rough-made circuit design prior to actual circuit drawn on a printed circuit board to avoid any short circuit. Printed circuit sketch should be drawn in actual size so that the components can be sorted and arranged neatly. Each component can be used in select in software ISIS Professional 7.

To draw a printed circuit, there is a few guidelines need to be followed:

- The distance between the components with one to another component is not too close and not too far also
- Used an appropriate measure of size and the components that are used.
- Designed and arrangement of the printed circuit preferably.

### 3.5.2 List of components

NO	QUANTITY	PART NAME
1	1	Bluetooth Device
2	1 SET	Female-male connector
3	1	Perspex Board
4	1	Arduino Uno
5	2	Yellow Smart Car Robot (x2)
6	1	L293D H-bridge
7	4	Ceramic capacitor
8	1	Mini Breadboard
9	1 SET	Breadboard Jumper Wire
10	1	Battery Holder Casing
11	1	Breadboard Jumper.

3.5.2 Table shows the list and cost of component

### **3.6 IMPLEMENTATION**

In the process of creating a project, the first and important need to concern is measure and regulation is the most important to produce a perfect and neat project.

There are some steps that need to following:

STEP 1: The process in the circuit PCB mounting

STEP 2: The process of developer

STEP 3: The process of etching and drilling

STEP 4: The process of soldering

#### **STEP 1: Process in the circuit PCB mounting**

Cut off the printed “artwork” circuit design according to the size and affix the printed design to the PCB board. Put the board inside the Ultra Violet machine and make sure the surface is clean, then design side facing the bulb and close the UV emitter tightly for about 105 seconds or 4 minutes. After the UV light circuit, do not exposed the PCB in the sun because this will cause the circuit at the trace has been lost from the surface of the PCB. We recommend that after the process of UV light just go on doing the circuit because to prevent developer damaged.