WIRELESS COMMUNICATION GARBAGE COLLECTOR

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KEMENTERIAN PENDIDIKAN MALAYSIA

POLITEKNIK MALAYSIA SEBERANG PERAI

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PROJECT (DEE6092)

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A proposal project submitted in fulfilment of the requirement for the award of the diploma of Electrical Engineering (Computer) Department of Electrical Engineering Polytechnic Seberang Perai (PSP).

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CHAPTER 1

INTRODUCTION

Wireless Communication Garbage Collector

There are environment problems arise in many towns in Malaysia. These problems come along by developing activities such as construction of houses, offices, and other business areas. The environment problems occur due to several reasons, they are the low budget allocation on environment management and public awareness in protecting the environment. The environment issue which comes up from year to year and still cannot be solved is about garbage and waste from various places dispose into rivers. Those garbage can clog water flow, induce the water become dirty, smelly, and often over flow so then give effect floods. Therefore, the development of the technology such as robot for garbage collector is the one aspect that is interested.

Wireless Garbage Collector can be described as the device of battery to power an electric motor which in use shovels to pick up the trash and place them into a bin. Solid waste management is a big challenge in urban areas for most of the countries throughout the world. An efficient waste management is a pre requisition for maintain a safe and green environment as there are increasing all kinds of waste disposal. Many technologies are used for waste collection as well as for well managed recycling. So wireless garbage collector which uses rechargeable battery is economically helpful for every users. By using this wireless garbage collector, user can collect the garbage of the required area by giving the input by keypad. Apart from that, the garbage collector can collect the medium garbage with side 80x33 of mm, for example, soda cans, plastic bottles etc. The main objective of this garbage collector is the whole purpose of assigning robots to do a man's work is to reduce our work load and most importantly, do the job for us in environment that is too hostile for us.

1.2 Background Research

As you can imagine, the world would be a disgusting place without the garbage man. For many years people burned waste, fed it to animals, buried it, and most commonly, tossed it over their shoulder. Some cities became buried, and built over the waste, and others pioneered new ways to save their cities from vermin and disease. Recycling began as a necessity and ended up in present day as a responsibility to the environment.

I)

Figure 1.1 Horse-drawn garbage collection

During this time, organized waste collection was developed in more than 70 percent of large U.S. cities and garbage collectors were the most common way it was done. Most garbage men used a horse and cart to collect the garbage and then dumped it in the oceans, wetlands, rivers or any other uninhabited areas. Around 1914, the horse drawn carts were replaced by covered, motorized trucks, and, just five years later, the rear loader truck made its debut.

II)

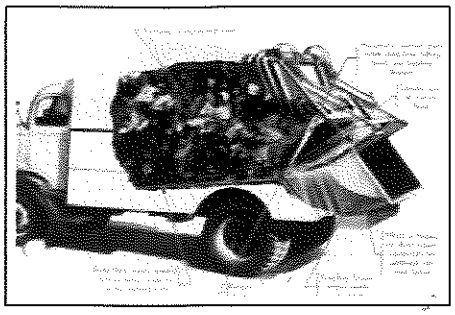

Figure 1.2 the Garwood Load Packer

Around the 1920's the rear loader was developed. It lifted the garbage can from the back up to the top of the truck and allowed more efficiency. The Garwood Load Packer was the first truck to use hydraulic blades to pack and push the garbage into the back of the truck. This was the first technological breakthrough combining hydraulics and packing capabilities. Around 1950 the residential collection truck was changed to a side-load process. After the garbage was loaded it was packed into the back of the truck with a huge hydraulic powered blade. This technology remains today.

iii)

Figure 1.3: The New Garbage Trucks

The 90's became the age of the refuse truck. During the 90's many companies made huge breakthroughs with hydraulics, engine power and safety. In 1991 the EPA set standards for landfill groundwater protection, monitoring and post closure care. These standards were very significant for future sites because they demanded standards that would save the future of landfill operations. Meanwhile more than 3000 household hazardous waste programs have been setup in all 50 states.

iv)

Figure 1.4 Modern Trucks

The residential truck has two curved arms that wrap around the can and then the track pulls the can up and into the opening you can see the arms at the top of the track in dump position. This truck is primarily used for residential cans from 50-300 gallons (a home can is 95 gallons). Some of the larger 300 gallon cans are used for business.

v)

Figure 1.5 Garbage Collector Robot

With the development of science and technology, we are no longer need the manpower to collect the rubbish every day and reduce the human work in cleaning and sweeping, to develop artificial intelligent robots in industries, to decrease the human effort and manpower in the cleaning. The garbage collector using both arm to pick an object and then place it to the backside of the small bin. Due to problems related to the collection, transportation and processing of residential solid waste today the garbage collection is manual which takes a lot of efforts and is time consuming.

1.3 Problem Statement

At here, we can know that around the place that the people throw the rubbish all around including roads, parks and even in hospitals. Because of the human behaviours, this has led to huge environmental pollution deteriorating the health of mankind and other living beings. So for this project, we are going aim on a green technology and to create the alternative source of power.

Furthermore, the pollution problem is getting critical day by day for the whole world. There have many people throw the garbage at different place. For example, hospital, river bank, coastal, company office, hostel, roadside and etc. At the lack of human resources, we can use the garbage collector help the staff clean the garbage. Besides that, the garbage collector cannot do the collect garbage mission at the rainy day, because it is not a waterproof. Moreover, without this garbage collector robot may use a lot of manpower to clean area and may be exposes the workers to a number of occupational hazards. To reduce the human work in cleaning and sweeping, to develop artificial intelligent robots in industries, to decrease the human effort and manpower in the cleaning, and to saves time and also reduces manual labour and occupational hazards, the wireless garbage collector can help people to prevent the dangerous situation which is broken glass or the broken light bulb.

1.4 Project Objective

1. To design and build garbage collector system.
2. To design an arm for picking up the object with garbage collector.

1.5 Project Scope

1. To design a garbage collector that can be used in normally on the ground
2. To design and build a garbage collector with 6V power by using Arduino UNO.

1.6 Significant Project

Therefore, the garbage pickup timings and personnel required to send vehicles to pick up trash to designated places while cutting down on expenses of fuel and vehicle emission. Pollution is man-made and can be seen in our own daily lives, more specifically in our own homes. Wireless garbage collector machine is a machine which is going to perform the garbage collect operation on its own. In case, this innovative idea would lead to reduced carbon footprint, lower greenhouse gas emission and cleaner cities in time. Thus, this project can lead the environment to be green and reduce manufacturing waste, in order to protect our nature and also plan to have a clean place for the next generation, so we want to keep working on this project to the end.

1.7 Definition of the term

A garbage collector robot is a machine that especially one programmable by a computer capable of carrying out a complex series of actions automatically. Robots can be guided by an external control device or the control may be embedded within. Robots may be constructed to take on human form but most robots are machines designed to perform a task with no regard to how they look. The branch of technology that deals with the design, construction, operation, and application of robots, as well as computer systems for their control, sensory feedback, and information processing is robotics. These technologies deal with automated machines that can take the place of humans in dangerous environments or manufacturing processes, or resemble humans in appearance, behaviour, and cognition. The garbage collector robots have replaced humans in performing repetitive and dangerous tasks which humans prefer not to do, or are difficult to do because of size limitations, or which take place in extreme environments such as broken glasses on floor or the tiny nail dropped on floor.

1.8 Chapter Summary

By implementing this project we will using battery as a power and Bluetooth to control our wireless garbage collector machine with the mobile phone. Thus, we paired the Bluetooth with our garbage collector machine to make it move in any direction by pressing the keypad on the mobile phone. This product are easier for people to carry at everywhere. At the same time manual loading takes time and reduces the productivity of the vehicles and manpower deployed. Besides that, manual handling of waste poses a threat to the health of the sanitation workers as the waste is highly contaminated.

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CHAPTER 2

LITERATURE REVIEW

A literature review is a text of a scholarly paper, which includes the current knowledge including substantive findings. Literature reviews are secondary sources, and do not report new or original experimental work.

A Wireless Communication Garbage Collector is a machine that control by people to detect the garbage and uses Robotic Arm to collect garbage. Garbage Collector is a very useful device which is very simple in construction. It designed to fulfil the task of collecting garbage from certain places and then dispose it at a single place.

Rapid growth if various high-tech tools and equipment's makes our jobs done comfortable and sophisticated. The project aims at fabricating garbage collecting machine system which makes the garbage collector based motor running through battery. Power plays a great role wherever man lives and works.

The robot is built on the caterpillar wheels, sizes 52x74x17 cm and the power is supplied from 6V 500mAh battery. The results of robot performances were found that the robot can move with an average speed of 0.5 meters per second on the ground via wireless communication and collect the garbage.

2.2 Operation

A. Wireless communication module

We are use HC-06 Serial Port Bluetooth Module in the Wireless Communication Garbage Collector robot. HC-06 Serial Port Bluetooth Module is a type of Bluetooth device class-2 USB dongles with a range of 10m. Bluetooth device class-2 USB dongles with a range of 10m and maximum output power as 25mW/4dBm is used to communicate between microcontroller and computer. It is a low cost, compact and easy to use this module.

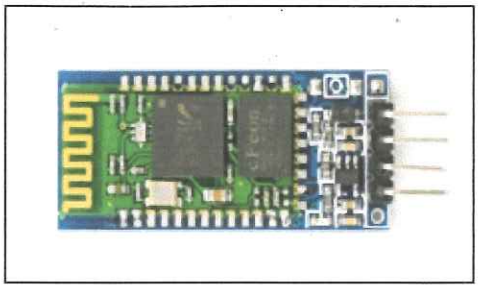

Figure 2.1: HC06 Serial Port Bluetooth Module

B. L293D Motor Driver IC

L293D is a typical Motor driver or Motor Driver IC which allows DC motor to drive on either direction. L293D is a 16-pin IC which can control a set of two DC motors simultaneously in any direction. It means that we can control two DC motors with a single L293D IC. [Dual H-bridge Motor Driver integrated circuit (*IC*)]

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.

In a single L293D chip there are two h-Bridge circuit inside the IC which can rotate two dc motor independently. Due its size it is very much used in robotic application for controlling DC motors. Given below is the pin diagram of a L293D motor controller.

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.

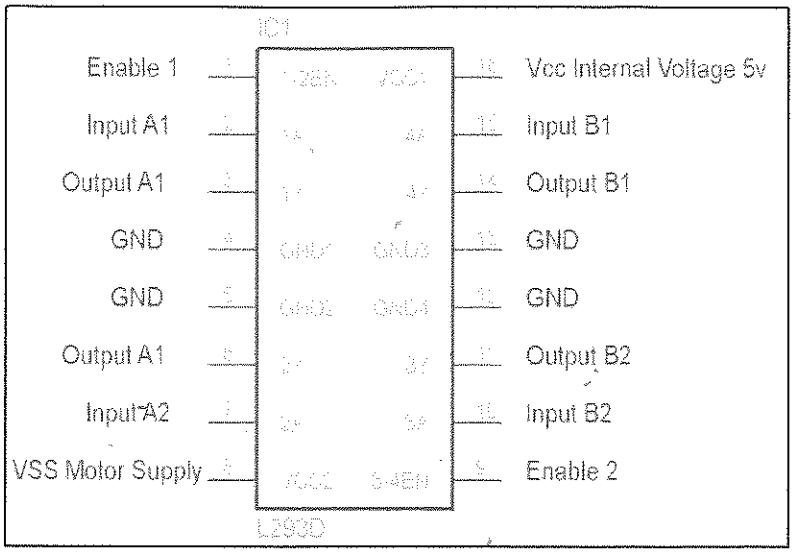

Figure 2.2: L293D IC Block Diagram

There are 4 input pins for L293D, pin 2, 7 on the left and pin 15, 10 on the right as shown on the pin diagram. 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.

VCC is the voltage that it needs for its own internal operation 5v. L293D will not use this voltage for driving the motor. For driving the motors it has a separate provision to provide motor supply VSS (V supply). L293D will use this to drive the motor. It means if you want to operate a motor at 9V then you need to provide a Supply of 9V across VSS Motor supply.

The maximum voltage for VSS motor supply is 36V. It can supply a max current of 600mA per channel. Since it can drive motors Up to 36v hence you can drive pretty big motors with this L293D. VCC pin 16 is the voltage for its own internal Operation. The maximum voltage ranges from 5v and up to 36v.

C. DC Motor

A DC motor is any of a class of electrical machines that converts direct current electrical power into mechanical power. 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. Most types produce rotary motion; a linear motor directly produces force and motion in a straight line.

Figure 2.3: DC Motor & Wheel

D. Robotic Arm

The robot structure consists basically of the robot body that includes arms and wheels. Some force such as electricity is required to make the arms and wheels turn under command. One of the most interesting aspects of robot in general is its behavior, which requires a form of intelligence.

E. Ceramic capacitor

A ceramic capacitor uses a ceramic material as the dielectric. Ceramics were one of the first materials to be used in the production of capacitors, as it was a known insulator. Many geometries were used in ceramic capacitors, of which some, like ceramic tubular capacitors and barrier layer capacitors are obsolete today due to their size, parasitic effects or electrical characteristics. The types of ceramic capacitors most often used in modern electronics are the multi-layer ceramic capacitor, otherwise named ceramic multi-layer chip capacitor (MLCC) and the ceramic disc capacitor.

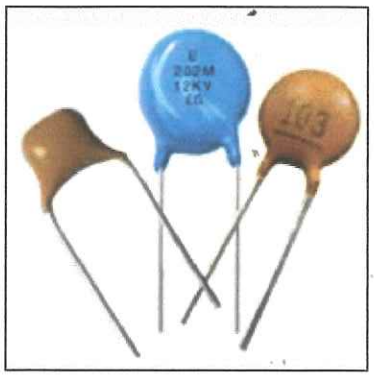

Figure 2.4: Ceramic capacitors

F. Arduino (Atmega 328 microcontroller)

Arduino is an open-source electronics platform based on easy-to-use hardware and software. Arduino boards are able to read inputs and turn it into an output. You can tell your board what to do by sending a set of instructions to the microcontroller on the board. To do so you use the Arduino programming language (based on Wiring), and the Arduino Software (IDE), based on Processing.

Over the years, Arduino has been the brain of thousands of projects, from everyday objects to complex scientific instruments. A worldwide community of makers - students, hobbyists, artists, programmers, and professionals - has gathered around this open-source platform, their contributions have added up to an incredible amount of accessible knowledge that can be of great help to novices and experts alike.

Arduino was born at the Ivrea Interaction Design Institute as an easy tool for fast prototyping, aimed at students without a background in electronics and programming. As soon as it reached a wider community, the Arduino board started changing to adapt to new needs and challenges, differentiating its offer from simple 8-bit boards to products for IoT applications, wearable, 3D printing, and embedded environments. All Arduino boards are completely open-source, empowering users to build them independently and eventually adapt them to their particular needs. The software, too, is open-source, and it is growing through the contributions of users worldwide.

Due to its simple and accessible user experience, Arduino has been used in thousands of different projects and applications. The Arduino software is easy-to-use for beginners, yet flexible enough for advanced users. It runs on Mac, Windows, and Linux. Teachers and students use it to build low cost scientific instruments, to prove chemistry and physics principles, or to get started with programming and robotics. Designers and architects build interactive prototypes, musicians and artists use it for installations and to experiment with new musical instruments. Makers, of course, use it to build many of the projects exhibited at the Maker Faire, for example. Arduino is a key tool to learn new things. Anyone - children, hobbyists, artists, programmers - can start tinkering just following the step by step instructions of a kit, or sharing ideas online with other members of the Arduino community.

There are many other microcontrollers and microcontroller platforms available for physical computing. Parallax Basic Stamp, Netmedia's BX-24, Phidgets, MIT's Handy board, and many others offer similar functionality. All of these tools take the messy details of

microcontroller programming and wrap it up in an easy-to-use package. Arduino also simplifies the process of working with microcontrollers, but it offers some advantage for teachers, students, and interested amateurs over other systems:

- Simple, clear programming environment

  The Arduino Software (IDE) is easy-to-use for beginners, yet flexible enough for advanced users to take advantage of as well. For teachers, it's conveniently based on the Processing programming environment, so students learning to program in that environment will be familiar with how the Arduino IDE works.

- Cross-platform

  The Arduino Software (IDE) runs on Windows, Macintosh OSX, and Linux operating systems. Most microcontroller systems are limited to Windows.

- Open source and extensible software

  The Arduino software is published as open source tools, available for extension by experienced programmers. The language can be expanded through C++ libraries, and people wanting to understand the technical details can make the leap from Arduino to the AVR C programming language on which it's based. Similarly, you can add AVR-C code directly into your Arduino programs if you want to.

- Open source and extensible and hardware

  The plans of the Arduino boards are published under a Creative Commons license, so experienced circuit designers can make their own version of the module, extending it and improving it. Even relatively inexperienced users can build the breadboard version of the module in order to understand how it works and save money.

However, the Arduino board that we use in this Wireless Communication Garbage Collector robot is Arduino/Genuino Uno. Arduino is a microcontroller board based on the ATmega328P (datasheet). 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 over again.

"Uno" means one in Italian and was chosen to mark the release of Arduino Software (IDE) 1.0. The Uno board and version 1.0 of Arduino Software (IDE) were the reference versions of Arduino, now evolved to newer releases. The Uno board is the first in a series of USB Arduino boards, and the reference model for the Arduino platform; for an extensive list of current, past or outdated boards see the Arduino index of boards.

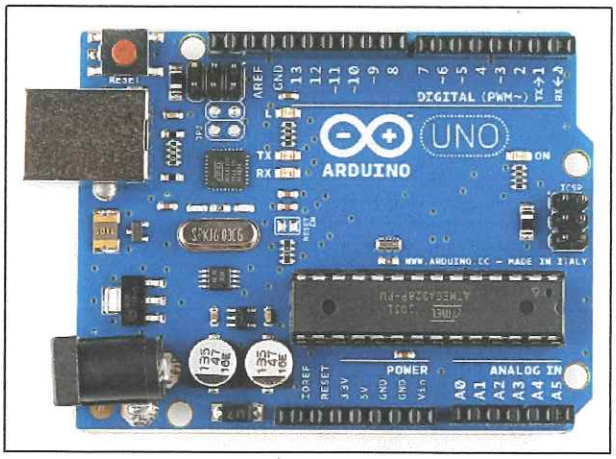

Figure 2.5: Arduino Uno

G. Servo Motor (TowerPro SG90 Micro 9g)

A servomotor is a closed-loop servomechanism that uses position feedback to control its motion and final position. The input to its control is a signal (either analogue or digital) representing the position commanded for the output shaft.

The motor is paired with some type of encoder to provide position and speed feedback. In the simplest case, only the position is measured. The measured position of the output is compared to the command position, the external input to the controller. If the output position differs from that required, an error signal is generated which then causes the motor to rotate in either direction, as needed to bring the output shaft to the appropriate position. As the positions approach, the error signal reduces to zero and the motor stops.

The very simplest servomotors use position-only sensing via a potentiometer and bang-bang control of their motor; the motor always rotates at full speed (or is stopped). This type of servomotor is not widely used in industrial motion control, but it forms the basis of the simple and cheap servos used for radio-controlled models.

More sophisticated servomotors use optical rotary encoders to measure the speed of the output shaft and a variable-speed drive to control the motor speed. Both of these enhancements, usually in combination with a PID control algorithm, allow the servomotor to be brought to its commanded position more quickly and more precisely, with less overshooting.

Figure 2.6: Servo Motor

2.3 PREVIOUS STUDIES

2.3.1

AUTONOMOUS PLASTIC TRASH DISPOSALDRONE –THE TRASH-BOT

Plastics are cheap, strong, and durable and offer considerable benefits to humanity. They potentially can enhance the benefits that both medical and scientific technology will bestow to humankind. Thus the main idea of our paper is to build an automatic plastic trash picking robot which automatically detects plastic around the beaches and store them in a container for recycling process. So this reduces the requirement of volunteers and people to clean up this debris and this TRASHBOT will do the work of human. Thus using this robotic technology to develop an autonomous trash collecting robot will provide a drastic importance in the field of sanitation and preventing plastic debris. To build an automatic trash robot using Arduino microcontroller and special robotic technologies which detects and collects the plastic stuffs automatically and process it. So this reduces the requirement of manual clearance of plastic waste, to clean up this debris.

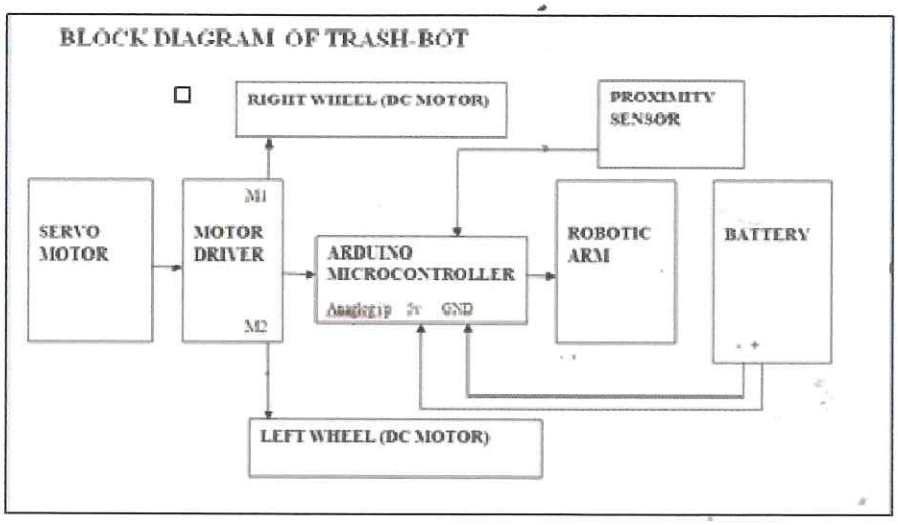

Figure 2.7: Block Diagram of Trash-Bot

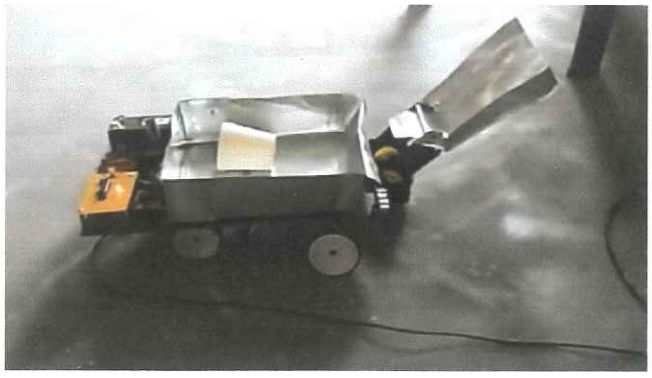

Figure 2.8: TRASHBOT

2.3.2 Dustbot

Dustbot is a robot that can collect garbage from homes. It can be summoned by phone call or SMS, and uses GPS to automatically make its way to the customer, collect the rubbish, and take it to a dustbin. In addition, the Dust bots carry environmental sensors to monitor the pollution levels over, for example, a pedestrian area. Prototypes have been tested in Italy, in Sweden, in Korea and Japan, and it is due for launch in 2009. The Dustbot project is funded by the European Commission.

Dustbot is allegedly the world's first robot that comes to take away rubbish from a residence upon request. It can be summoned to an address by phone or SMS at any time of the day. "The caller's position is calculated and the Dustbot is dispatched. When the robot arrives you use the robots display board to enter what sort of trash it is and then the robot carries it to a dust bin", said Matteo Reggente, one of the DustBot scientists. The DustBot then opens its bin, collects the trash and takes it to a designated area.

The Dustbot system, consisting of the Dustcart and the Dust Clean robots, is designed to work in tight urban areas where large trucks find it difficult to operate, such as old European cities. It can work in narrow streets which are difficult for large refuse trucks to negotiate. The Dust Clean robot can also sweep, vacuum-clean and measure pollution.

Figure 2.9: DUSTBOT

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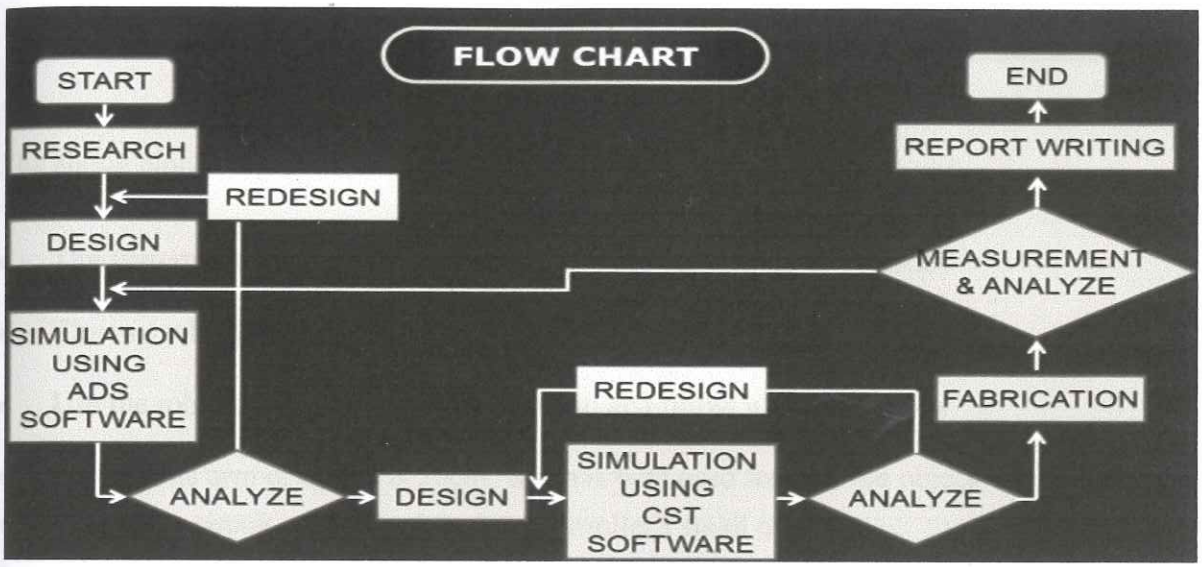
Bab 3: Research Methodology

Bab 3.1 Introduction

Methodology is the systematic, theoretical analysis of the methods applied to a field of study. It comprises the theoretical analysis of the body of methods and principles associated with a branch of knowledge. A methodology is a method or process that is typically used to perform a project analysis. The project want to use many time complete. In order to complete project, we are doing a plan use the time can be complete the project at within a predetermined time. There are several steps that need to be taken to implement the project.



Bab 3.2.1 Research Methods

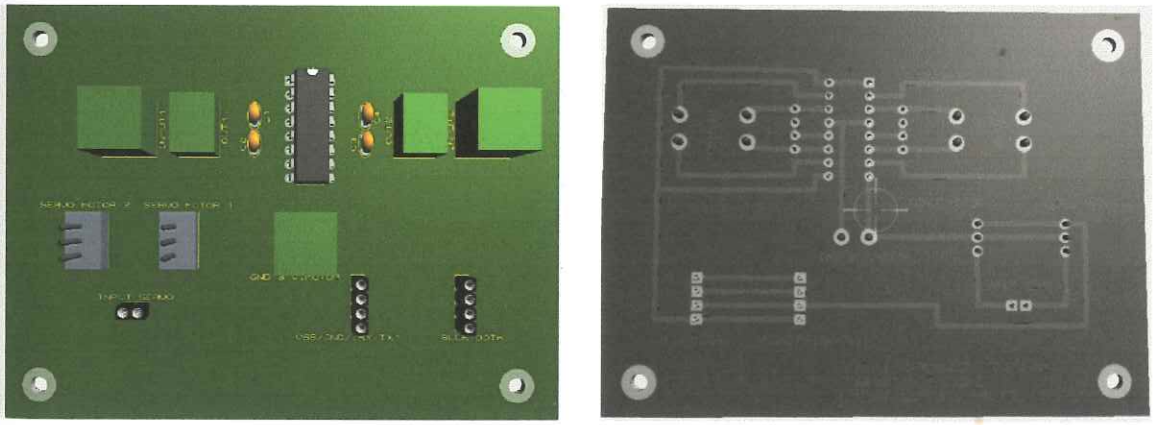


Figure2.10: Simulate PCD board

We find the schematic circuit is used to confirm that the components are working well and that the components are related to each other. In the design of the principle of the circuit, we should understand some of the basic steps, and each must be described in detail as follows.

- Can show the wiring tools in the schematic circuit design
- Can use the schematic circuit example to design a new circuit
- Can use the symbol to identify the component

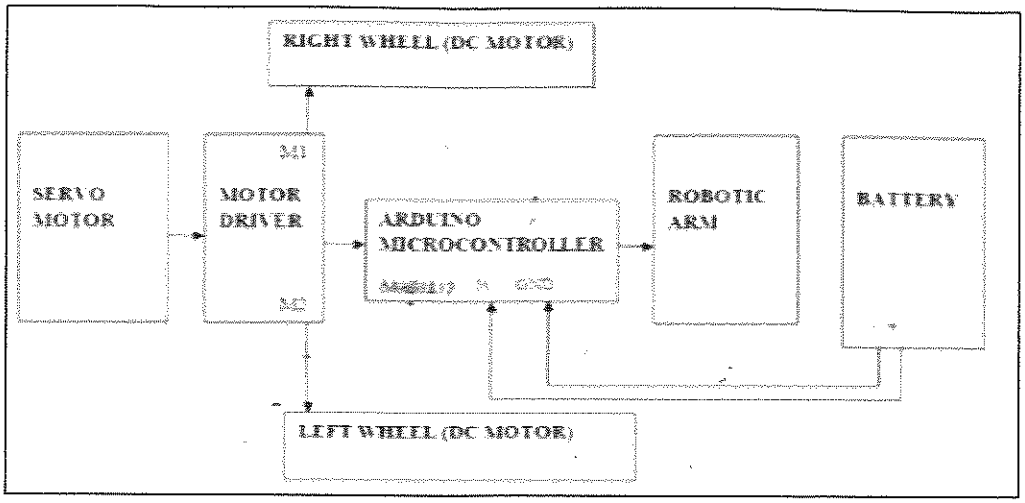


Figure2.11: Block Diagram

The above block diagram shows a view of the final project module:

- The system is using Arduino Atmega 328 micro controller to control.
- The two wheel movement is using DC motor.
- Use the robotic arm to picking up the trash and throw it to the dustbin.
- The robotic arm of length is 20cm, width is 6cm used for take the object.
- The driver circuit enhances the microcontroller's small output.
- The switch is used to select the mode operation.