MOBILE ROBOT POWER SUPPLY

BY

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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)

JUNE 2017

PROJECT REPORT CONFIRMATION

We hereby declare that the work in this report is my own except for quotations and summaries which have been duly acknowledged.

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Date: 03/11/2017

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Pn Roslina bt Saad

Dedicated to,

Thanks to my god,

For give me a good health and strength while making this report.

My beloved father and mother,

Who has always been my epitome of love and always pray for my strength to finish up this report.

My beloved relatives,

My siblings,

Thank you for your support and pray.

The person who has been very understanding and helpful, my supervisor

Pn Roslina bt saad

For the support and guidance. Hope that I always be remembered.

My unforgettable friends,

My housemate, my course mate and all DTK students intake June 2017,

Our struggle not yet ends.

Finally, friends that always together during this third years study,

Hopefully achieved what we aspired.

ACKNOWLEDGEMENT

First and foremost I would like to take this opportunity to express my gratitude to everyone who supported me throughout the course of this project. I would like to say a gratitude to our supportive supervisor, Pn Roslina bt Saad for her aspiring guidance, invaluably constructive criticism and friendly advice during the project work. A sincerely grateful to him for sharing his truthful and illuminating views on a number of issues related to the project.

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.

Abstract

Solar concept is not new for us. We all know the importance of solar energy. Solar gadgets are increasing day by day. As non-renewable energy sources are decreasing, usage of solar energy is increased. This solar energy is not only used on the Earth but also used in space stations where no electrical power is available.

Here is the simple circuit to charge 6V, 4.5Ah rechargeable Lead-acid battery from the solar panel. This solar charger has current and voltage regulation and also has over voltage cut off facilities. This circuit may also be used to charge any battery at constant voltage because output voltage is adjustable.

Abstrak

Konsep solar bukanlah sesuatu yang baru untuk kita. Kita semua tahu pentingnya tenaga solar. Alat solar semakin meningkat setiap hari. Oleh kerana sumber tenaga yang tidak boleh diperbaharui berkurangan, penggunaan tenaga suria meningkat. Tenaga solar ini tidak hanya digunakan di Bumi tetapi juga digunakan di stesen angkasa yang tidak ada kuasa elektrik.

Berikut adalah litar mudah untuk mengecas 6V, 4.5Ah boleh dicas semula bateri asid Lead dari panel suria. Pengecas solar ini mempunyai peraturan semasa dan voltan dan juga mempunyai kemudahan pemotongan voltan. Litar ini juga boleh digunakan untuk mengecas sebarang bateri pada voltan malar kerana voltan output boleh diselaraskan.

CHAPTER 1:

INTRODUCTION

Very soon you will be a walking energy station with people asking you to help them charge their batteries with your clothes! This isn't a scene out of a Sci-Fi movie. It is the simple application of solar cells. They are the only way we can convert sunlight into electricity directly and day by day they are getting better, smaller and cheaper. Nothing can challenge the sun when it comes to radiating energy. Every hour the energy available from the sun is more than what human's require for an entire year. Petrol, diesel and all these fossil fuels are nothing but sun's energy concentrated over years and years. This makes them very efficient in terms of energy per unit of the fuel. So why not tap it directly? Solar energy isn't something new. People have used sun to dry and preserve things. Vedic literatures in India even state the use of flying machines which were powered using the sun. Come 21st century, we have come a long way in developing solar cells which are the devices powering our future, converting sun's energy into electricity. Solar panels are simply solar cells lined up together in series and parallel so as get sufficient.

Voltage and are p-n junction semiconductor devices with pure silicon wafer doped with 'n' type phosphorous on the top and 'p' type boron on the base. If the PV cell is placed in the sun, photons of light strike the electrons in the p-n junction and energize them, knocking them free of their atoms. These electrons are attracted to the positive charge in the n-type silicon and repelled by the negative charge in the p-type silicon. Connecting wires across the junction will have a current in them.

A battery provides electricity in a direct current -- the electricity always flows in the same direction. But if you hook up an electromagnetic to an alternating current -- a circuit in which electricity flows first in one direction and then the other many times per second -- you alternate the polarity of the electromagnet in time with the changes in the current's direction. That creates a constantly changing magnetic field -- the perfect condition for inducting electricity.

Once you've got your nail wrapped in insulated wire, you can connect the two ends of the wire to the terminals on a battery. Electricity flows through the coiled wire, generating a magnetic field along the nail. You can use the nail to pick up other nails through magnetism. If you switch the ends of the wire to the opposite terminals on the battery, you'll reverse the polarity of your electromagnet -- what was the north end of the magnet becomes the south end and vice versa.

If you assemble a second coil of wire and place it near the first, you can use the magnetic field from your electromagnet to create a flow of electrons in the second coil. If you hook that second coil of wire to a voltmeter, you can actually see the needle or readout change whenever you connect or disconnect the wires from the battery.

1.0 Research Background

In today's generation, many of us are carrying a heavier workload than we used to, and feeling the crunch. You might not be able to control your workload, but you can control how you react to it. You can choose to be overwhelmed, or you can choose to accept where you are today, while taking steps to improve your situation. In order to cope with all the situations, as a human being need to be prepared with fresh ideas and surround ourselves in a harmony surrounding. There is a way that can help to enhance ourselves and to relax our mind. It is just by having houseplants. When you want to enhance interior spaces with houseplants, you are not just adding greenery. These living organisms interact with your body, mind and home in ways that enhance the quality of life.

1.1 Motivation

My motivation to undertake this project is due to my experience and observation of the inefficiencies of the current system which is mobile robot power supply in a new technology way. Besides that, I believe that nowadays people are taking for granted about our technology which is, it is much more important to care about the technology that already exists.

1.2 PROBLEM STATEMENT

In our life, the use of robotics in certain places is becoming more popular in recent years. The trend seems to continue as long as the robotics technology meets diverse and challenging needs of the mobile robot power supply. But some people in this generation does not know much about mobile robot power supply. The robot does not need to be plugged-in, in a socket or a 3 pin plug because this robots comes in with a solar panel on it. The source of power supply for this robots comes from the sunlight. It is a natural way which does not need an electric to charge it. When the sunlight hits the solar panel that is fixed in the robot, it is automatically recharge and the power is transfer to a chargeable device as battery. So the main source of the power supply comes from the sunlight which does not require electric and it transform as a battery.

1.3 OBJECTIVE

- To develop a technology of mobile robot power supply that can be mobiling.
- To design application of solar power systems that could extend to higher power application, like; solar powered vehicles.
- To reduce the amount of electricity usage.

1.4 SCOPE and LIMITATION

In this project, the solar charger is mainly produced to replace the normal charge with use of electric current. Therefore there is no limitation of using this source of solar, hence we may also control the input and output with the usage of Arduino as a microcontroller.

CHAPTER 2:

LITERATURE REVIEW

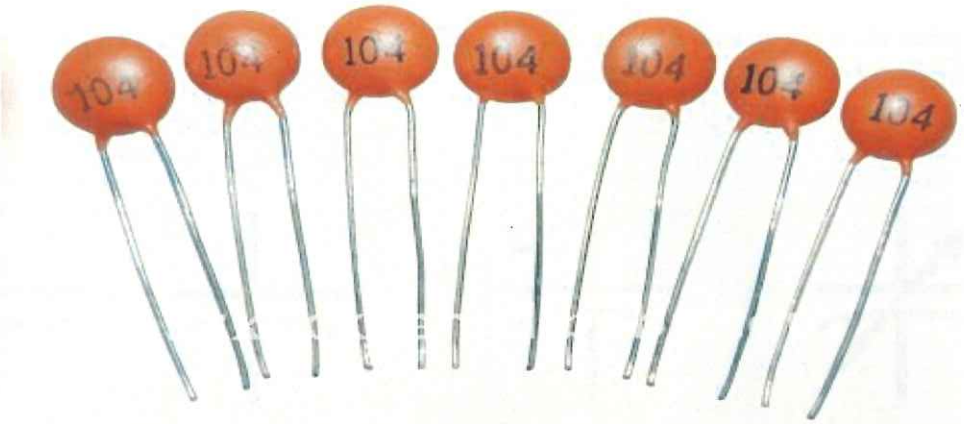
Solar cells have come a long way from bulky 6% efficient chunks to thin films with as much as 30% efficiency. They are selling like hot cakes today given their necessity and utility. And the reason being they are faithful good chaps unlike oil which will soon be more precious to us than diamonds and the black monster: coal which has polluted the air, hand in cuff with the other fossil fuels. We need to understand solar panels so as to understand their applications. Today, we have monocrystalline, polycrystalline and amorphous thin film panels. Mono-crystalline are so far the most efficient, given that they have the maximum silicon in a unit area so more current for the same number of photons. They are made out of a single silicon crystal as a continuous lattice. While for the polycrystalline panels, molten silicon is poured into molds and separate boundaries can be seen due to this. Lesser quantity of silicon in a unit area means lesser efficiency of production of electricity. Amorphous thin film panels are layers of silicon on a glass surface and are the least expensive. Hence, they are used in applications where you can do away with efficiency for lowering the costs.

COMPONENTS USED

1. SOLAR PANEL

Solar panel refers to a panel designed to absorb the sun's rays as a source of energy for generating electricity or heating. A photovoltaic (in short PV) module is a packaged, connected assembly of typically 6×10 solar cells. Solar Photovoltaic panels constitute the solar array of a photovoltaic system that generates and supplies solar electricity in commercial and residential applications. Each module is rated by its DC output power under standard test conditions, and typically ranges from 100 to 365 watts. The efficiency of a module determines the area of a module given the same rated output – an 8% efficient 230 watt module will have twice the area of a 16% efficient 230 watt module. There are a few solar panels available that are exceeding 19% efficiency. A single solar module can produce only a limited amount of power; most installations contain multiple modules. A photovoltaic system typically includes a panel or an array of solar modules, a solar inverter, and sometimes a battery and/or solar tracker and interconnection wiring.

2. CAPACITOR



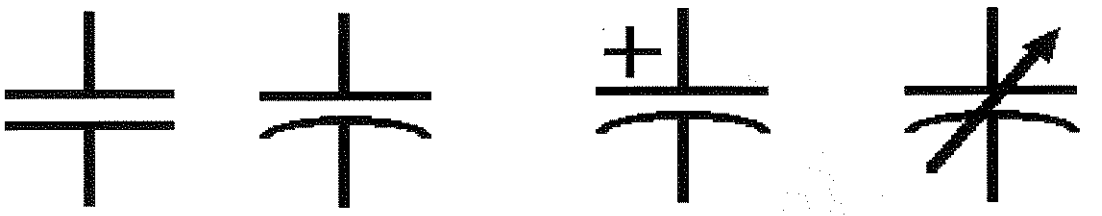
A capacitor or condenser is a passive electronic component consisting of a pair of conductors separated by a dielectric. When a voltage potential difference exists between the conductors, an electric field is present in the dielectric. This field stores energy and produces a mechanical force between the plates. The effect is greatest between wide, flat, parallel, narrowly separated conductors.

An ideal capacitor is characterized by a single constant value, capacitance, which is measured in farads. This is the ratio of the electric charge on each conductor to the potential difference between them. In practice, the dielectric between the plates passes a small amount of leakage current. The conductors and leads introduce an equivalent series resistance and the dielectric has an electric field strength limit resulting in a breakdown voltage.

A capacitor (formerly known as condenser) is a device for storing electric charge. The forms of practical capacitors vary widely, but all contain at least two conductors separated by a non-conductor. Capacitors used as parts of electrical systems, for example, consist of metal foils separated by a layer of insulating film.

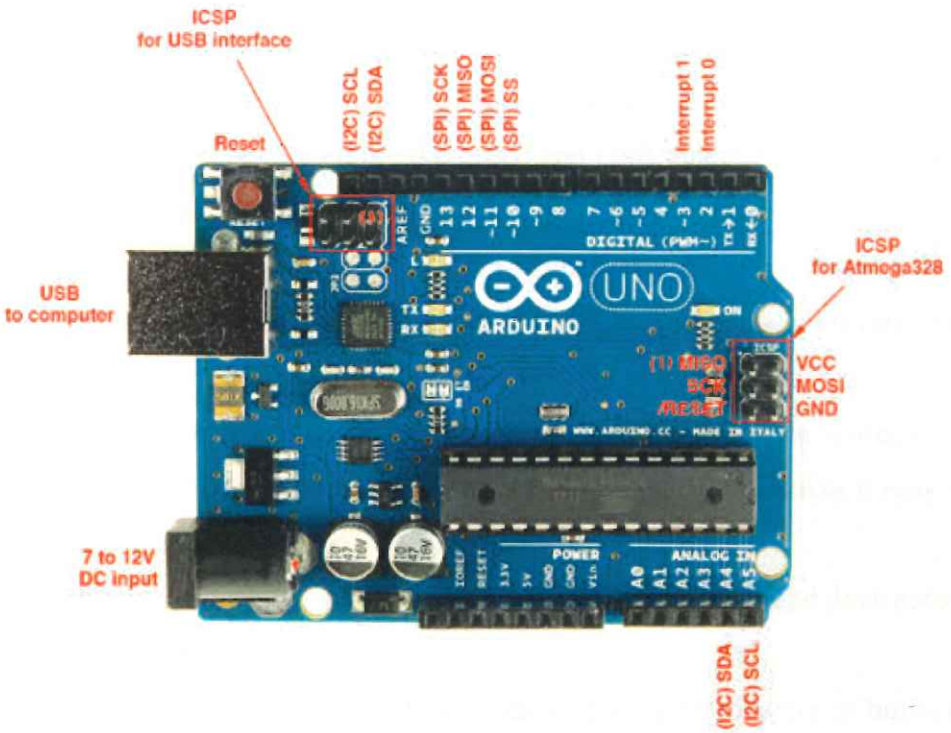
Capacitors are widely used in electronic circuits for blocking direct current while allowing alternating current to pass, in filter networks, for smoothing the output of power supplies, in the resonant circuits that tune radios to particular frequencies and for many other purposes.

A capacitor is a passive electronic component consisting of a pair of conductors separated by a dielectric (insulator). When there is a potential difference (voltage) across the conductors, a static electric field develops in the dielectric that stores energy and produces a mechanical force between the conductors. An ideal capacitor is characterized by a single constant value, capacitance, measured in farads. This is the ratio of the electric charge on each conductor to the potential difference between them.



Normal Normal Electrolytic Variable

3. ARDUINO (MICROCONTROLLER)



The 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 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.

Features of the Arduino Uno Board:

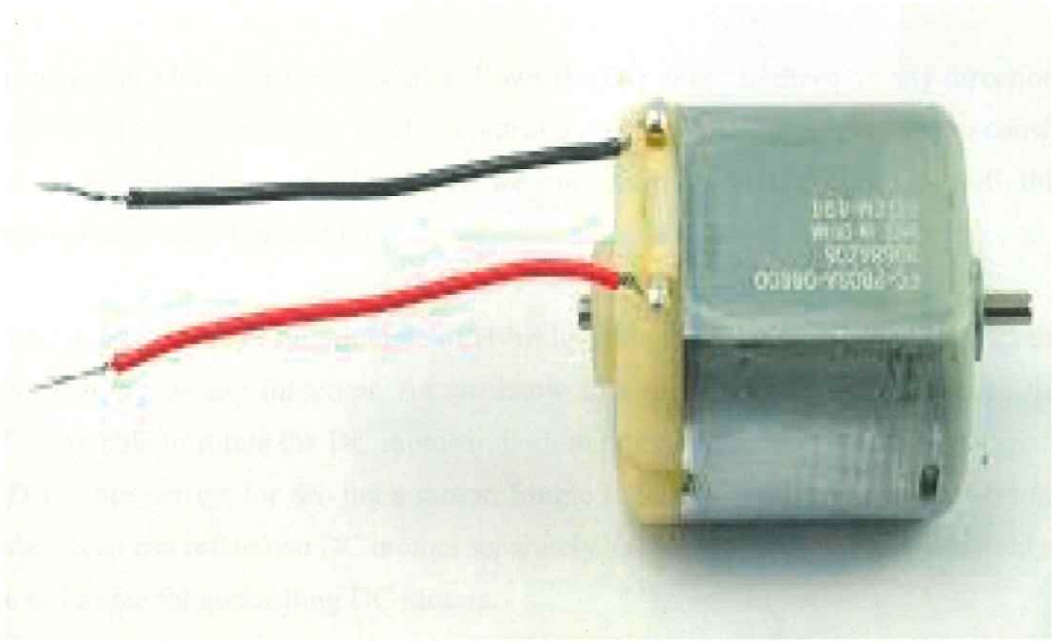
- It is an easy USB interface. This allows interface with USB as this is like a serial device.
- The chip on the board plugs straight into your USB port and supports on your computer as a virtual serial port. The benefit of this setup is that serial communication is an extremely easy protocol which is time-tested and USB makes connection with modern computers and makes it comfortable.
- It is easy-to-find the microcontroller brain which is the ATmega328 chip. It has more number of hardware features like timers, external and internal interrupts, PWM pins and multiple sleep modes.
- It is an open source design and there is an advantage of being open source is that it has a large community of people using and troubleshooting it. This makes it easy to help in debugging projects.
- It is a 16 MHz clock which is fast enough for most applications and does not speeds up the microcontroller.
- It is very convenient to manage power inside it and it had a feature of built-in voltage regulation. This can also be powered directly off a USB port without any external power. You can connect an external power source of up to 12v and this regulates it to both 5v and 3.3v.
- 13 digital pins and 6 analogue pins. This sort of pins allows you to connect hardware to your Arduino Uno board externally. These pins are used as a key for extending the computing capability of the Arduino Uno into the real world. Simply plug your electronic devices and sensors into the sockets that correspond to each of these pins and you are good to go.
- This has an ICSP connector for bypassing the USB port and interfacing the Arduino directly as a serial device. This port is necessary to re-boatload your chip if it corrupts and can no longer used to your computer.
- It has a 32 KB of flash memory for storing your code.
- An on-board LED is attached to digital pin 13 to make fast the debugging of code and to make the debug process easy.
- Finally, it has a button to reset the program on the chip.

Arduino was created in the year 2005 by two Italian engineers David Cuartielles and Massimo Banzi with the goal of keeping in mind about students to make them learn how to program the

Arduino Uno microcontroller and improve their skills about electronics and use it in the real world.

Arduino Uno microcontroller can sense the environment by receiving input from a variety of sensors and can affect its surroundings by controlling lights, motors, and other actuators. The microcontroller is programmed using the Arduino programming language (based on Wiring) and the Arduino development environment (based on Processing).

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.

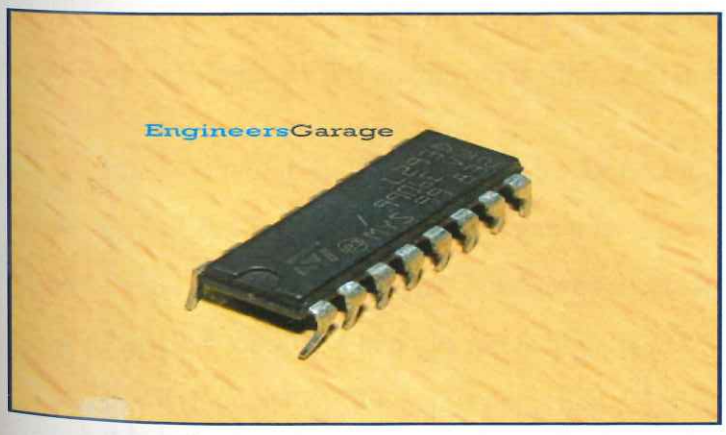
Advantages of DC Motor:

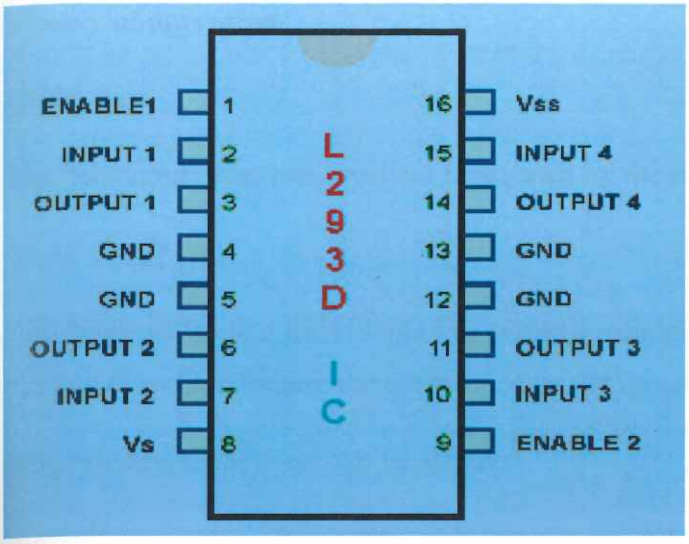
1. Provide excellent speed control for acceleration and deceleration
2. Easy to understand design
3. Simple, cheap drive design

7 . L293D MOTOR DRIVER IC

L293D IC is a typical Motor Driver IC which allows the DC motor to drive on any direction. This IC consists of 16-pins which are used to control a set of two DC motors instantaneously in any direction. It means, by using a L293D IC we can control two DC motors. As well, this IC can drive small and quiet big motors.

This L293D IC works on the basic principle of H-bridge, this motor control circuit allows the voltage to be flowing in any direction. As we know that the voltage must be change the direction of being able to rotate the DC motor in both the directions. Hence, H-bridge circuit using L293D ICs are perfect for driving a motor. Single L293D IC consists of two H-bridge circuits inside which can rotate two DC motors separately. Generally, these circuits are used in robotics due to its size for controlling DC motors.





- Pin-1 (Enable 1-2): When the enable pin is high, then the left part of the IC will work otherwise it won't work. This pin is also called as a master control pin.
- Pin-2 (Input-1): When the input pin is high, then the flow of current will be through output 1
- Pin-3 (Output-1): This output-1 pin must be connected to one of the terminals of the motor
- Pin4 &5: These pins are ground pins
- Pin-6 (Output-2): This pin must be connected to one of the terminals of the motor.
- Pin-7 (Input-2): When this pin is HIGH then the flow of current will be though output 2
- Pin-8 (Vcc2): This is the voltage pin which is used to supply the voltage to the motor.
- Pin-16 (Vss): This pin is the power source to the integrated circuit.
- Pin-15 (Input-4): When this pin is high, then the flow of current will be through output-4.
- Pin-14 (Output-4): This pin must be connected to one of the terminals of the motor
- Pin-12 & 13: These pins are ground pins
- Pin-11 (Output-3): This pin must be connected to one of the terminals of the motor.
- Pin-10 (Input-3): When this pin is high, then the flow of current will through output-3
- Pin-9 (Enable3-4): When this pin is high, then the right part of the IC will work & when it is low the right part of the IC won't work. This pin is also called as a master control pin for the right part of the IC.

Theory of operation

Ohm's law

The behaviour of an ideal resistor is dictated by the relationship specified in Ohm's law:

$$V = I \cdot R$$

Ohm's law states that the voltage (V) across a resistor is proportional to the current (I) passing through it, where the constant of proportionality is the resistance (R).

Equivalently, Ohm's law can be stated:

$$I = \frac{V}{R}$$

This formulation of Ohm's law states that, when a voltage (V) is present across a resistance (R), a current (I) will flow through the resistance. This is directly used in practical computations. For example, if a 300 ohm resistor is attached across the terminals of a 12 volt battery, then a current of 12 / 300 = 0.04 amperes (or 40 milli amperes) will flow through that resistor.

Power dissipation

The power P dissipated by a resistor (or the equivalent resistance of a resistor network) is calculated as: $$P = I^2R = IV = \frac{V^2}{R}$$

The first form is a restatement of Joule's first law. Using Ohm's law, the two other forms can be derived.

CHAPTER 3:

METHODOLOGY

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

Methodology includes a philosophically coherent collection of theories, concepts or 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 assumptions that underlie a particular study relative to the scientific method. This is why scholarly literature often includes a section on the methodology of the researchers.

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 process needs to be done according to proper procedures to ensure that projects do not have any problems.

Among the measures the work done in preparing this project are.

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

FLOW CHART OF PROJECT