DESIGN AND CONSTRUCTUION OF ANDROID CONTROL AUTOMATIC DRAINAGE CLEANER

A thesis report submitted to the department of mechanical engineering for the partial fulfillment of the degree of Bachelor of Science in Mechanical Engineering

A Thesis by

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APPROVAL

This is to certify that the project on **" Design & Construction of Android Control Automatic Drainage Cleaner."**ByMd. Bodruzzaman (ID No: BME   1602009444), Mohammad Rabiul Hoque (ID No: BME 1602009003),Md. Rashedul Hasan (ID No: BME 1602009437), Md. Sharif Hassan (ID No: BME 1602009442) has been carried out under our supervision. The project has been carried out in partial fulfillment of the requirements of the degree of Bachelor of Science (B.Sc.) in Mechanical Engineering of years of 2020 and has been approved as to its style and contents.

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DECLERATION

We, hereby, declare that the work presented in this project is the outcome of the investigation and research work performed by us under the supervision of Md. Minhaz Uddin , Lecturer, Department of Mechanical Engineering, Sonargaon University (SU). We also declare that no part of this project and thesis has been or is being submitted elsewhere for the award of any degree.

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ABSTRACT

In this project the proposed concept is to replace the manual work in drainage cleaning by automated system controlled by android. Now-a-days even though automation plays a vital role in all industrial applications in the proper disposal of sewages from industries and commercials are still a challenging task. Drainage pipes are using for the disposal and unfortunately sometimes there may be loss of human life while cleaning the blockages in the drainage pipes. To overcome this problem and to save human life we implement a design **"Android Controlled Automatic Drain Cleaning System"**. we designed our project to use this in efficient way to control the disposal of wastages and with regular filtration of wastages, clearance of gaseous substance are treated separately and monitor the disposal in frequent manner. We have arranged for solar power to operate the entire project.

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Chapter 1 Introduction

1.1 General

Android Control Automatic Drainage cleaning System Using auto mechanism & solar power system proposed to overcome the real time problems. With the continued expansion of industries, the problem of sewage water must be urgently resolved due to the increasing sewage problems from industries of the surrounding environment. The waste and gases produced from the industries are very harmful to human beings and to the environment. Our proposed system is to cleaning and control the drainage level using auto mechanism technique. auto mechanism is the major controlling unit and the drainage level is monitor by municipal. In this system we used motor, chain, driver, bucket, frame. Automatic Drainage Cleaning Machine is an automated engineering system which aims to overcome the real time problems. With the continued expansion of industries, there is continuous dumping of waste in drainage as well as water bodies in and around the industrial sites. The dumping of wastes causes harm to aquatic life as well as pollutes the water body which is very harmful to humans as well as animals. This problem of sewage water must be urgently resolved due to the increasing sewage problems from industries of the surrounding environment. The waste and gases produced from the industries are very harmful to human beings and to the environment. Our proposed system helps to clean and control the drainage level using automated technique. The project consists of a rigid, lightweight aluminium frame to provide portability. A high torque DC Motor is used as power source to automate the drainage cleaning system. Metal forks are moved in continuous cycles to remove all the pollutants from the area. Cleaning of drains/gutters has always been a problem. Labors cleaning gutters & drain seems unethical and also leads to a high risk of them catching infections or poisoning due to large amounts of waste/chemicals in them. Also throwing of bottles/plastics and other such objects into the gutters lead to narrowing and eventually blockage in gutter flow. This leads to overflow in many cases. So here we provide a fully automated drain gutter cleaning mechanism to tackle these modern day gutter jamming issues. Our system uses an automated gutter/drain cleaning system that lets fluids flow through it but catches large solid waste like bottles & plastic and accumulates it. So gutter cleaners need to just clean these gutter cleaning systems installed at points instead of cleaning entire gutter

floors. Our system consists of metal teeth based jaws that wait at the bottom of the mechanism. It is mounted in a frame to hold the system upright in the gutter. The vertical frame bed is used to let liquid flow but catch all solid waste. The mechanism consists of a filter basket on top of it. After particular time intervals the jaw lifts up using a motorized shaft which is connected using a chain to the jaws. It then reaches the top and turns upside down to dump the solid waste. Now after dumping the waste, the motor rotates again to bring the jaw again to the bottom position to collect more waste. The system is a very efficient way to cleaning gutters & drains and also requires very low power since it will only rotate once or twice a day to dump the solid waste. The Automatic drainage cleaning system is used to clean the drainage system automatically by the ADCS Machine, which is operated mechanically with the help of several arrangement of various components of machine and various linkages. The water flowing in drainage have various impurities which having plastic bottles, polythene, dirt and other solid waste. Due to blocking of drainage system we may face several problems in rainy seasons as well as normal days. Due to blocking of drainage we see that the wastes get overflow on the roads which is a big problem mostly in rainy season. So by introducing the Automatic drainage cleaning system we can eliminate the several problems as well as we can replace the human labor who clean these drainages and they having high risk of catching infections. As we know that the drainage is narrow width of 910mm approx. So we have to introduce the ADCS in between the width of drainage.

1.2 Objective:

The objectives of this thesis are …

> To design & construction of Automatic Drain Cleaner system.
>
> To design & implementation of android controlled Drain Cleaner system.
>
> To design & implementation of solar power Drain Cleaner system. system.
>
> To the machine is mainly used in drain water cleaning system.
>
> To the cleaning the blockages in the drainage pipes.

Chapter 02 Literature Review

2.1 Introduction:

A drain cleaner is a chemical-based consumer product that unblocks sewer pipes or clogged wastewater drains. The term may also refer to a mechanical device such as a plumber's snake, drain auger, toilet plunger, or similar device. Occasionally, the term is applied to a plumber or other individual who performs the drain cleaning and hygiene. Chemical drain cleaners, plungers, handheld drain augers, air burst drain cleaners, and home remedy drain cleaners are typically applied to the problem of a clogged single drain, such as a sink, toilet, tub, or shower drain. An effective drain cleaner can remove soft obstructions (such as hair and grease) accumulating near the fixture's drain inlet. If more than one plumbing fixture is clogged then electric drain cleaners, battery powered drain cleaners, sewer jetters or such mechanical devices are usually required to clear obstructions along the entire length of the drain piping system, that is, from fixture drain inlets through the main building drains and lateral piping outside the building to the collector sewer mains.

2.2 History:

The history of drain cleaners parallels the development of common drain systems themselves. As a result, there is not an extensive history of cleaners in the US, as municipal plumbing systems were not readily available in middle-class American homes until the early 20th century. Prior to this time, Americans often discarded the dirty water collected in basins after use. Limited piping systems gradually developed with lead materials, but after WWI when the poisonous properties of lead became more well-known, piping was reconstructed with galvanized iron. Galvanized iron is actually steel covered in a protective layer of zinc, but it was soon discovered that this zinc layer naturally corroded due to exposure to the atmosphere and rainwater, as well as cement, runoff, etc. Once corrosion occurred down to the base metal, plaques and rust would form, leading to sediment build-up that would gradually clog these drains. Thus, the first motivation for drain cleaners came to be. The struggle against corroding galvanized iron pipes eventually led to a replacement by copper or plastic (PVC) piping by the 1960s. Copper and plastic do not possess that zinc layer that naturally corrodes to expose the base metal to decay. Still, however, natural substances such as hair, grease, or other oils continued to be an issue in drain clogs, and so, the development of more effective chemical drain cleaners became necessary.

2.3 Types of Drain Cleaning System:

There are three main types of drain cleaners:

- Caustic drain cleaners contain substances such as lye and caustic potash. ...
- Oxidizing drain cleaners contain substances such as household bleach, peroxides and nitrates.
- Acid drain cleaners aren't commonly found in stores, and some are sold only to plumbers.

Chemical Drain Cleaners

Be they liquid, gel or powder form, most of the drain cleaners you'll find on store shelves use strong chemicals, and they come in liquid, gel and powder forms. All chemical reactions involve moving electrons, and drain cleaners work by either taking or giving electrons to the clogging substance, generating heat in the process. There are three main types of drain cleaners:

- **Caustic drain cleaners** contain substances such as lye and caustic potash. They're bases, so they give electrons to the clogging substance, and their hydroxide ions create the reaction that clears the clog. Their alkaline, or basic, chemicals release heat and turn grease into a soap-like substance that's more easily dissolved. These drain cleaners are typically heavier than <u>water</u>, which enables them to reach the clog through standing water.

- **Oxidizing drain cleaners** contain substances such as household <u>bleach</u>, peroxides and nitrates. These chemicals cause the organic material of the clog to lose electrons and become oxidized. The product is heavier than water, so it can move through standing water, and it releases heat and gas to help clear the blockage.

- **Acid drain cleaners** aren't commonly found in stores, and some are sold only to plumbers. These typically contain high concentrations of sulfuric acid or hydrochloric acid, substances that increase hydronium ions in a solution and attract electrons from the clog. The hydronium ions react chemically with the material in the clog, and the reaction releases heat, which is necessary to melt congealed grease

Because most of these products generate heat, they may soften the polyvinyl chloride, or PVC, pipes found in homes today. However, such damage is rare if you use the drain cleaner as directed -- damage is more likely to occur when drain cleaner is used on older, metal pipes.

Aside from their effect on pipes, there are other disadvantages to chemical drain cleaners. They're extremely toxic if swallowed, and they can burn eyes, skin and mucous membranes and eat through clothing. They can release noxious fumes, and if used improperly, they can cause explosions. These products can also harm septic systems by killing beneficial bacteria, and they can mar bathroom and kitchen fixtures.

If you use chemical drain cleaners, read the directions carefully and heed all the warnings. Use the product in a well-ventilated area, wear rubber gloves, and keep children and pets away from the drain. Never mix different drain cleaners, and don't use a plunger in conjunction with drain cleaners.

Most drain cleaners advise waiting 15 minutes or more after pouring the product into the drain before flushing it with hot water. If your drain is still clogged afterward, you may need to repeat the process.

2.4 Differences a Mechanical Drain Cleaner :

To clean a clogged sewer drain you've got a choice of using either a mechanical drain cleaner.

A mechanical drain cleaner has these advantages:

- **Readily available:** mechanical drain cleaners are commonly found at neighborhood tool rental stores.
- **Large object removal:** in the hands of a skilled user, special attachments for a mechanical drain cleaner can cut through tree roots and remove some types of foreign objects from a drain.

Chapter 03 Methodology

3.1 Process of Project:

➢ Creating an idea for Design and construction of Android Control Automatic Drain Cleaner.

➢ And designing a block diagram & circuit diagram to know which components need to construct it.

➢ Collecting the all components and programming for the microcontroller to controlled the system.

➢ Setting all components in a PCB board & soldering. Then assembling the all block in a board and finally run the system & checking.
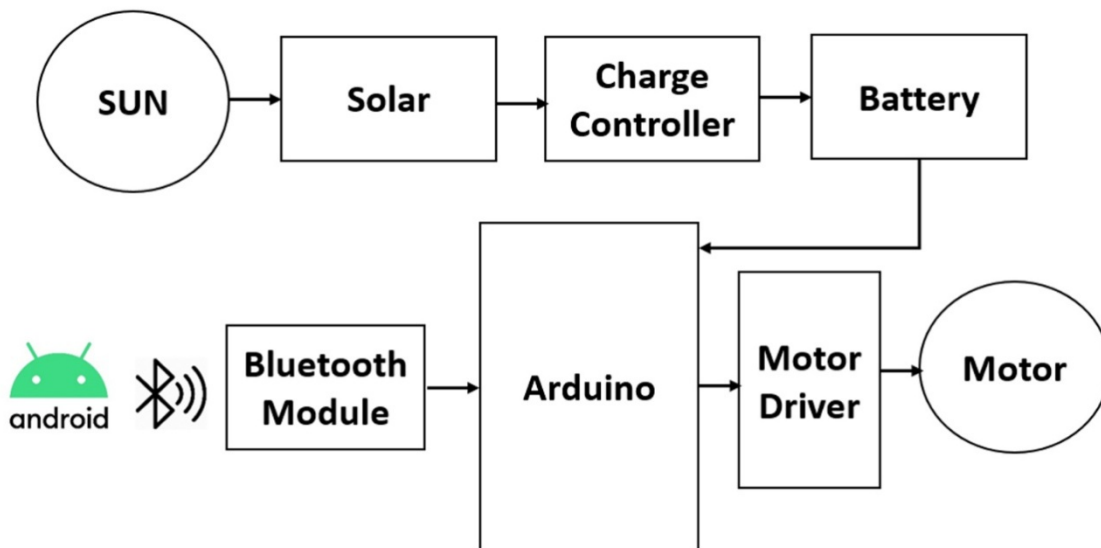
3.2 Block Diagram:

Figure 3.2.1:Block Diagram of Android Control Drain Cleaner.
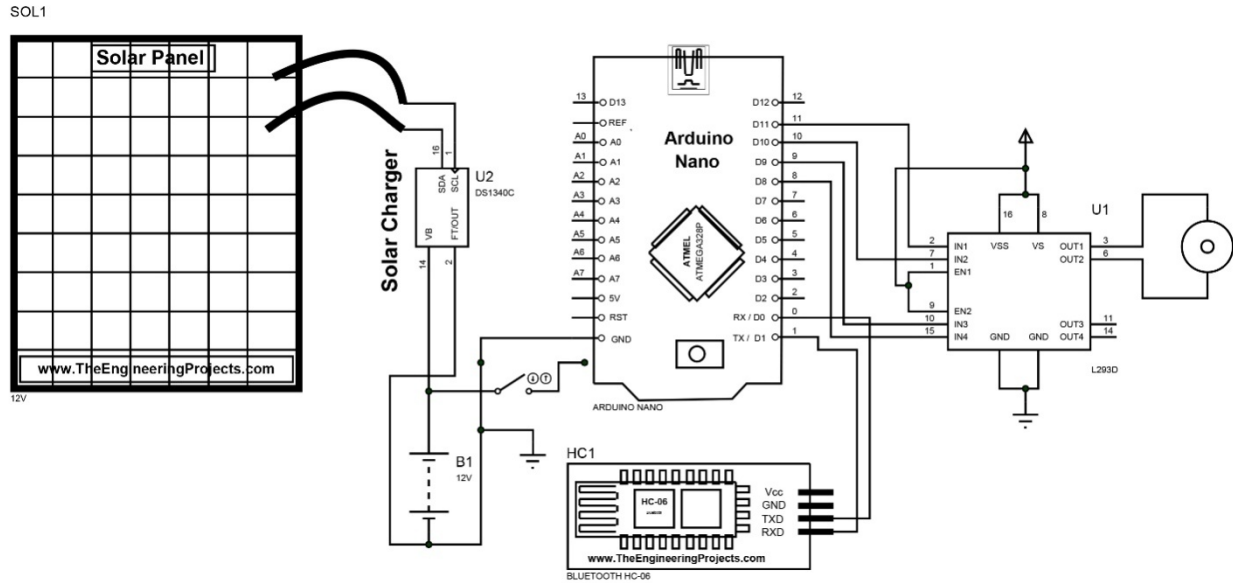
3.3 Circuit Diagram:

Figure 3.3.1:Circuit Diagram of Android Control Drain Cleaner.

3.4 Working Principal:

The Device Is Place Across Drain So That Only Water Flow Through Lower Grids. Waste Like Bottle, Etc. Floating in Drain Are Lifted by Teeth Which Is Connected to Chain. This Chain Is Attached by Gears Driven by Motor. The Energy Provided to Motor Is Solar Photovoltaic Cell Connected to It. When Motor Runs the Chain Starts to Circulate Making Teeth to Lift Up. The Waste Materials Are Lifted by Teeth and Are Stored in Waste Storage Tank. The entire system is Android Control which is controlled by the mobile apps through Bluetooth. An Arduino has been used this system a Bluetooth and a motor driver are connected this Arduino. when a signal through by mobile apps Bluetooth module receive this signal and sent to Arduino. The motor driver controls the motor with the signal received from the Arduino. In this way the whole system is controlled. And the whole system is powered by solar panel. Finally, we have been able to finish the job successfully in the best way we can.

3.5 Required Instruments:

1. Arduino Nano.
2. Gear Motor.
3. Solar Panel.
4. Battery.
5. Booster Circuit.
6. Bluetooth Module.
7. L293D Motor Driver IC.

3.5.1 Arduino Nano

Arduino is an open-source electronics prototyping platform based on flexible, easy-to-use hardware and software. It's intended for artists, designers, hobbyists, and anyone interested in creating interactive objects or environments. Arduino can sense the environment by receiving input from a variety of sensors and can affect its surroundings by   controlling

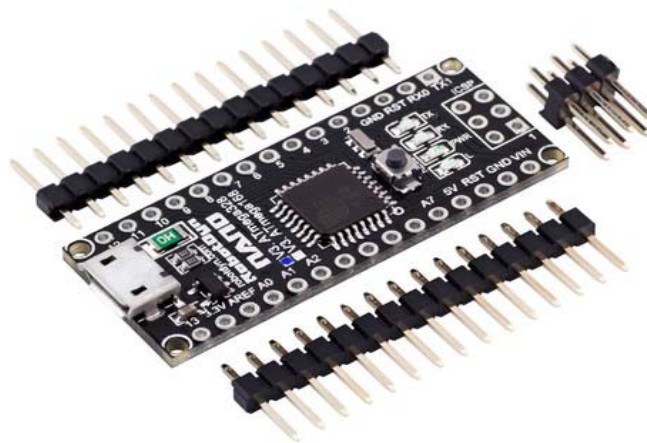Lights, motors, and other actuators.

Figure 3.5.1.1:Arduino Nano

The microcontroller on the board is programmed using the Arduino programming language (based on Wiring) and the Arduino development environment (based on Processing). Arduino projects can be stand-alone or they can communicate with software on running on a computer (e.g. Flash, Processing, MaxMSP).

Arduino Nano is a surface mount breadboard embedded version with integrated USB. It is a smallest, complete, and breadboard friendly. It has everything that Diecimila/Duemilanove has (electrically) with more analog input pins and onboard +5V AREF jumper. Physically, it is missing power jack. The Nano is automatically sense and switch to the higher potential source of power.

Nano's got the breadboard-ability of the Boarduino and the Mini+USB with smaller footprint than either, so users have more breadboard space. It's got a pin layout that works well with the Mini or the Basic Stamp (TX, RX, ATN, GND on one top, power and ground on the other). This new version 3.0 comes with ATMEGA328 which offer more programming and data memory space. It is two layers. That make it easier to hack and more affordable.
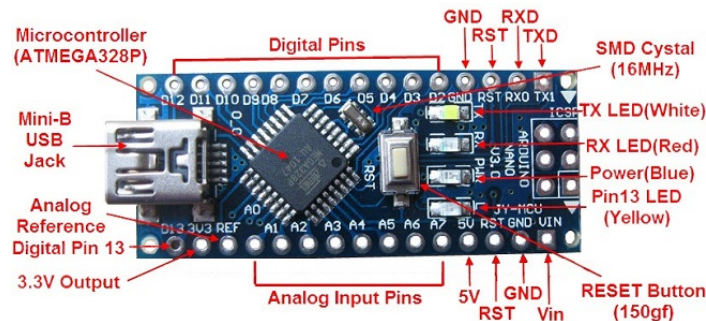

Figure 3.5.1.2:Section of Arduino Nano.

Operating Voltage (logic level):5 V

Input Voltage (recommended):7-12 V

Input Voltage (limits):6-20 V

Digital I/O Pins: 14 (of which 6 provide PWM output)

Analog Input Pins: 8

DC Current per I/O Pin: 40 mA

Flash Memory: 32 KB (of which 2KB used by boot loader)

SRAM   : 2 KB

EEPROM: 1 KB

Clock Speed: 16 MHz

Dimensions: 0.70" x 1.70"

Features:

• Automatic reset during program download

• Power OK blue LED

• Green (TX), red (RX) and orange (L) LED

• Auto sensing/switching power input

• Small mini-B USB for programming and serial monitor

• ICSP header for direct program download

• Standard 0.1 spacing DIP (breadboard friendly)

• Manual reset switch

Microcontroller IC ATmega328p:

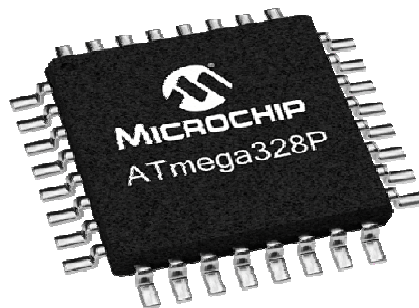Figure 3.5.1.3: Microcontroller IC ATmega 328p.

The high-performance Microchip picoPower 8-bit AVR RISC-based microcontroller combines 32KB ISP flash memory with read-while-write capabilities, 1024B EEPROM, 2KB SRAM, 23 general purpose I/O lines, 32 general purpose working registers, three flexible timer/counters with compare modes, internal and external interrupts, serial programmable USART, a byte-oriented 2-

wire serial interface, SPI serial port, a 6-channel 10-bit A/D converter (8-channels in TQFP and QFN/MLF packages), programmable watchdog timer with internal oscillator, and five software selectable power saving modes. The device operates between 1.8-5.5 volts. By executing powerful instructions in a single clock cycle, the device achieves throughputs approaching 1 MIPS per MHz, balancing power consumption and processing speed.

3.5.2 DC Gear Motor:

A gear motor is an all-in-one combination of a motor and gearbox. The addition of a gear head to a motor reduces the speed while increasing the torque output. ... Most of our DC motors can be complimented with one of our unique gearheads, providing you with a highly efficient gear motor solution.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.

Figure 3.5.2.1: DC Gear Motor

DC motors were the first form of motor widely used, as 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 brushed motor used for portable power tools and appliances. Larger DC motors are currently used in propulsion of electric vehicles, elevator and hoists, and in drives for steel rolling mills. The advent of power electronics has made replacement of DC motors with AC motors possible in many applications.
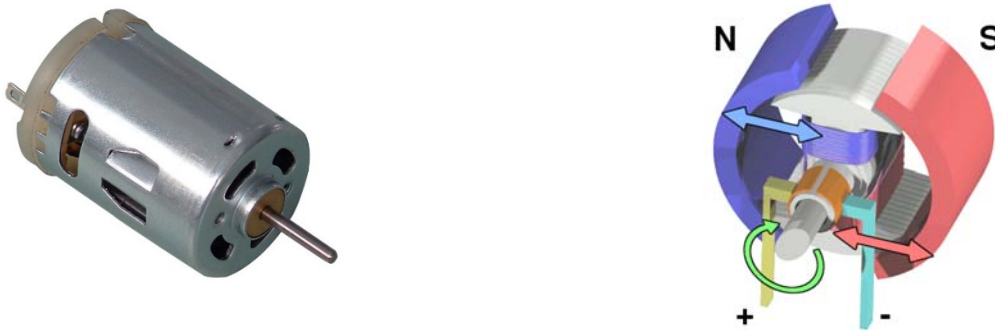

Figure 3.5.2.2: DC Motor.

A coil of wire with a current running through it generates an electromagnetic field aligned with the center of the coil. The direction and magnitude of the magnetic field produced by the coil can be changed with the direction and magnitude of the current flowing through it.A simple DC motor has a stationary set of magnets in the stator and an armature with one or more windings of insulated wire wrapped around a soft iron core that concentrates the magnetic field. The windings usually have multiple turns around the core, and in large motors there can be several parallel current paths. The ends of the wire winding are connected to a commutator.

The commutator allows each armature coil to be energized in turn and connects the rotating coils with the external power supply through brushes. (Brushless DC motors have electronics that switch the DC current to each coil on and off and have no brushes.)The total amount of current sent to the coil, the coil's size and what it's wrapped around dictate the strength of the electromagnetic field created.A Direct Current (DC) motor is a rotating electrical device that converts direct current, of electrical energy, into mechanical energy. An Inductor (coil) inside the DC motor produces a magnetic field that creates rotary motion as DC voltage is applied to its terminal. Inside the motor is an iron shaft, wrapped in a coil of wire. This shaft contains two fixed, North and South, magnets on both sides which causes both a repulsive and attractive force, in turn, producing torque.

Rated voltage: 12 V DC

Reduction Ratios: 1:270

Direction of rotation: CW

At no load:

Speed: 10.8 ±10%rpm

Current: 0.035A(max 0.43A)

At max efficiency:

Torque: 2.4kg.cm

Speed: 9.3 ±10% rpm

Current 0.068 A(max   2.4A)

3.5.3 Motor Driver

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 you can control two DC motor with a single L293D IC.DualH-bridge Motor Driver integrated circuit (IC).
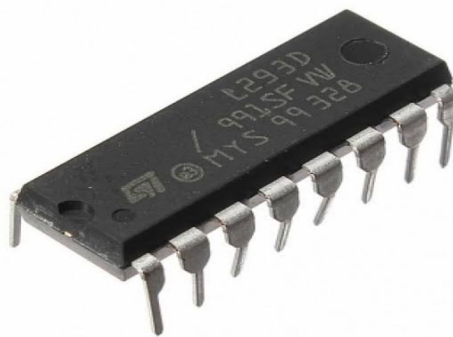

Figure3.5.3.1 Motor Driver Ic L293D.

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.
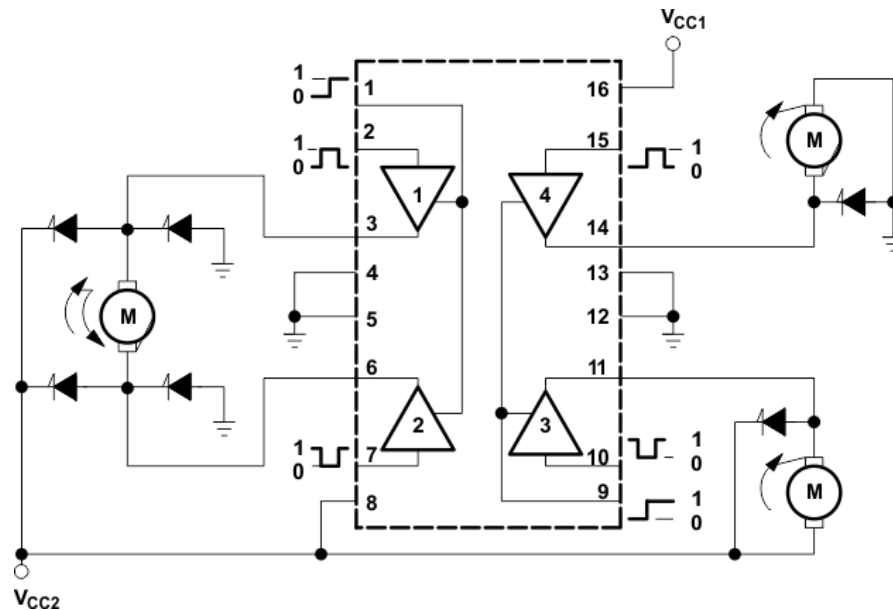

Figure 3.5.3.2: Schematic diagram of L293D Motor Driver IC.

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 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.

In simple you need to provide Logic 0 or 1 across the input pins for rotating the motor.

L293D Logic Table

Lets consider a Motor connected on left side output pins (pin 3,6). For rotating the motor in clockwise direction the input pins has to be provided with Logic 1 and Logic 0.

• **Pin 2** = **Logic 1** and **Pin 7** = **Logic 0** | Clockwise Direction

• **Pin 2** = **Logic 0** and **Pin 7** = **Logic 1** | Anticlockwise Direction

• **Pin 2** = **Logic 0** and **Pin 7** = **Logic 0** | Idle [No rotation] [Hi-Impedance state]

• **Pin 2** = **Logic 1** and **Pin 7** = **Logic 1** | Idle [No rotation]

In a very similar way the motor can also operate across input pin 15,10 for motor on the right hand side.

3.5.4 Bluetooth Module HC-05

Bluetooth is a wireless technology standard for exchanging data between fixed and mobile devices over short distances using short-wavelength UHF radio waves in the industrial, scientific and medical radio bands, from 2.400 to 2.485 GHz, and building personal area networks.
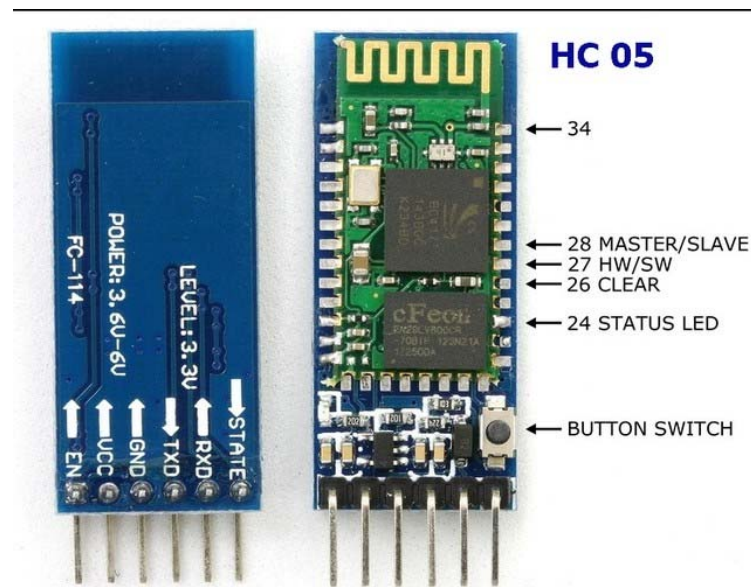
Figure 3.5.4.1: Bluetooth Module HC-05

HC-05 Technical Specifications

- Serial Bluetooth module for Arduino and other microcontrollers
- Operating Voltage: 4V to 6V (Typically +5V)
- Operating Current: 30mA
- Range: <100m
- Works with Serial communication (USART) and TTL compatible
- Follows IEEE 802.15.1 standardized protocol
- Uses Frequency-Hopping Spread spectrum (FHSS)
- Can operate in Master, Slave or Master/Slave mode
- Can be easily interfaced with Laptop or Mobile phones with Bluetooth

- Supported baud rate: 9600,19200,38400,57600,115200,230400,460800.

Applications

The **HC-05** is a very cool module which can add two-way (full-duplex) wireless functionality to your projects. You can use this module to communicate between two microcontrollers like Arduino or communicate with any device with Bluetooth functionality like a Phone or Laptop. There are many android applications that are already available which makes this process a lot easier. The module communicates with the help of USART at 9600 baud rate hence it is easy to interface with any microcontroller that supports USART. We can also configure the default values of the module by using the command mode. So if you looking for a Wireless module that could transfer data from your computer or mobile phone to microcontroller or vice versa then this module might be the right choice for you. However do not expect this module to transfer multimedia like photos or songs; you might have to look into the CSR8645 module for that.

1. Wireless communication between two microcontrollers
2. Communicate with Laptop, Desktops and mobile phones
3. Data Logging application
4. Consumer applications
5. Wireless Robots
6. Home Automation

How to Use the HC-05 Bluetooth Module

The **HC-05** has two operating modes, one is the Data mode in which it can send and receive data from other Bluetooth devices and the other is the AT Command mode where the default device settings can be changed. We can operate the device in either of these two modes by using the key pin as explained in the pin description.

It is very easy to pair the HC-05 module with microcontrollers because it operates using the Serial Port Protocol (SPP). Simply power the module with +5V and connect the Rx pin of the module to the Tx of MCU and Tx pin of module to Rx of MCU as shown in the figure below
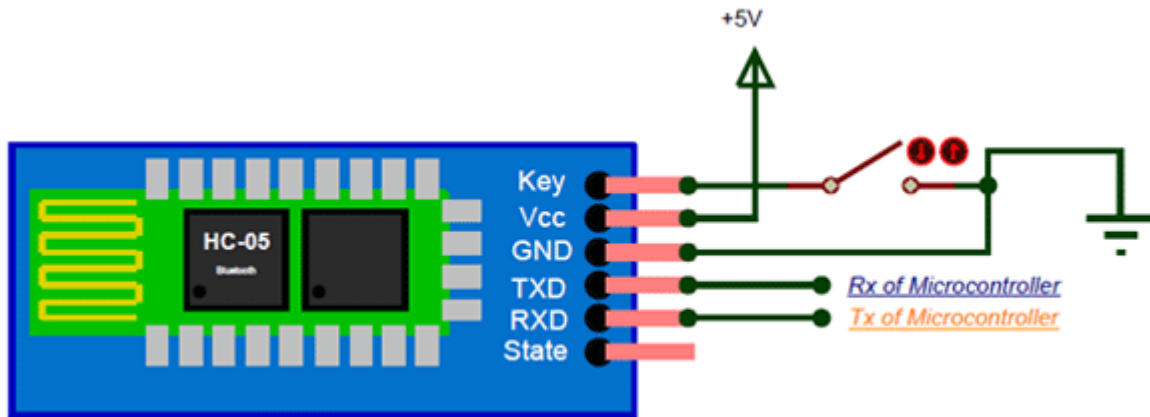
Figure 3.5.4.2 Bluetooth Module Pin Out

During power up the key pin can be grounded to enter into Command mode, if left free it will by default enter into the data mode. As soon as the module is powered you should be able to discover the Bluetooth device as "HC-05" then connect with it using the default password 1234 and start communicating with it.

Pin Configuration of HC-05 Bluetooth Module

Pin Number	Pin Name	Description
1	Enable / Key	This pin is used to toggle between Data Mode (set low) and AT command mode (set high). By default it is in Data mode
2	Vcc	Powers the module. Connect to +5V Supply voltage
3	Ground	Ground pin of module, connect to system ground.
4	TX – Transmitter	Transmits Serial Data. Everything received via Bluetooth will be given out by this pin as serial data.
5	RX – Receiver	Receive Serial Data. Every serial data given to this pin will be broadcasted via Bluetooth

6	State	The state pin is connected to on board LED, it can be used as a feedback to check if Bluetooth is working properly.
7	LED	Indicates the status of Module • Blink once in 2 sec: Module has entered Command Mode • Repeated Blinking: Waiting for connection in Data Mode • Blink twice in 1 sec: Connection successful in Data Mode
8	Button	Used to control the Key/Enable pin to toggle between Data and command Mode

Table 4.5.4.1: Pin Configuration of Bluetooth Module

3.5.5 Solar Panel

A solar panel is a set of solar photovoltaic modules electrically connected and mounted on a supporting structure. A photovoltaic module is a packaged, connected assembly of solar cells. The solar panel can be used as a component of a larger photovoltaic system to generate and supply electricity in commercial and residential applications. Each module is rated by its DC output power under standard test conditions (STC), and typically ranges from 100 to 320 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. 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, an inverter, and sometimes a battery and/or solar tracker and interconnection wiring.

Figure: 3.5.5.1 Solar panel

Solar cell modules produce electricity only when the sun is shining. They do not store energy, therefore to ensure flow of electricity when the sun is not shinning, it is necessary to store some of the energy produced. The most obvious solution is to use batteries, which chemically store electric energy. Batteries are groups of electro chemical cells (devices that convert chemical energy to electrical energy) connected in series. Battery cells are composed of two electrodes immersed in electrolyte solution which produce an electric current when a circuit is formed between them. The current is caused by reversible chemical reactions between the electrodes and the electrolyte within the cell. Batteries that are re-chargeable are called secondary or accumulator batteries. As the battery is being charged, electric energy is stored as chemical energy in the cells. When being discharged, the stored chemical energy is being removed from the battery and converted to electrical energy. In East-Africa, the most common type of secondary battery is the Lead-acid battery.

Specification of Solar Panel

- Size: 4.4" x 5.4" / 110mm x 140mm
- Weight: 3 ounces / 90 grams
- Cell type: Monocrystaline
- Cell efficiency: 19%+
- 2.27 Watts Peak Power
- Technical drawing

Dimensions:

- Length: 111.86mm/4.40in

- Width: 135.83mm/5.34in

- Thickness (without screws): 4.72mm/0.18in

- Thickness (with screws): 9.82mm/0.38in
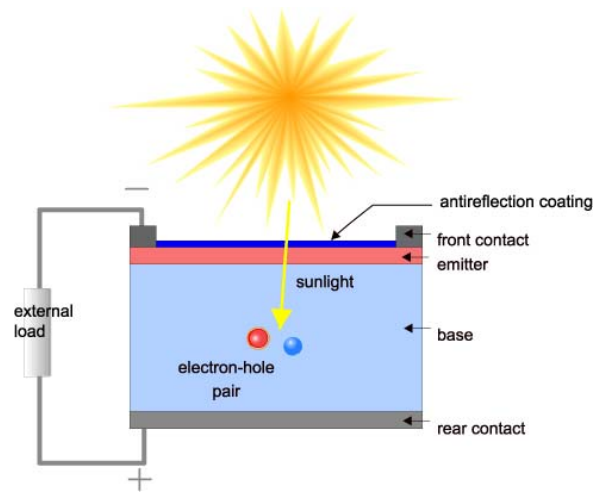
Solar Charger Controller
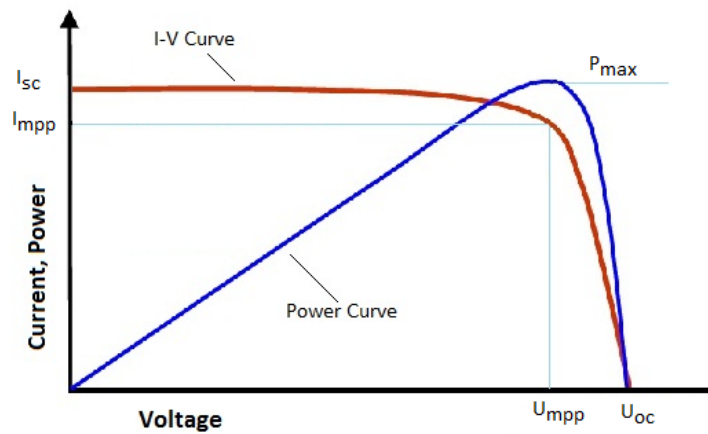

Figure 5.5.5.2: Solar Panel Schema Diagram

Figure 3.5.5.3: Solar Sell System Curve

Here is a solar charger circuit that is used to charge Lead Acid or Ni-Cd batteries using the solar energy power. The circuit harvests solar energy to charge a 6 volt 4.5 Ah rechargeable battery for various applications. The charger has voltage and current regulation and over voltage cut-off facilities.
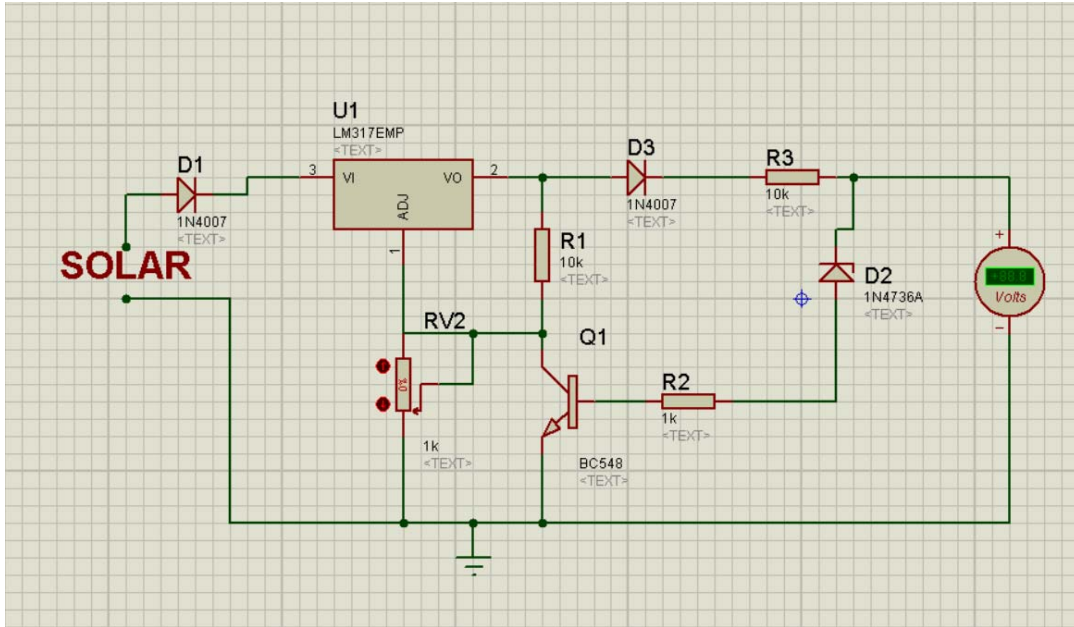
Figure 3.5.5.4: Solar Charger Controller Circuit.

The circuit uses a 12 volt solar panel and a variable voltage regulator IC LM 317. The solar panel consists of solar cells each rated at 1.2 volts. 12 volt DC is available from the panel to charge the battery. Charging current passes through D1 to the voltage regulator IC LM 317. By adjusting its Adjust pin, output voltage and current can be regulated. VR is placed between the adjust pin and ground to provide an output voltage of 9 volts to the battery. Resistor R3 Restrict the charging current and diode D2 prevents discharge of current from the battery.

Transistor T1 and Zener diode ZD act as a cut off switch when the battery is full. Normally T1 is off and battery gets charging current. When the terminal voltage of the battery rises above 6.8 volts, Zener conducts and provides base current to T1. It then turns on grounding the output of LM317 to stop charging.

3.5.6 Boost Converter 6009

This DC-DC Module is based on IC XL6009E1 which is a high-performance step-up switching current (BOOST) module. The module uses the second generation of high-frequency switching technology XL6009E1 core chip that offers superior performance over the first generation technology LM2577. XL6009 replaces LM2577 module as LM2577 is about to be phased out.
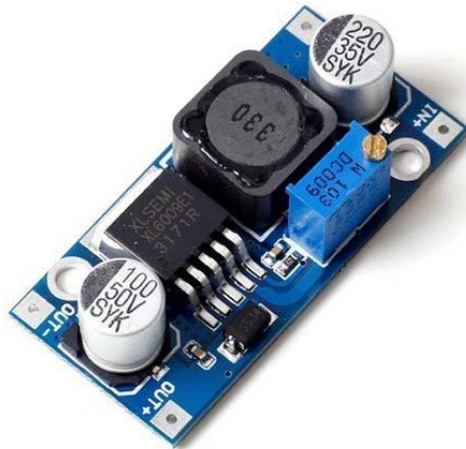
Figure 3.5.6.1 DC Boost Converter

Features

- Wide input voltage range of 3V – 32V (optimum operating voltage range is 5 – 32V)
- Wide Output voltage range of 5V – 35V (Adjustable using on board preset)
- Built in 4A MOSFET switches enables efficiency of up to 94% (LM2577 current is 3A)
- High switching frequency of 400KHz, can use a small-capacity filter capacitors that can achieve very good results (LM2577 switching frequency is only 50KHz)

Pin Definition

Specifications	Value
Type	Non-Isolated Boost (BOOST)
Rectification	Non-synchronous rectification
Input Range	3V ~ 32V
Output Range	5V ~ 35V
Input Current	4A (maximum), load 18mA (5Vinput, 8V output, no-load is less than 18mA . The higher the voltage, the load current increases.)
Conversion efficiency	<94% (the greater the current, the lower the efficiency)
Switching frequency	400KHz

Output ripple	50mV (the higher the voltage, the greater the current, the greater ripple)
Load Regulation	± 0.5%
Voltage Regulation	± 0.5%
Working temperature	-40 ° C ~ +85 ° C
Dimensions	43mm * 21mm * 14mm (length * width* height)

Table:3.5.6.1 Pin Definition of Boost Converter

Pins Output

- IN+ input positive
- IN- input negative!
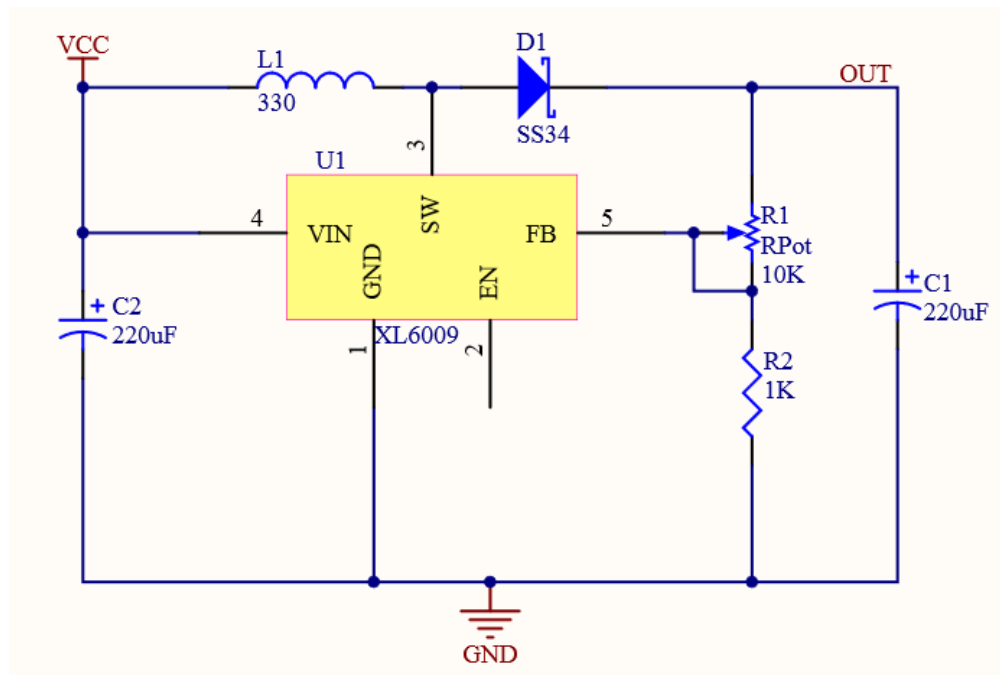- OUT+ output positive
- OUT- output negative

Figure 3.5.6.2: Schematic Diagram of Boost Converter.

3.5.7 Relay:

A relay is an electrically operated switch. Many relays use an electromagnet to mechanically operate a switch, but other operating principles are also used, such as solid-state relays. Relays are used where it is necessary to control a circuit by a

separate low-power signal, or where several circuits must be controlled by one signal. The first relays were used in long distance telegraph circuits as amplifiers: they repeated the signal coming in from one circuit and re-transmitted it on another circuit. Relays were used extensively in telephone exchanges and early computers to perform logical operations.
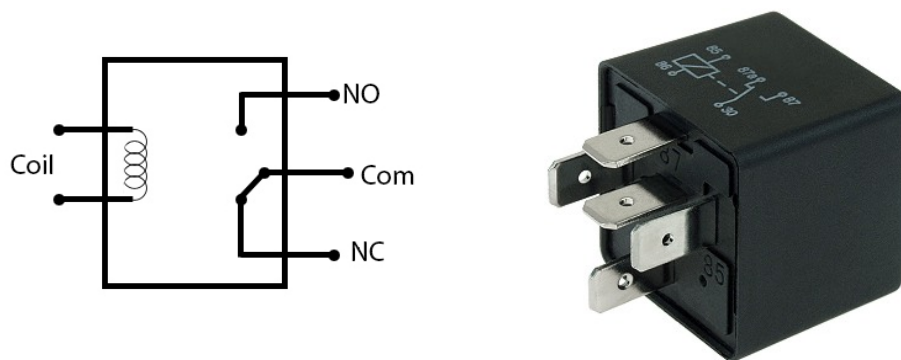

Figure 3.5.7.1: Relay .

A type of relay that can handle the high power required to directly control an electric motor or other loads is called a contactor. Solid-state relays control power circuits with no moving parts, instead using a semiconductor device to perform switching. Relays with calibrated operating characteristics and sometimes multiple operating coils are used to protect electrical circuits from overload or faults; in modern electric power systems these functions are performed by digital instruments still called "protective relays".

Magnetic latching relays require one pulse of coil power to move their contacts in one direction, and another, redirected pulse to move them back. Repeated pulses from the same input have no effect. Magnetic latching relays are useful in applications where interrupted power should not be able to transition the contacts.

Magnetic latching relays can have either single or dual coils. On a single coil device, the relay will operate in one direction when power is applied with one polarity, and will reset

when the polarity is reversed. On a dual coil device, when polarized voltage is applied to the reset coil the contacts will transition. AC controlled magnetic latch relays have single coils that employ steering diodes to differentiate between operate and reset commands.
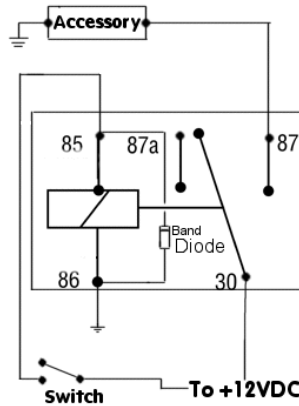
The relay module is the one in the figure below.

Figure 7.5.7.3 Relay Schematic Diagram.

This module has two channels (those blue cubes). There are other varieties with one, four and eight channels.

Mains voltage connections.

In relation to mains voltage, relays have 3 possible connections:

COM: common pin

NO (Normally Open): there is no contact between the common pin and the normally open pin. So, when you trigger the relay, it connects to the COM pin and supply is provided to a load

NC (Normally Closed): there is contact between the common pin and the normally closed pin. There is always connection between the COM and NC pins, even when the relay is turned off. When you trigger the relay, the circuit is opened and there is no supply provided to a load.

If you want to control a lamp for example, it is better to use a normally-open circuit, because we just want to light up the lamp occasionally.

GND: goes to ground

IN1: controls the first relay (it will be connected to an Arduino digital pin)

IN2: controls the second relay (it should be connected to an Arduino digital pin if you are using this second relay. Otherwise, you don't need to connect it)

VCC: goes to 5V

3.5.8 Battery:

The Battery is an electric device, that is used to store current which is produced from the solar panel and supplied to the corresponding loads. The number of batteries required depend on the load requirement.

Figure 3.5.8.1 12 Volt Battery

These are small Sealed Lead Acid batteries that are generally used for semi-portable appliances that need more power or a fair bit of power (more than can be provided by D, C or AA cells) for a longish time. They are typically used for people who go caving, or for lighting for an overnight camping trip where you are travelling on foot. They are not ridiculously heavy or bulky. They are good to drive a lantern on a tinny for that night fishing expedition. Being sealed, you cannot fear that the battery acid (which is actually a GEL) will spill. The amp-hour rating tells you how long the battery will last before it goes flat. For example, a 7.2Ah battery will give 7.2 amps for one hour or 3.6 amps for 2 hours or 1.8 amps for 4 hours, etc. Generally, an adequate amount of current for a lantern. They are ideally charged by solar panels.
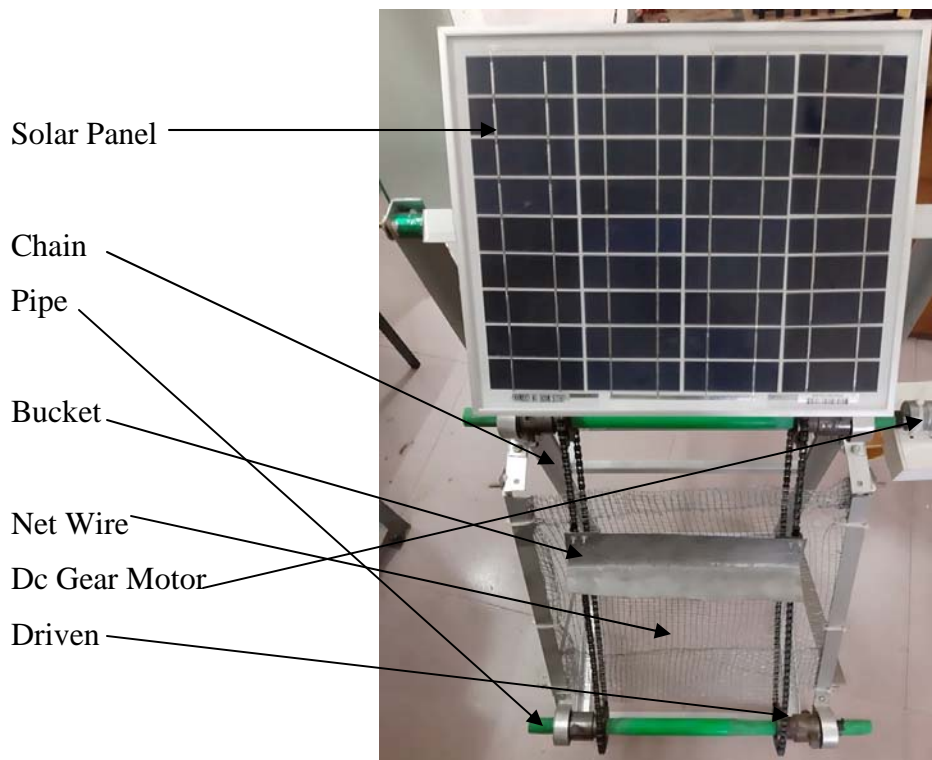
3.6 Complete Project Picture:

Figure 3.6.1: Complete Project Picture.

Chapter 4 Result and Discussion

4.1 Result:

Finally, we were able to create our project successfully. After making the Mechanical body, we designed a circuit to control it and when we operated it with mobile apps, we called it working pretty well. It is very well controlled and is again able to clean the drain dirt very well. Below is a picture of our successfully completed entire project.

4.2 Discussion:

Cleaning of drains/gutters has always been a problem. Labors cleaning gutters & drain seems unethical and also leads to a high risk of them catching infections or poisoning due to large amounts of waste/chemicals in them. Also throwing of bottles/plastics and other such objects into the gutters lead to narrowing and eventually blockage in gutter flow. This leads to overflow in many cases. So here we provide a fully automated drain gutter cleaning mechanism to tackle these modern day gutter jamming issues. Our system uses an automated gutter/drain cleaning system that lets fluids flow through it but catches large solid waste like bottles & plastic and accumulates it. So gutter cleaners need to just clean these gutter cleaning systems installed at points instead ofcleaning entire gutter floors. Our system consists of metalteeth based jaws that wait at the bottom of the mechanism This project automatically cleans the water in the drainage system randomly and removes waste and this form an efficient and easy way of cleaning the drainage system and preventing the blockage. It also reduces labor and improves the quality of water that is cleaned. If the garbage are allowed to flow they will end up flowing down to recreational beaches used for tourism purposes making a scene not pleasurable to the eyes else these garbage flow to residential sites where they are burnt in a way of getting rid of them, thereby causing climate change. Here we provide a fully automated drain gutter cleaning mechanism to tackle these modern day gutter jamming issues. This proposed system uses an automated gutter (or) drain cleaning system that lets fluids flow through it but catches large solid waste like bottles, plastic and accumulates it. So, gutter cleaners need to just clean these gutter cleaning systems installed at points instead of cleaning entire gutter floors. The problem such as Environmental pollution and spreading of viral diseases are avoidable. Automation of Drainage Cleaning System

would reduce the risk of various diseases spread due to accumulation of waste. The devices are place across drain so that only water flow through lower grids, waste like bottle, etc. Floating in drain is lifted by a tooth which is connected to chain. This chain is attached by sprockets driven by motor. When motor runs the chain starts to circulate making teeth to lift up. The waste materials are lifted by teeth and are stored in waste storage tank.

Chapter 5 Conclusion

5.1 Advantages:

➢ Production cost is very low.

➢ No need of purchase special machine.

➢ Its operated and maintenance is simple.

➢ It is compact and portable.

➢ It can be efficiently used.

➢ Totally wireless controlled.

➢ Renewable Energy.

5.2 Applications:

This device finds place in.

➢ It is used almost in all types if **Drainage** (Large , Small & medium).

➢ This machine is mainly used in cleaning system.

➢ project to use this in efficient way to control the disposal of wastages and

➢ with regular filtration of wastages.

5.3 Future Scope:

➢ In the future it can be improved by using more sensors.

➢ In the future, controlling the Internet can be done to improve it.

5.4 Conclusion:

In the cleaning system of drainage control by the, motor, roller chain and sprocket, lifter and the collecting bin to achieve automatic control of android. Automation is a technology concerned with his application of mechanical, electronic and computer based systems to operate and control production. This system is used to Operate Automatic Drain Cleaning System. This project may be developed with the full utilization of men, machines, and materials and money. Also we have

followed thoroughly the study of time motion and made our project economical and efficient with the available resources. This system was Designed, fabricated successfully and also tested. It works satisfactorily. We hope that this will be done among the most versatile and interchangeable one even in future. Thus we can able to obtain Automatic Drain Cleaning system.

References

[1] International Refereed Journal of Engineering and Science (IRJES)ISSN (Online) 2319-183X, (Print) 2319-1821Volume 3, Issue 3(March 2014), PP.54-60.

[2] International journal of innovative research in technology 2014 IJIRT Volume 1 Balachandra.G1, Karthikeyan.S2, Elangovan.K3, and Divya.N4. 1,2,3B.E/EEE Final year, Knowledge Institute of Technology, Salem, India4Assistant professor, Department of EEE, Knowledge Institute of Technology, Salem, India.

[3] Theory of machines –S S Rattan Department of Mechanical Engineering Regional Engineering College Kurukshetra (2004). Publication: Tata McGraw-Hill Publishing company Limited.

[4] Design of machine elements (DME-II) by K Raghavendra .first edition 2015.

[5] Design and Data hand book for Mechanical Engineers by KMahadevan and K Balaveerareddy. Fourth edition 2013.

[6] Ganesh U L,et.al."Semi-Automatic Drain For Sewage Water Treatment Of Floating Materials", International Journal of Research in Engineering and Technology, Vol No- 05, Jul-2016.

[7] James C. Conwell, G.E. Jhonson, "Design, Construction and Instrumentation of a Machine to Measured Tension and Impact Forces in Roller Chain Drives", December 1989.

[8] S D Rahul Bharadwaj, Shraddha R Jogdhankar, "Automatic Wastewater treatment process to reduce global warming" International Journal of Environmental Science: Development and Monitoring, Vol No- 2 (2013).

[9] Dr .K.Kumaresan et.al., "Automatic Sewage Cleaning Equipment", International Conference on Explorations and Innovations in Engineering and Technology , 2016.

[10]R.Sathiyakala et.al., "Smart Sewage Cleaning System" International Journal of Innovative Research in Computer and Communication Engineering, Vol No- 4, February 2016.