ACKNOWLEDGEMENT

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We would like to express extreme gratitude and heartfelt thanks to **Mr. M VENKATESH** HOD Dept. of E&CE, Sandur polytechnic Yeshwantnagar. For his encouragement, invaluable help, advice and motivation, which lead to the completion of this project successfully.

It is our privilege to express our sincere regards to our project co-coordinator **Mrs. S. S. PATIL** Lecturer in Dept. of E&CE and **Mr. SREEHARSHA A N** Sr. Lecturer in E&CE for continuous motivation, advice and whole hearted cooperation during the completion of our project.

We have great sense of gratitude to **Mr. MOHAMMAD RAFIQ H** Sr. Lecturer in E&CE**, Mrs. M SHANTHA** Sr.Lecturer **, Mr. KOTRESHI C K** S lecturer in E&CE and **Mr. RAHUL S MAHENDRAKAR** lecturer in E&CE Dept. and **Mr. MARULASIDDANAGOUDA K N** Asst. Lecturer in E&CE Sandur polytechnic, Yeshwantnagar. For this technical guidance, suggestions and advice.

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We also like to express our special thanks to the family members for their motivation, inspiration, caring and financial support during the course of our project.

PROJECT ASSOCIATES

1. B VARSHITA
2. G CHANDAN
3. J M DARSHAN
4. HUIRAJAPRASAD NS
5. TEJASWINI K

DEPARTMENT OF TECHNICAL EDUCATION

BENGALURU-560001

BONAFIDE CERTIFICATE

Certified that this project report **"FIRE FIGHTING & SOIL MOISTURIZER ROBOT"** is the bonafide work of **"G CHANDAN"** who carried out the project work under my supervision.

SIGNATURE	**SIGNATURE**
M VENKATESH	S.S.PATIL
HEAD OF THE DEPARTMENT	**PROJECT COORDINATOR**
	Lecturer

Department of E & C Engineering

Sandur Polytechnic

Yeshwantnagar-583124

Sandur (Tq), Ballari (Dist),

Karnataka

Examiner 1: .....

Examiner 2: .....

CANDIDATE'S DECLARATION

I, **G CHANDAN** a student of diploma in E & CE Department bearing **Reg. No: 446EC16007** of VI semester hereby declare that I own full responsible for the information, results and conclusions provided in this project work titled **"FIRE FIGHTING & SOIL MOISTURIZER ROBOT"** submitted to **Board of Technical Examination, Government of Karnataka** for the award of diploma in E&C Engineering.

To the best of my knowledge, this project work has not been submitted in part or full elsewhere in any other institution/organization for the award of any certificate/diploma/degree. I have completely taken care in acknowledging the contribution of others in this academic work. I further declare that in case of any violation of intellectual property rights and particulars declared, found at any stage, I, as the candidate will be solely responsible for the same.

Date:

Place: YESHWANTNAGAR

Signature of candidate

Name: G CHANDAN

Reg No: 446EC16007

DEPARTMENT OF TECHNICAL EDUCATION

SANDUR POLYTECHNIC

YESHWANTNAGAR-583124

Department of Electronics & Communication Engineering

CERTIFICATE

Certified that this project report entitled **"FIRE FIGHTING & SOIL MOISTURIZER ROBOT"** which is being Submitted by **Miss. G CHANDAN** Reg. No. **446EC16007**, of bonafide student of SANDUR POLYTECHNIC in partial fulfillment for the award of **Diploma in Electronics & communication Engineering** during the year 2018-19 is record of student's own work carried out under my guidance. It is certified that all corrections/suggestions indicated for Internal Assessment have been incorporated in the report and one copy of it being deposited in the polytechnic library.

The project report has been approved as it satisfies the academic requirements in respect of Project work prescribed for the said diploma.

It is farther understood that by this certificate the undersigned do not endorse or approve any statement made opinion expressed or conclusion drawn there in but approve the project only for the purpose for which it is submitted.

GUIDE
SREEHARSHA A N
Sr.Lect. in E&CE Dept.

Examiner 1:…….

Examiner 2:…….

Dept. of Electronics & Communication Engineering

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BENGALURU-560001

BONAFIDE CERTIFICATE

Certified that this project report **"FIRE FIGHTING & SOIL MOISTURIZER ROBOT"** is the bonafide work of **"HULIRAJAPRASAD N S"** who carried out the project work under my supervision.

SIGNATURE	**SIGNATURE**
M VENKATESH	S.S.PATIL
HEAD OF THE DEPARTMENT	**PROJECT COORDINATOR**
	Lecturer

Department of E & C Engineering

Sandur Polytechnic

Yeshwantnagar-583124

Sandur (Tq), Ballari (Dist),

Karnataka

Examiner 1: .....

Examiner 2: .....

ABSTRACT

As we the future engineers of the society, we have the responsibility on our shoulders to solve the issues of the society by the knowledge that we have acquired to let the nation archive greater highs and betterment of the society.

Fire Fighting and Soil Moisturizer Robot, the idea behind development of this project is for the betterment of the society. This is a semi-automatic robot that works in two modes of initial modes i.e. MANUAL MODE and AUTOMATIC MODE.

In MANUAL MODE, the robot performs the operations which are completely in the control of the user. The operation that can be performed in this mode is the basic movements such as FORWARD, REVERSE, RIGHT, LEFT and STOP operations.

In AUTOMATIC MODE, the robot is further classified into two automatic operational modes i.e. RED MODE and GREEN MODE.

In RED MODE, the robot acquires the information of the surrounding environment to detect the fire and reaches the fire (target) and extinguishes the fire by the extinguisher liquid in the tank.

In GREEN MODE, the robot acquires the information of the surrounding environment to checking the moisture level of the soil, if the soil moisture level is critical then it will pump the water to moisturize the soil else keeps checking the rest of the field.

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CONTENT:

1. INTRODUCTION

The recent wildfires the job of a fire fighter is becoming more dangerous each year. Whether it's a fire in an old building or house, most times firefighters are going in blind in an attempt to rescue the people trapped inside. Often they don't know what they are walking into whether it will be collapsing walls, obstructed pathways or chemical leaks. Sometimes the fire is just so extreme, a firefighter cannot simply get close enough to properly fight it.

The main aim of our project is to save millions of fire fighters life from disastrous accidents or miss-happening and also to help farmers as far as we can, we came up with the idea of "Fire Fighting and Soil Moisturizing Robot".

Fire Fighting and Soil Moisturizer Robot, it is semi-automatic robot that can be operated in two initial modes i.e. "MANUAL MODE" and "AUTOMATIC MODE".

In MANUAL MODE, the robot is in complete control of the user. The user can perform basic four wheel motions i.e. moving FORWARD, REVERSE, RIGHT, LEFT and STOP. This mode is added so that the robot can be transported to the desired location of the user with no any other means of transportation.

In AUTOMATIC MODE, the robot is can further work in two different modes in this mode i.e. "RED MODE" and "GREEN MODE". This robot is equipped with sensors like flame sensor, ultrasonic sensor, and soil moisturizer sensor for collection of information that is required by the robot for the next operation to be performed in automatic mode.

In RED MODE, the heart of the robot in this mode is the flame sensor for detection of fire around the robot. This mode is dedicated to the Fire-Fighters. Here the robot detects the presents of fire around it and moves toward the fire (target) to extinguish the fire with the extinguisher liquid in the tank by the mini liquid pump.

In GREEN MODE, the heart of the robot in this mode is the soil moisturizer sensor for checking the moisture level of the soil in the targeted location. This mode is dedicated to the farmers. Here the soil moisture level is checked, if the moisture level is critical then the water will be pumped by the mini water pump else the robot goes on checking rest of the soil in the targeted land.

All the operation of the robot is controlled through MCU (Micro Control Unit) i.e. Arduino UNO. Arduino UNO is the main brain of the robot system. The operations or the actions by the robot are based on the programme in it and also by the change in sensor information.

2. BLOCK DIAGRAM

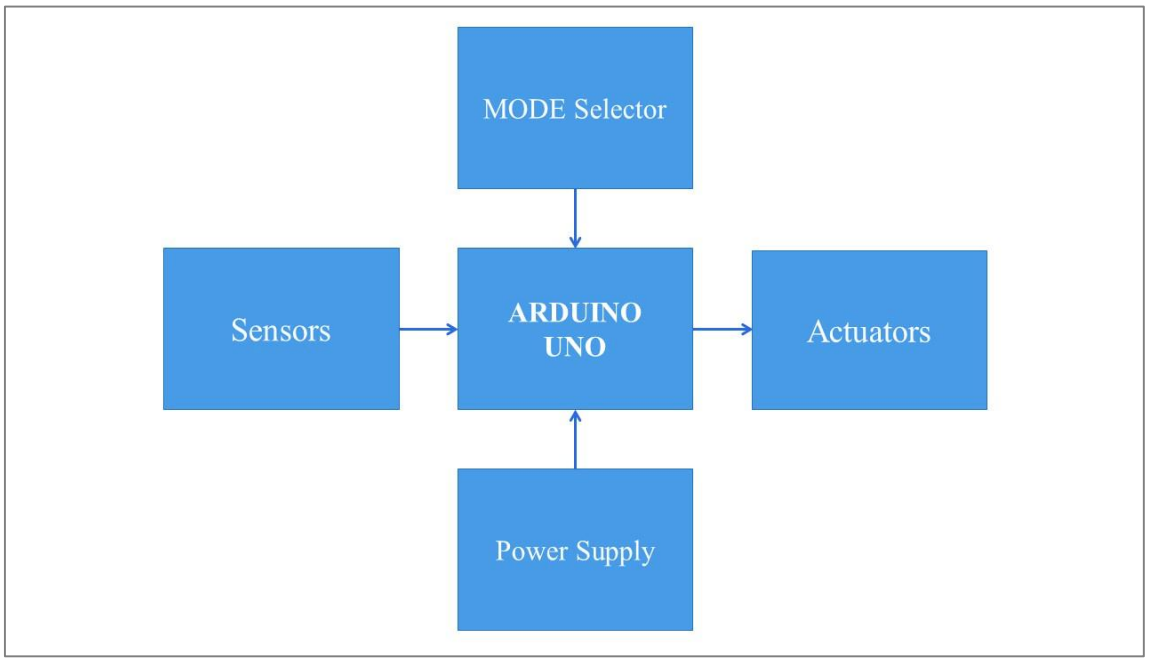


Fig. 2.1 Generalized Block Diagram

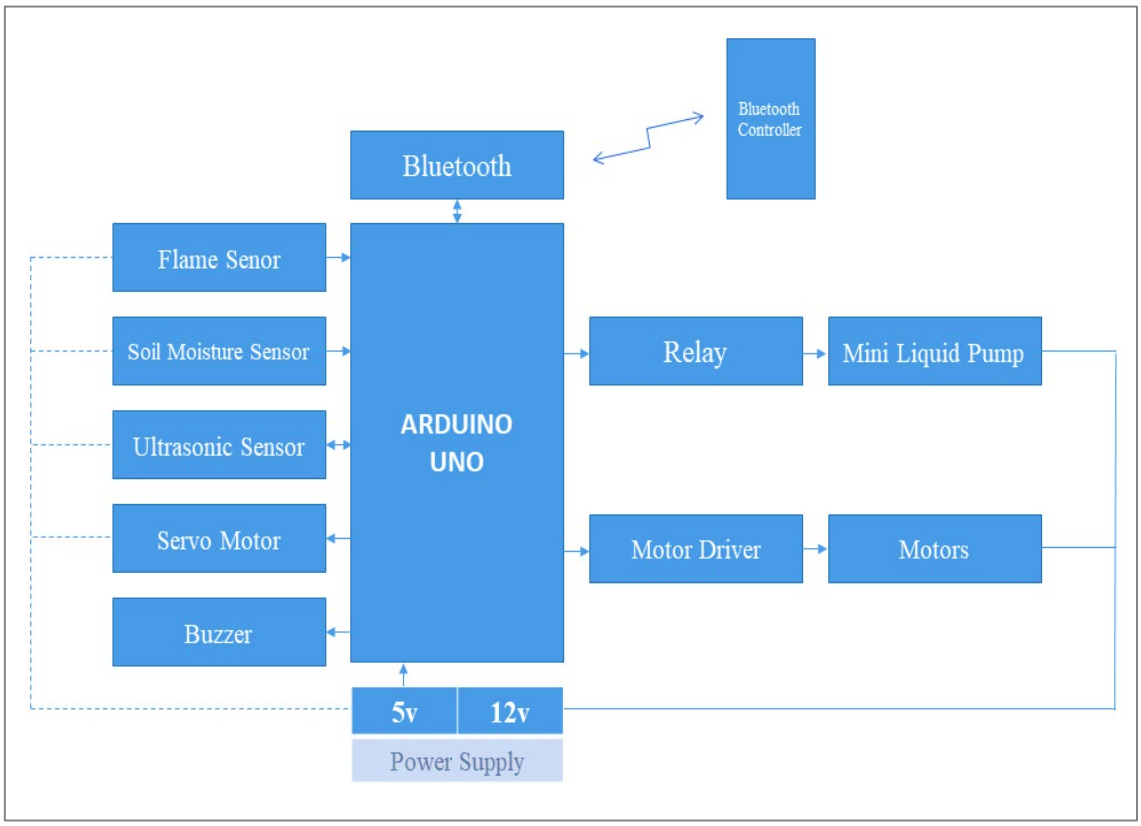


Fig. 2.2 Brief Block Diagram

Block Diagram Description:

The brief block diagram is as shown in the *Figure 2.2*. FIRE FIGHTING & SOIL MOISTURIZER ROBOT, is initialized by giving a long beep by the buzzer.

As the robot is semi-automatic machine, the user has to select the initial mode of operation and has to give other commands, all this commands to the robot is communicated through the Bluetooth module. The initial modes are MANUAL MODE and AUTOMATIC MODE. The controller also sends the status of the robot to the user by Bluetooth module.

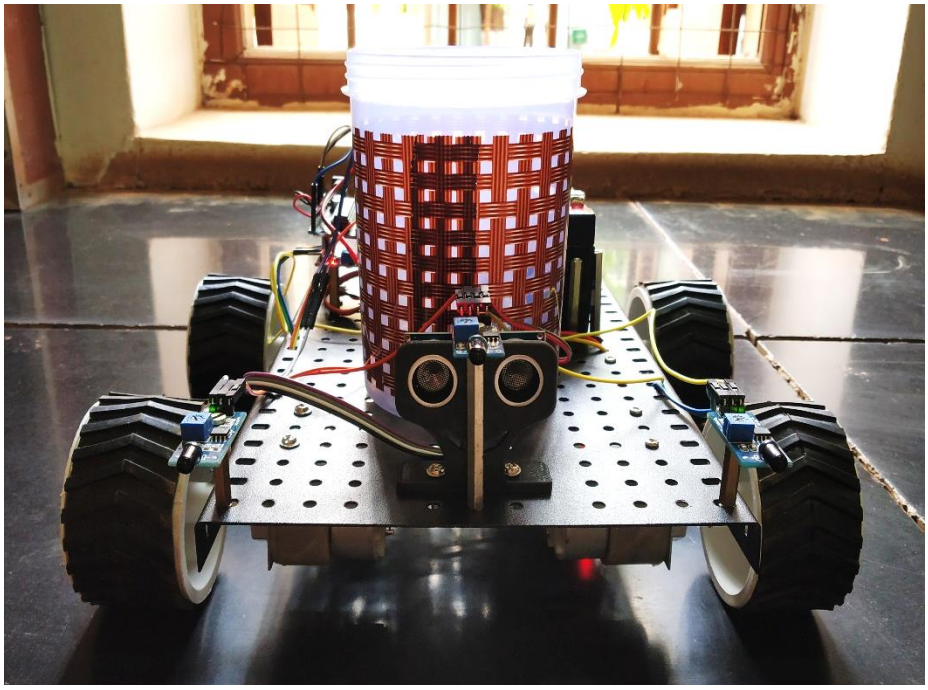
All the sensors receive continue updates of the environmental changes around it. The complete information of the sensors is fed to the MCU (Arduino UNO) for data processing for the program in MCU. For the respected mode selected, the sensor information is used to act accordingly. The ultrasonic sensor is always active and detects the obstacle on the way and stop the robot from collision. In MANUAL MODE, the basic 4 wheel movements can be performed here by giving appropriate commands. The basic movements are carried out by the motors thought the controls of the motor driver.

In AUTOMATIC MODE, further the user has to enter the command to select to switch to either RED MODE or GREEN MODE. In RED MODE, the flame sensor information is acquired and further decisions are taken based on the changes in the input of the flame sensor. And in GREEN MODE, the flame sensor is deactivated and the information of soil moisture sensor is collected by perpendicularly digging the sensor into the soil, this digging perpendicular to the ground is done using servo motor. Based on the criticality of the level of soil moisture, the moisture level is improved by pumping water on to the targeted land area.

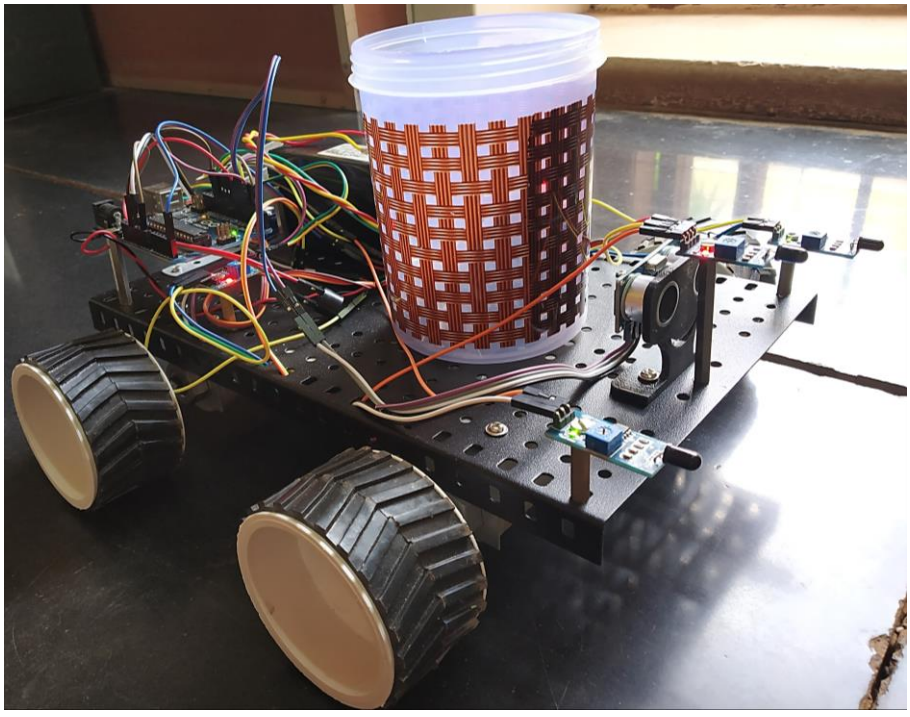
Buzzer is used to indicate the surrounding people that nearby fire is caught or other parameters based on the different beeps produced. Here as the mini water pump does not have its own control circuit, we use the relay which will turn ON and OFF the water pump when required.

The user side controller can be a smart phone or a computer with Bluetooth. If the control device is a smart phone, then we need to control the robot by the app “Arduino Bluetooth Controller” available in Play store and if the control device is a computer then we can use either “Tera Term” or “Putty”.

Front View:



Side View:



3. HARDWARE DESCRIPTION

3.1. Arduino UNO:

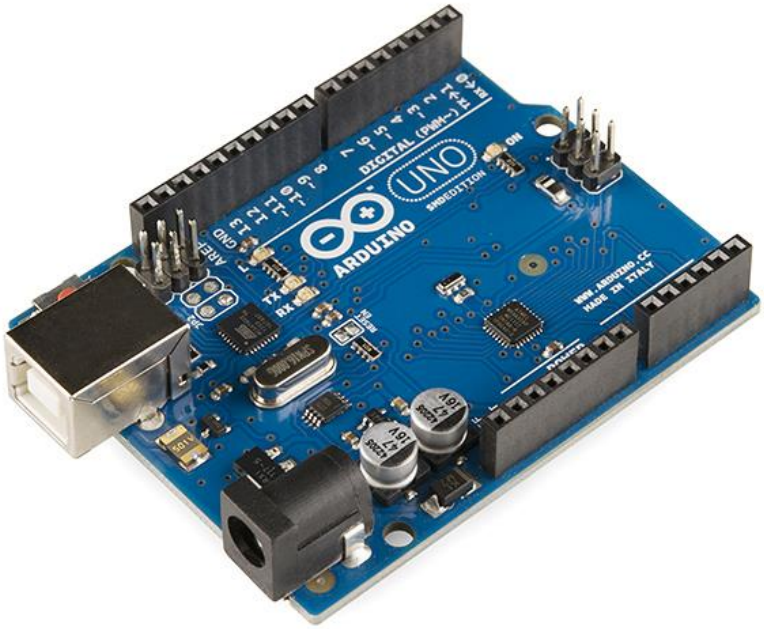


Fig. 3.1.1 Arduino UNO

The Arduino UNO is an open-source microcontroller board based on the Microchip ATmega328P microcontroller and developed by Arduino.cc and is shown in *Figure 3.1.1*. The board is equipped with sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards (shields) and other circuits. The board has 14 Digital pins, 6 Analog pins, and programmable with the Arduino IDE (Integrated Development Environment) via a Type-B USB cable. It can be powered by a USB cable or by an external 9v battery, though it accepts voltages between 7 and 20 volts. It is also similar to the Arduino Nano and Leonard. "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. The ATmega328 on the Arduino Uno comes preprogrammed with a bootloader that allows uploading new code to it without the use of an external hardware programmer. It communicates using the original STK500 protocol. The Uno uses the Atmega16U2 (Atmega8U2 up to version R2) programmed as a USB-to-serial converter.

Technical Specifications:

- Microcontroller: Microchip ATmega328P.
- Operating Voltage: 5 Volts.
- Input Voltage: 7 to 20 Volts.
- Digital I/O Pins: 14 (of which 6 provide PWM output).
- Analog Input Pins: 6.
- DC Current per I/O Pin: 20 mA.
- DC Current for 3.3V Pin: 50 mA.
- Flash Memory: 32 KB of which 0.5 KB used by bootloader.
- SRAM: 2 KB.
- EEPROM: 1 KB.
- Clock Speed: 16 MHz
- Length: 68.6 mm.
- Width: 53.4 mm.
- Weight: 25 g.

PIN:

General Pin Functions:

- **LED**: There is a built-in LED driven by digital pin 13. When the pin is HIGH value, the LED is on, when the pin is LOW, it's off.
- **VIN**: The input voltage to the Arduino/Genuino board when it's using an external power source (as opposed to 5 volts from the USB connection or other regulated power source). You can supply voltage through this pin, or, if supplying voltage via the power jack, access it through this pin.
- **5V**: This pin outputs a regulated 5V from the regulator on the board. The board can be supplied with power either from the DC power jack (7 - 20V), the USB connector (5V), or the VIN pin of the board (7-20V). Supplying voltage via the 5V or 3.3V pins bypasses the regulator, and can damage the board.
- **3V3**: A 3.3-volt supply generated by the on-board regulator. Maximum current draw is 50 mA.
- **GND**: Ground pins.
- **IOREF**: This pin on the Arduino/Genuino board provides the voltage reference with which the microcontroller operates. A properly configured shield can read the IOREF pin voltage and select the appropriate power source or enable voltage translators on the outputs to work with the 5V or 3.3V.
- **Reset**: Typically used to add a reset button to shields which block the one on the board.

3.1.1. Special Pin Functions:

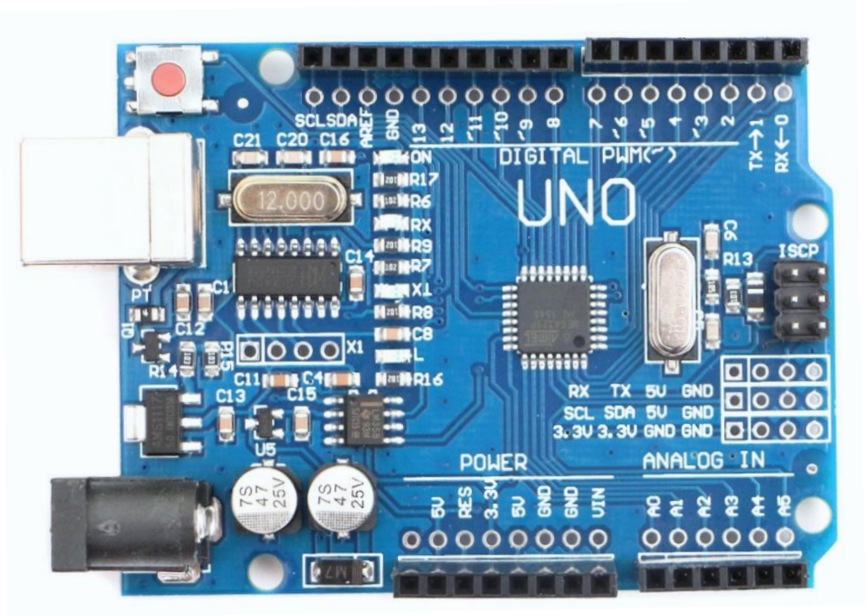


Fig. 3.1.2 Arduino UNO Board Pins

The above *Figure 3.1.1* shows the pins of Arduino UNO. Each of the 14 digital pins and 6 Analog pins on the Uno can be used as an input or output, using pinMode(), digitalWrite(), and digitalRead() functions. They operate at 5 volts. Each pin can provide or receive 20 mA as recommended operating condition and has an internal pull-up resistor (disconnected by default) of 20-50k ohm. A maximum of 40mA is the value that must not be exceeded on any I/O pin to avoid permanent damage to the microcontroller. The Uno has 6 analog inputs, labeled A0 through A5, each of which provide 10 bits of resolution (i.e. 1024 different values). By default, they measure from ground to 5 volts, though is it possible to change the upper end of their range using the AREF pin and the analogReference () function.

In addition, some pins have specialized functions:

Serial / UART: pins 0 (RX) and 1 (TX). Used to receive (RX) and transmit (TX) TTL serial data. These pins are connected to the corresponding pins of the ATmega8U2 USB-to-TTL Serial chip.

- **External Interrupts**: pins 2 and 3. These pins can be configured to trigger an interrupt on a low value, a rising or falling edge, or a change in value.
- **PWM** (**P**ulse **W**idth **M**odulation): 3, 5, 6, 9, 10, and 11 Can provide 8-bit PWM output with the analogWrite() function.
- **SPI** (**S**erial **P**eripheral **I**nterface): 10 (SS), 11 (MOSI), 12 (MISO), 13 (SCK). These pins support SPI communication using the SPI library.
- **TWI** (**T**wo **W**ire **I**nterface) / I²C: A4 or SDA pin and A5 or SCL pin. Support TWI communication using the Wire library.
- **AREF** (**A**nalog **REF**erence): Reference voltage for the analog inputs.

3.2. Flame Sensor:

Fig. 3.2.1 Single channel

Fig. 3.2.2 Five Channel

A flame sensor is a sensor designed to detect and respond to the presence of a flame or fire, allowing flame detection. Responses to a detected flame depend on the installation, but can include sounding an alarm, deactivating a fuel line. When used in applications such as industrial furnaces, their role is to provide confirmation that the furnace is working properly; in these cases, they take no direct action beyond notifying the operator or control system. A flame detector can often respond faster and more accurately than a smoke or heat detector due to the mechanisms it uses to detect the flame. The above single channel flame sensor in *Figure 3.2.1* can detect the fire in the angular range of 60^{o}, but five channel flame sensor in the *Figure 3.2.2* can cover an angular range of more than 120^{o}. These detectors are sensitive to both UV and IR wavelengths, and detect flame by comparing the threshold signal of both ranges.

Specifications:

- LM393 comparator chip.
- Detection Range: 760 nm to 1100 nm.
- Operating Voltage: 3.3 V to 5 V.
- Maximum Output Current: 15 mA.
- Digital Outputs: 0 and 1.
- Detection Angle (single channel): about 60 degrees.
- Detection Angle (five channel): about 120 degrees.
- Adjustable sensitivity via potentiometer.
- Fixed bolt holes for easy installation.

3.3. Soil Moisture Sensor:

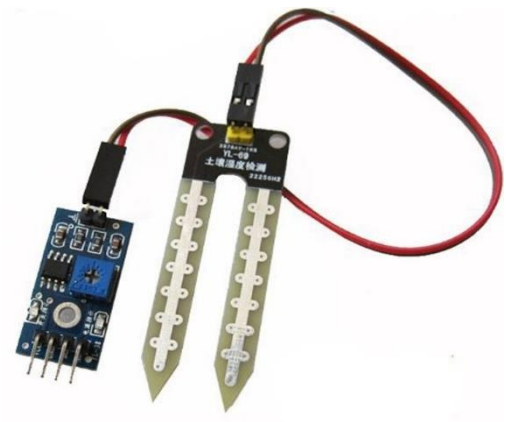


Fig. 3.3 Soil Moisture Sensor

Soil moisture sensors measure the volumetric water content in soil shown in *Figure 3.3*. Since the direct gravimetric measurement of free soil moisture requires removing, drying, and weighting of a sample, soil moisture sensors measure the volumetric water content indirectly by using some other property of the soil, such as electrical resistance, dielectric constant, or interaction with neutrons, as a proxy for the moisture content.

The relation between the measured property and soil moisture must be calibrated and may vary depending on environmental factors such as soil type, temperature, or electric conductivity. Reflected microwave radiation is affected by the soil moisture and is used for sensing in hydrology and agriculture. Portable probe instruments can be used by farmers or gardeners.

Soil moisture sensors typically refer to sensors that estimate volumetric water content. Another class of sensors measure another property of moisture in soils called water potential, these sensors are usually referred to as soil water potential sensors.

Specifications:

- Operating voltage: 3.3V~5V.
- Dual output mode, analog output more accurate.
- A fixed bolt hole for easy installation.
- Having LM393 comparator chip, stable.
- Panel PCB Dimension: Approx.3cm x 1.5cm.
- Soil Probe Dimension: Approx. 6cm x 3cm.
- VCC: 3.3V-5V.
- DO: digital output interface (0 and 1).
- AO: analog output interface.

3.4. Ultrasonic sensor:

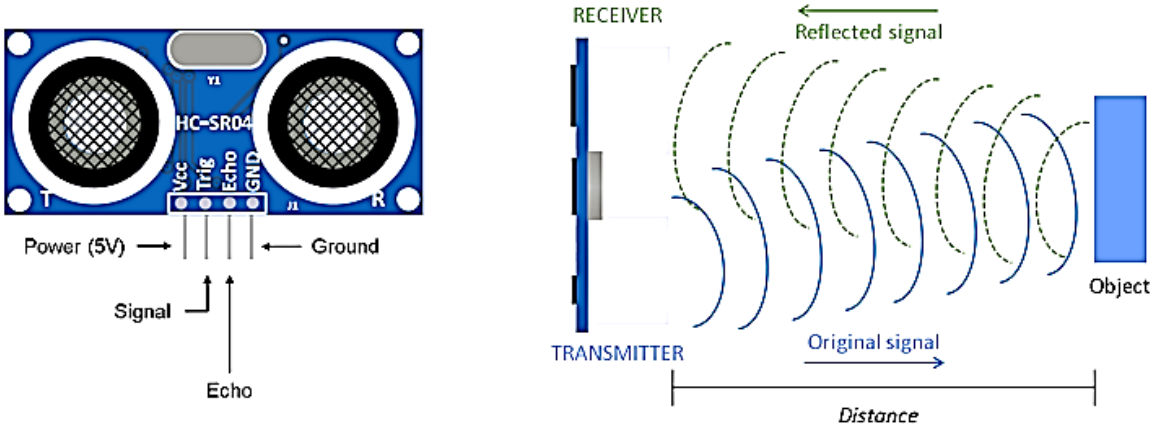


Fig. 3.4.1 Ultrasonic Sensor

Ultrasonic sensor measure distance by using ultrasonic waves. A short ultrasonic trigger pulse is transmitted at the time 0, reflected by an object and is shown in *Figure 3.4.1*. The working of the sensor is with respect *to Figure 3.4.2*. The senor receives the echo signal and converts it to an electric signal. The next pulse can be transmitted when the echo is faded away. This time period is called cycle period. The recommend cycle period should be no less than 50ms. If a 10µs width trigger pulse is sent to the signal pin, the Ultrasonic module will output eight 40kHz ultrasonic signal and detect the echo back. The measured distance is proportional to the echo pulse width and can be calculated by the formula above. If no obstacle is detected, the output pin will give a 38ms high level signal.

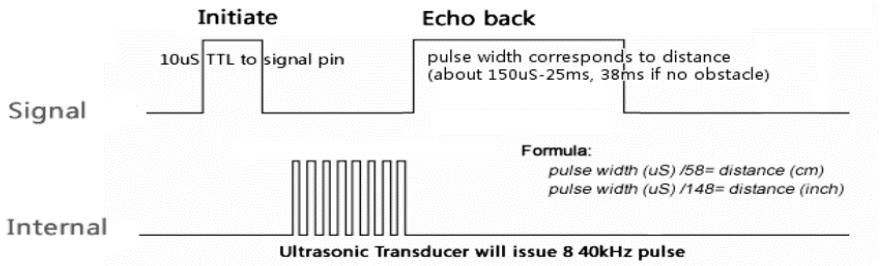


Fig. 3.4.2 Ultrasonic Signals

Specifications:

- Supply voltage: 5 volts.
- Current Consumption: 15mA.
- Ultrasonic frequency: 40kHz.
- Max. Range: 400 cm.
- Min. Range: 3 cm.
- Resolution: 1 cm.
- Trigger pulse width: 10µs.

3.5. Servo Motor:

Fig. 3.5.1 Servo Motor

A servomotor is a rotary actuator or linear actuator that allows for precise control of angular or linear position, velocity and acceleration and is shown in *Figure 3.5.1*. It consists of a suitable motor coupled to a sensor for position feedback. It also requires a relatively sophisticated controller, often a dedicated module designed specifically for use with servomotors. The working of servo motor is with respect to *Figure3.5.2.* Servos are controlled by sending an electrical pulse of variable width, or pulse width modulation (PWM), through the control wire. There is a minimum pulse, a maximum pulse, and a repetition rate. A servo motor can usually only turn 90° in either direction for a total of 180° movements. The motor's neutral position is defined as the position where the servo has the same amount of potential rotation in the both the clockwise or counter-clockwise direction. The PWM sent to the motor determines position of the shaft, and based on the duration of the pulse sent via the control wire, the rotor will turn to the desired position. The servo motor expects to see a pulse every 20 milliseconds and the length of the pulse will determine how far the motor turns. For example, a 1.5ms pulse will make the motor turn to the 90° position. Shorter than 1.5ms moves it in the counter clockwise direction toward the 0° position, and any longer than 1.5ms will turn the servo in a clockwise direction toward the 180° position.

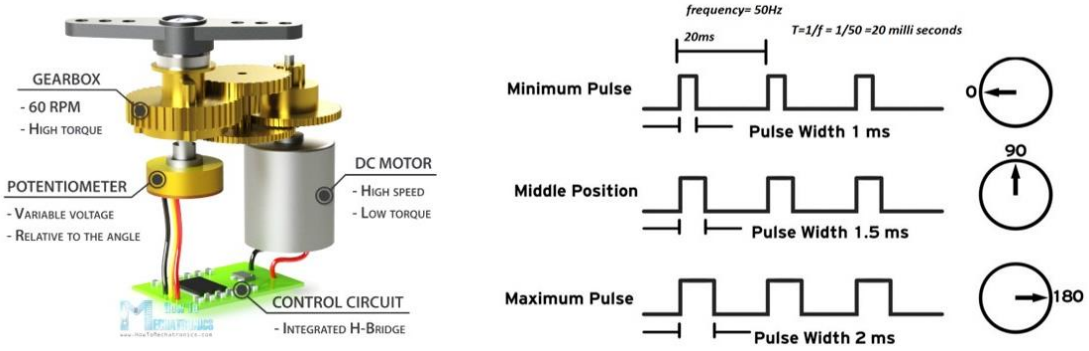


Fig. 3.5.2 Working of Servo Motor

Specifications:

- Operating Voltage: 3.3V – 5V.
- Input frequency: 50Hz.

3.6.Motor Driver (H-Bridge):

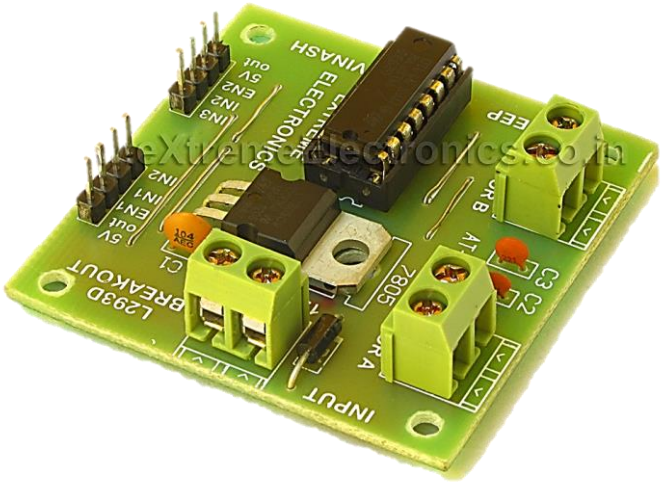


Fig. 3.6 L293D Motor Driver

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 as shown in the *Figure 3.6*.

It works on the concept of H-bridge. H-bridge is a circuit which allows the voltage to be flown in either direction. As you know voltage need to change its direction for being able to rotate the motor in clockwise or anticlockwise direction, Hence H-bridge IC are ideal for driving a DC motor. There are 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. Let's consider a Motor connected on left side output pins (pin 3,6). For rotating the motor in clockwise direction the input pins have 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]
Pin 2 = **Logic 1** and **Pin 7** = **Logic 1** |	Idle [No rotation]

Features:

- High output current up to 1A/channel.
- Wide voltage supply range ranging from 4.5V to 36V.
- Internal Electrostatic Discharge (ESD) protection.
- A separate input supply.
- Inputs having large noise immunity.

3.7. Bluetooth:

Fig. 3.7 Bluetooth Module (HC-05)

HC-05 Bluetooth Module is an easy-to-use Bluetooth SPP (Serial Port Protocol) module, designed for transparent wireless serial connection setup and is as shown in *Figure 3.7.* Its communication is via serial communication which makes an easy way to interface with controller or PC. HC-05 Bluetooth module provides switching mode between master and slave mode which means it able to use neither receiving nor transmitting data.

Pin Description:

Pin	Description	Function
VCC	+5V	Connect to +5V.
GND	Ground	Connect to Ground.
TXD	UART_TXD, Bluetooth Serial Signal Sending Pin	Connect with MCU's (Microcontroller and etc) RXD PIN.
RXD	UART_RXD, Bluetooth Serial Signal Receiving Pin	Connect with MCU's (Microcontroller and etc) TXD PIN.
KEY	Mode Switch Input	If the input is low or left unconnected, the module is in pairing mode or communication mode. If the input is high, then the module will enter AT mode.

Features:

- Input Voltage: 5V DC.
- Communication Method: Serial Communication.
- can switch between master mode and slave mode.
- Transmission Distance: 20m ~ 30m in free space.

3.8. Relay:

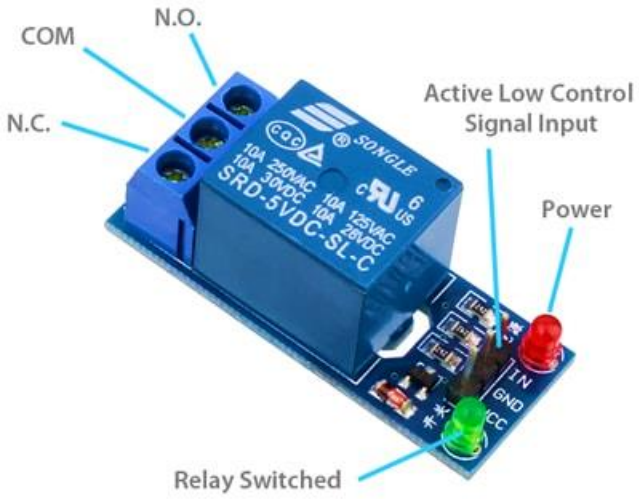


Fig. 3.8.1 Single 12v Relay

Relay is an electrically operated switch as shown in *Figure 3.8.1*. 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. 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". A relay is used to switch on a high powered circuit with a small current.

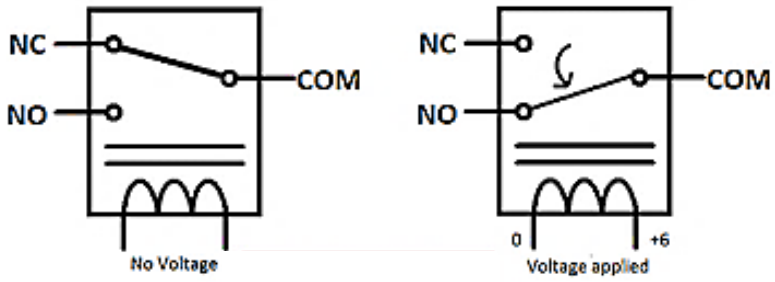


Fig. 3.8.2 Single 12v Relay

The logical circuit of the operation of relay is as shown in the *Figure 3.8.2*. The relay will act as either Normally Open (NO) switch or Normally Closed switch. The tolerance of the relay that we are using is ~230V.

3.9. Buzzer:

Fig. 3.9 Active Buzzer

A 5V Active Buzzer for audio signaling and is shown in *Figure 3.9*, which may be mechanical, electromechanical, or piezoelectric. Just like what you are viewing now, it is 5V DC Electronic Part Active Buzzer Module. An active buzzer rings out as long as it is electrified. Compared with a passive buzzer, it is a bit expensive but easier to control. Typical uses of buzzers include alarm devices, timers.

Specification:

- Positive external 3.3V-5V voltage (can be directly connected with the 5V, 3.3V and IO pin of MCU).
- Negative external GND to MCU GND or MCU IO pin.

Passive Buzzer Features:

- Passive internal shocks without source - so if you cannot make it with a DC signal tweet.
- Sound frequency control.

Active Buzzer Features:

- An active buzzer with a concussion internal source- so long as it will be called an energized.
- Program easy to control - SCM can let a high-low sound - while passive buzzer did not.

3.10. Power Supply Section:

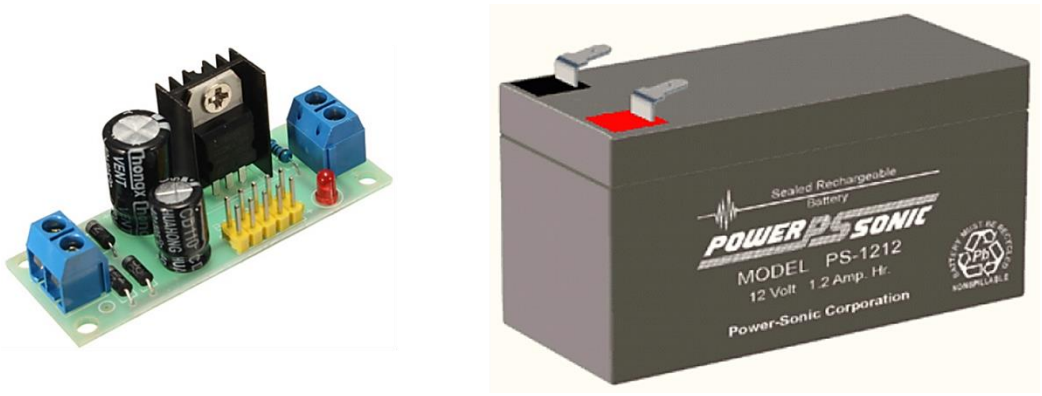


Fig. 3.10 AC supply is converted and stored in 12 battery

The AC power supply from mains first gets converted into and unregulated DC and then into a constant regulated DC and is stored in the 12V battery as shown in the *Figure 3.10* regulator 7805 and capacitors.

The working of the circuit can be divided into two parts. In the first part, the AC Mains is converted into unregulated DC and in the second part, this unregulated DC is converted into regulated 5V DC. So, let us start discussing the working with this in mind.

Initially, a 230V to 12V Step down transformer is taken and its primary is connected to mains supply. The secondary of the transformer is connected to Bridge rectifier (either a dedicated IC or a combination of 4 1N4007 Diodes can be used).

A 1A fuse is placed between the transformer and the bridge rectifier. This will limit the current drawn by the circuit to 1A. The rectified DC from the bridge rectifier is smoothened out with the help of 1000µF Capacitor.

So, the output across the 1000µF Capacitor is unregulated 12V DC. This is given as an input to the 7805 Voltage Regulator IC. 7805 IC then converts this to a regulated 5V DC and the output can be obtained at its output terminals.

3.11. Mini Water Pump:

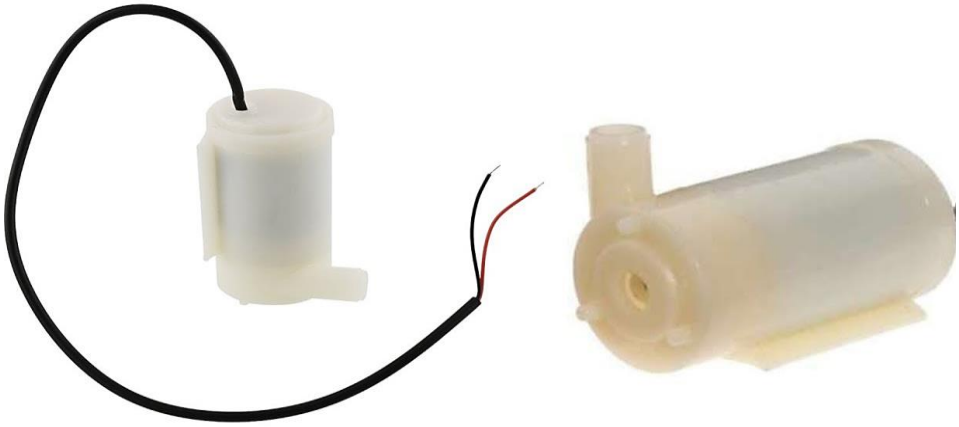


Fig. 3.11 Mini 12v Motor Pump

The pumping of water is a basic and practical technique, far more practical than scooping it up with one's hands or lifting it in a hand-held bucket. This is true whether the water is drawn from a fresh source, moved to a needed location, purified, or used for irrigation, washing, or sewage treatment, or for evacuating water from an undesirable location. Regardless of the outcome, the energy required to pump water is an extremely demanding component of water consumption. All other processes depend or benefit either from water descending from a higher elevation or some pressurized plumbing system.

The pump we are using is a submersible pump as shown in Figure 3.11. A submersible pump is a device which has a hermetically sealed motor close-coupled to the pump body. The whole assembly is submerged in the fluid to be pumped. The main advantage of this type of pump is that it prevents pump cavitation, a problem associated with a high elevation difference between pump and the fluid surface. Submersible pumps push fluid to the surface as opposed to jet pumps having to pull fluids. Submersibles are more efficient than jet pumps.

4. Software Implementation

4.1. Flow Chart:

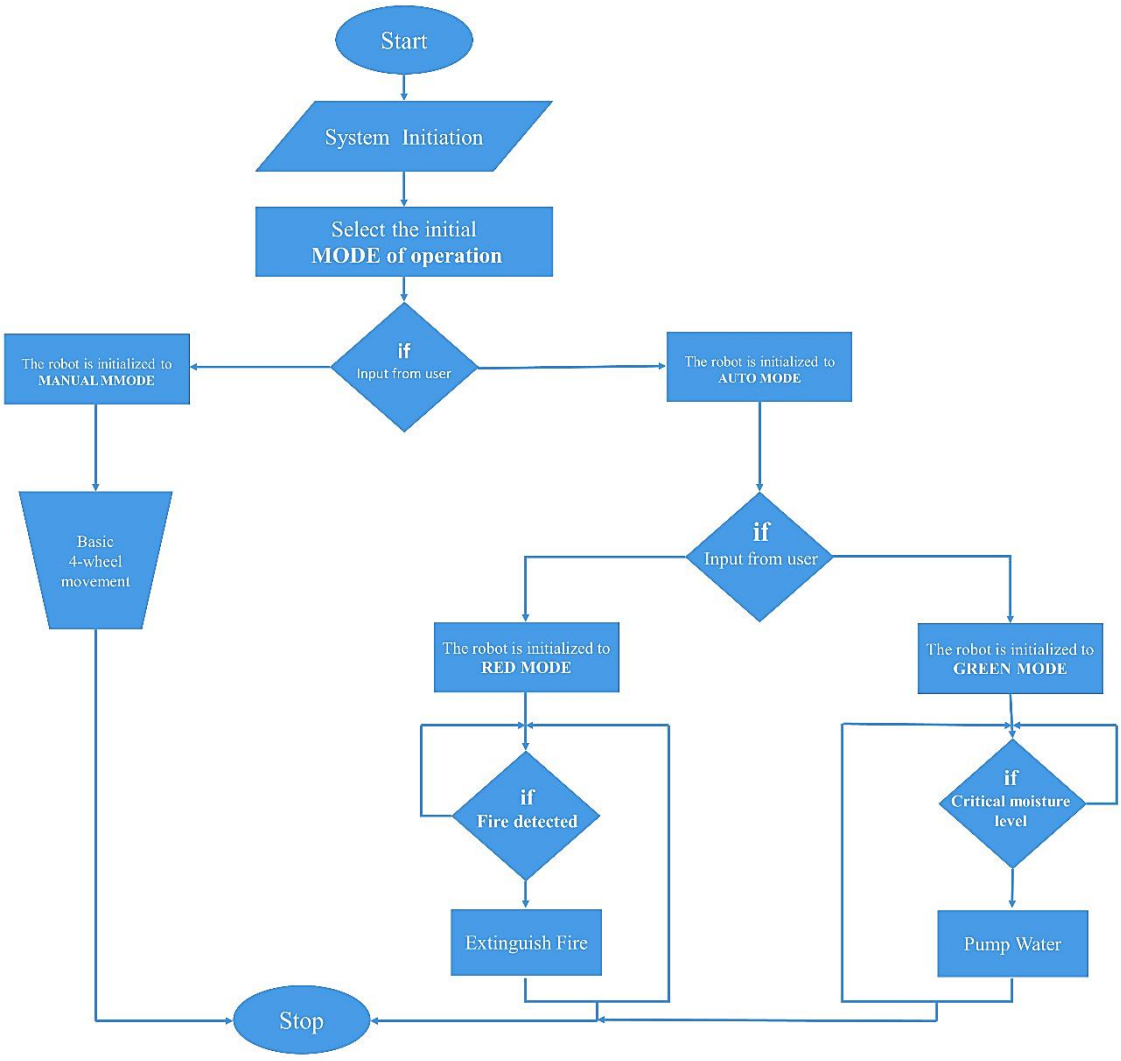


Fig. 4.1 Flow chart

The above flow chart describes the working logic of the “FIRE FIGHTING and SOIL MOISTURIZER ROBOT”, as shown in *Figure 4.1*.

4.2. Development & Testing Tool:

Arduino IDE:

The Arduino IDE is incredibly minimalistic, yet it provides a near-complete environment for most Arduino-based projects. The top menu bar has the standard options, including File, Edit, Sketch, Tools, and Help. The middle section of the IDE is a simple text editor that where you can enter the program code. The bottom section of the IDE is dedicated to an output window that is used to see the status of the compilation, how much memory has been used, any errors that were found in the program, and various other useful messages.

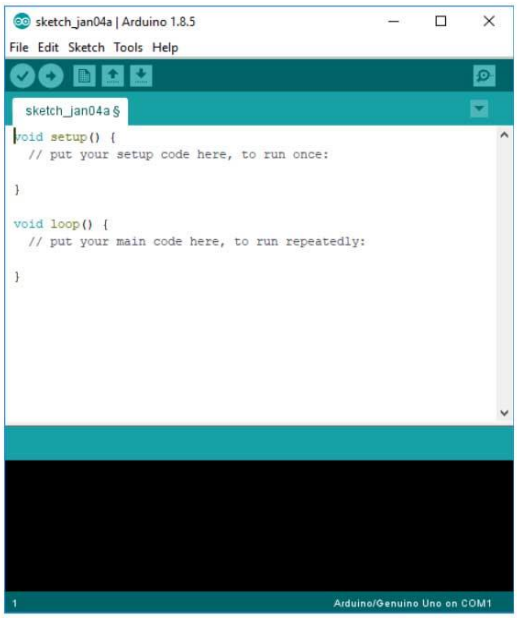


Fig. 4.2.1 Arduino IDE Window

Fig. 4.2.2 Arduino IDE Icon Tool Bar

The Arduino IDE icon tool bar as described below as shown in *Figure 4.2.2*.

- The **Check Mark** is used to verify your code. Click this once you have written your code.
- The **Arrow** uploads your code to the Arduino to run.
- The **Dotted Paper** will create a new file.
- The **Upward Arrow** is used to open an existing Arduino project.
- The **Downward Arrow** is used to save the current file.
- The far right button is a **Serial Monitor**, which is useful for sending data from the Arduino to the PC for debugging purposes.

The programming language used to code the "FIRE FIGHTING & SOIL MOISTURIZER ROBOT" is C-language.

Tera Term:

Fig. 4.2.3 Tera Term Window

Tera Term is an open-source software which is used for Serial Communication with devices using TCP/IP protocol, Bluetooth or by Serial Communication Port and is as shown in *Figure 4.2.3*. It supports varies languages such as Japanese, English, Russian and Korean.

Fig. 4.2.4 Terminal Window

The above *Figure 4.2.4* is the terminal window of Tera Term software. The terminal contains the status of the "FIRE FIGHTING & SOIL MOISTURIZER ROBOT", the status of robot is transmitted by the Bluetooth module and through Serial Communication using Tera Term the status is displayed and the robot controlled.

5. ADVANTAGES:

- To detect the exact direction of fire source.
- Capability of sensing accurately with increased flexibility.
- Reduce human effort.
- Reliable and economical.
- Sensitive to weather conditions.
- Low cost in long run.

6. DISADVANTAGES:

- It has a limited extinguisher liquid storage tank.
- It cannot detect fire at all levels altitudes.

7. APPLICATIONS:

- It can be used in server rooms.
- It can be used in places where probability of explosion is high to extinguishes fire.
- It can be used in Agriculture.
- It can also be used in Plant nursery.

8. FUTURE ENHANCEMENT:

- GPS can be added to detect the robot's location and direct the robot the nearby accident zone for help.
- Automation of the robot eliminates the manual mode and becomes independent i.e. complete AUTOMATIC machine.

9. CONCUSION:

Here we are developing **"FIRE FIGHTING & SOIL MOISTURIZER"** to save the life of the person, who take risk to save many people from fire accidents and help the people who grow food for us in the possible way we can.

If fire is detected or low moisture level of soil then with the help of sensors, Arduino UNO operates the mini-liquid pump mechanism through actuator circuit. As the robot has to endure different situation, this effectiveness test will help us to make a better model.

10. WEBILOGRAPY:

- WIKIPEDIA.
- Datasheet & instruction of Arduino UNO: www.arduino.cc
- Electronics communication system - George Kennedy.
- Connection and component working logic: www.youtube.com
- Principles of electronics - V K Mehta.
- Simulation of Project: www.tinkercad.com