Design and Implementation of Flood Protected Safe House



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Declaration

This is to certify that the project titled “Design and Implementation of Flood Protected Safe House” is the result of our study in partial fulfillment of the B.Sc. Engineering degree under the supervision of Shithi Dev, Lecturer, Department of Electrical and Electronic Engineering (EEE), Sonargaon University, Bangladesh. It is also hereby declared that this project or any part of it has not been submitted elsewhere for the award of any degree.

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Certificate of Approval

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Acknowledgement

First of all, we would like to say thanks to almighty “ALLAH” for giving us the strength to finish the project as a partial fulfillment for the requirements for the Degree of B. Sc. In Electrical and Electronic Engineering.

We would like to express our gratitude and appreciation to our supervisor, Shithi Dev, Lecturer, Department of Electrical and Electronic Engineering of Sonargaon University for the guidance and enthusiasm extended throughout the progress of this work.

We are also grateful to all the faculties of the Department of Electrical and Electronic Engineering of Sonargaon University, Bangladesh for giving us the opportunity to complete the work and necessary support during the period.

This thesis work would not have been possible without the encouragement, logical help and advice from our friends. We are grateful to them.

Finally, we must acknowledge with due respect the constant support and patience of our parents.

Abstract

Flooding is one of the very common and critical natural events that disrupts human lives globally. Around 2.2% which makes up almost 2.9% of the worlds population live in regions that have 10% flood probability in every 50 years. Moreover increase in global warming is said to further increase flooding events in near future. Though flooding leads to loss of life, it leads to even more loss of property as property is immovable unlike humans that can go to higher places. There is absolutely no way to save a house in case of flood hits the area. We make a hydraulic based safe house which can increases his height automatically depending on flood.

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LIST OF ABBREVIATIONS

A	Ampere
AC	Alternative Current
AFH	Adaptive Frequency Hopping
C	Capacitance
CDI	Capacitor Discharge Ignition
CMOS	Complementary Metal Oxide Semiconductor
CT	Current Transformer
DC	Direct Current
EDR	Enhance Data Rate
EEPROM	Electrically Erasable Programmable Read-Only Memory
EN	Enable
F	Farad
FTDI	Future Technology Devices International
GHz	Giga Harz
GND	Ground
GSM	Global System for Mobile Communication
IC	Integrated Circuit
I/O	Input Output
IRLED	Infrared Light Emitting Diode
IoT	Internet of Thinks
K	Kilo
KB	Kilo Byte
LCD	Liquid Cristal Display
LED	Light emitting Diode
mA	Mile Ampere
MAC	Media Access Control
Mbps	Mega Byte per Second
MCU	Microcontroller Unit
MHz	Mega Harz
MPU	Microprocessor Unit
N/O	Normally Open

N/C	Normally Close
PCB	Printed Circuit Board
PT	Potential Transformer
PWM	Pulse Wide Modulation
R	Resistance
RAM	Random Access Memory
RSR	Reset
RX	Receiver
RXD	Received Serial Data
R/W	Read Write
S/I	International System
SPDT	Single Pull Double Throw
SPP	Serial Port Protocol
TTL	Transistor-Transistor Logic
TX	Transmitter
TXD	Transmitted Serial Data
USB	Universal Serial Bus
V	Voltage
VCC	Voltage Common Collector
Vin	Input Voltage

LIST OF SYMBOLS

Ω	ohm
uF	Microfarad
nF	Nano farad
Ωt	Time Phase
°C	Degree Celsius
Q	Charge

CHAPTER I
INTRODUCTION

1.1 Introduction

Flooding is one of the very common and critical natural events that disrupts human lives globally. Around 2.2% which makes up almost 2.9% of the worlds population live in regions that have 10% flood probability in every 50 years. Moreover increase in global warming is said to further increase flooding events in near future. Though flooding leads to loss of life, it leads to even more loss of property as property is immovable unlike humans that can go to higher places. There is absolutely no way to save a house in case of flood hits the area.

Well we here attempt to solve this problem by designing a mechanism that can save houses in flooding events. The system uses hydraulics to actually lift a house as per water level to escape flood water in such events. This is a futuristic concept that has to be done before construction of the house n order to work. We develop a small model with a model house to demonstrate the concept. It involves firstly developing the house on a thick steel frame platform.

The concept involves 3 steel rods buried atleast 3 meters below the ground and 3 meters above ground for withstanding flood impacts. The supporting rods are used to keep the house steady in case of strong winds/storm in flood prone region. The steel platform is attached with 4 hydraulic cylinders mounted on 4 corners of the house. The cylinders are used to create the lift needed to lift the house in an upright manner without any jerking when needed.

We hereby use a high torque motor to operate the hydraulics. The motor is a 2 way motor that is used to drive fluid into and out of 4 cylinders as and when needed. Whenever the water level rises the user can choose to lift the house. We hereby use the same flood water to operate hydraulic cylinders instead of costly hydraulic fluid which is prone to leakage. In order to lift the motor drives water into all 4 cylinders thereby causing the cylinder pistons to rise higher gradually. This leads to lifting of the platform of the house. The 3 support rods mounted around the platform are used to keep the house stable and upright in the process.

Thus driving water up the cylinders creates a lift which can be used to raise houses by 6 – 10 feet in order to protect them from flood water. When the flood water recedes, the owner may choose to lower the house, in which case the motor will start pulling water from cylinders, thus lowering the house gradually without any jerks. The hydraulics along with the support rods are designed to life house without causing any critical jerks or angular change which may damage house structure or interiors. This system provides an alternative to a low cost flood proof housing system in flood prone areas.

1.2 Objective

The objective of hydraulic flood protection for homes is to provide a reliable and effective solution to prevent or minimize flood damage to residential properties. This involves using hydraulic systems and engineering techniques to divert flood waters away from homes and other buildings, and/or to protect them from flood waters through the use of physical barriers. The goal of hydraulic flood protection is to prevent or reduce the impact of flooding on homes, which can cause extensive damage and put people's lives and safety at risk. By implementing effective flood protection measures, homeowners can minimize the risk of property damage, protect their personal belongings, and ensure the safety of their families during times of flooding. Some specific objectives of hydraulic flood protection for homes might include: Designing and installing hydraulic systems that can effectively divert flood waters away from homes and other buildings. Build physical barriers, such as flood walls or sluice gates, to prevent flood water from entering your home. Construction of a drainage system to remove excess water from around the home and reduce the risk of flooding. Provides a flood warning system that can warn homeowners of potential flooding and give them time to prepare and take action. Development of sustainable and environmentally sound flood protection measures that minimize impacts on natural ecosystems.

1.3 Related Work

There are several related works and approaches for hydraulic protection for homes, including: flood Floodwalls: These are physical barriers that can be constructed around homes to prevent floodwaters from entering. Floodwalls can be made of various materials such as concrete, steel, or sandbag Floodgates: Similar to floodwalls, floodgates are barriers that can be deployed to prevent flood waters from entering

homes. Floodgates can be manually or automatically operated and can be made of various materials. Sump pumps: Sump pumps are devices that can be installed in basements or crawl spaces to remove water that accumulates during flooding. Drain pumps can help prevent flooding in low-lying areas of your home. Drainage Systems: Drainage systems can be designed to drain excess water around the home and reduce the risk of flooding. This may include making trenches, installing French drains, or designing permeable surfaces.

specific characteristics of the property. This can involve reviewing flood maps, analyzing local drainage systems, and assessing the topography and soil type of the property. Risk analysis: Based on the site assessment, a risk analysis can be conducted to identify potential flood hazards and the level of risk to the property. This analysis can help inform the design of flood protection measures. Design development: The design development phase involves developing a detailed plan for hydraulic flood protection measures. This can include designing physical barriers, drainage systems, and other flood protection measures based on the site assessment and risk analysis. Implementation: The implementation phase involves installing the hydraulic flood protection measures according to the design plan. This can involve excavating and grading the site, installing drainage systems and constructing physical barriers such as floodwalls or floodgates. Testing and commissioning: Once the flood protection measures have been installed, they should be tested to ensure that they are functioning as intended. This can involve testing drainage systems, operating floodgates or other physical barriers, and conducting water flow tests. Monitoring and maintenance: After the flood protection measures have been implemented, ongoing monitoring and maintenance are essential to ensure that they remain effective. This can involve regular inspections of the drainage systems and physical barriers, as well as ongoing maintenance and repairs as needed.

1.4 Methodology

Developing a work plan and methodology for hydraulic flood protection for homes involves several key steps, including: Site assessment: Conducting a thorough site assessment is essential to understand the potential risks of flooding and the specific characteristics of the property. This can involve reviewing flood maps, analyzing local drainage systems, and assessing the topography and soil type of the property. Risk analysis: Based on the site assessment, a risk analysis can be conducted to identify

potential flood hazards and the level of risk to the property. This analysis can help inform the design of flood protection measures. Design development: The design development phase involves developing a detailed plan for hydraulic flood protection measures. This can include designing physical barriers, drainage systems, and other flood protection measures based on the site assessment and risk analysis. Implementation: The implementation phase involves installing the hydraulic flood protection measures according to the design plan. This can involve excavating and grading the site, installing drainage systems and constructing physical barriers such as floodwalls or floodgates. Testing and commissioning: Once the flood protection measures have been installed, they should be tested to ensure that they are functioning as intended. This can involve testing drainage systems, operating floodgates or other physical barriers, and conducting water flow tests. Monitoring and maintenance: After the flood protection measures have been implemented, ongoing monitoring and maintenance are essential to ensure that they remain effective. This can involve regular inspections of the drainage systems and physical barriers, as well as ongoing maintenance and repairs as needed.

1.5 Existing System

There are several existing systems of hydraulic flood protection for homes that are currently available, including: Flood barriers: There are a variety of flood barriers available that can be used to protect homes from flooding. These include permanent floodwalls, temporary flood barriers such as sandbags, and inflatable barriers that can be quickly deployed in the event of a flood. Sump pumps: Sump pumps are often installed in basements or crawl spaces to remove water that accumulates during flooding. Sump pumps can prevent flooding in low-lying areas of homes and are often used in combination with other flood protection measures. Drainage systems: Drainage systems can be designed to remove excess water from around homes and reduce the risk of flooding. This may include making trenches, installing French drains, or designing permeable surfaces. Overhanging Foundation: Homes may be built with raised foundations to prevent flood water from entering. This could include raising a house above flood level or building a platform to keep a house above flood level.

1.6 Project Outline

This project is organized as follows:

Chapter 1 Introduction.

In this chapter we discus about this project.

Chapter 2 Analysis of the system component.

In this chapter we discus about all component, which component we used in this project. Like NodeMCU, Proximity sensor, Moisture sensor, resistor, capacitor, diode, Transistor, etc.

Chapter 3 Hardware development.

In this chapter we discus about hardware developing. how we develop our project, how we make this project.

Chapter 4 Result and discussions.

In this chapter we discus about project output, we check house position by using water sensor.

Chapter 5 Conclusions.

CHAPTER II
ANALYSIS OF THE SYSTEM COMPONENT

2.1 Introduction

The proposed system is Flood Protected safe house; it can protect your house from sudden flood or flat-flood. This system can increase his own height by using hydraulic power. There is a moisture sensor. Which is installed under this house, when flood is occur, sensor will trigger controller for increasing height.

2.2 Required Component

The Controller has the following main components.

Table: 2.1 Required Component

Component	**Software**
NodeMCU	Arduino IDE
Moisture Sensor	Proteus
Proximity Sensor	Serial monitor
Motor Driver	
Gear Motor	
Buzzer	
Power Connector.	
Diode.	
Resistor.	
Capacitor.	
Transistor.	
Li-io Battery	
Vero-Board.	

2.3 NodeMCU

NodeMCU is an open source T platform. It includes firmware which runs on the ESP8266 Wi-Fi SoC from Espressif Systems, and hardware which is based on the ESP-12 module. The term "NodeMCU" by default refers to the firmware rather than the development kits. The firmware uses the Lua scripting language. It is based on the eLua project, and built on the Espressif Non-OS SDK for ESP8266.

NodeMCU was created shortly after the ESP8266 came out. On December 30, 2013, Espressif Systems began production of the ESP8266. The ESP8266 is a Wi-Fi SoC integrated with a Tensilica Xtensa LX106 core, widely used in IoT applications. NodeMCU started on 13 Oct 2014, when Hong committed the first file of nodemcu-firmware to GitHub.

Two months later, the project expanded to include an open-hardware platform when developer Huang R committed the gerber file of an ESP8266 board, named devkit v0.9. Later that month, Tuan PM ported MQTT client library from Contiki to the ESP8266 SoC platform, and committed to NodeMCU project, then NodeMCU was able to support the MQTT IoT protocol, using Lua to access the MQTT broker.



Fig: 2.1 NodeMCU.

2.3.1 Specification of NodeMCU

Table: 2.2 Specification of NodeMCU

NodeMCU	
Microcontroller	Tensilica 32-bit RISC CPU Xtensa LX106
Operating Voltage	3.3V
Input Voltage	7-12V
Digital I/O Pins (DIO)	16
Analog Input Pins (ADC)	1
UARTs	1

SPIs	1
I2Cs	1
Flash Memory	4 MB
SRAM	64 KB
Clock Speed	80 MHz
Wi-Fi	IEEE 802.11 b/g/n

2.3.2 Pin Function of NodeMCU

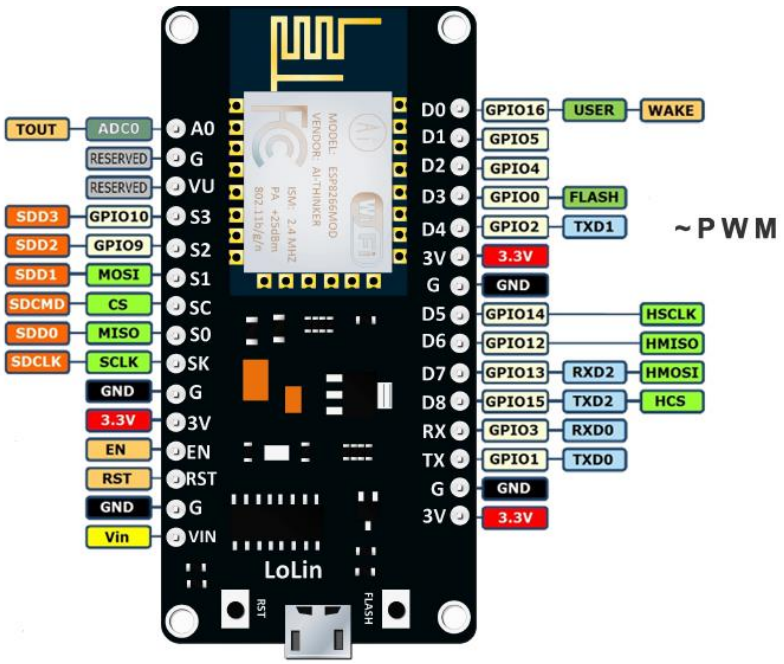


Fig: 2.2 Pin Function of NodeMCU.

Table: 2.3 Pin function of NodeMCU.

Level	GPIO	Notes
A0		Analog to Digital Converter (ADC)
RSV		Reserved
RSV		Reserved
SD3	GPIO 10	
SD2	GPIO 09	
SD1	GPIO 08	Master Out Slave In (MOSI)
CMD	GPIO 06	CS/SDCMD

SD0	GPIO 07	Master In Slave Out (MISO)
CLK		Clock Signal
GND		Ground
3V3		3.3V Output
EN		Enable
RST		Reset
GND		Ground
Vin		Raw input Voltage
TX	GPIO 01	Serially data transmit
RX	GPIO 03	Serially data Received
D8	GPIO 15	CS
D7	GPIO 13	MOSI
D6	GPIO 12	MISO
D5	GPIO 14	SCLK
D4	GPIO 02	TXD 1
D3	GPIO 00	Flash
D2	GPIO 04	SDA
D1	GPIO 05	SCL
D0	GPIO 16	Wake

2.4 Moisture Sensor

A soil moisture sensor can read the amount of moisture present in the soil surrounding it. It is ideal for monitoring garden, or your plant's water level. This is a must have tool for a connected garden.

This sensor uses the two probes to pass current through the soil, and then it reads that resistance to get the moisture level. More water makes the soil conduct electricity more easily (less resistance), while dry soil conducts electricity poorly (more resistance).

It will be helpful to remind you to water your indoor plants or to monitor the soil moisture in your garden. The IO Expansion Shield is the perfect shield to connect this senor to Arduino.

The new soil moisture sensor uses Immersion Gold which protects the nickel from oxidation.

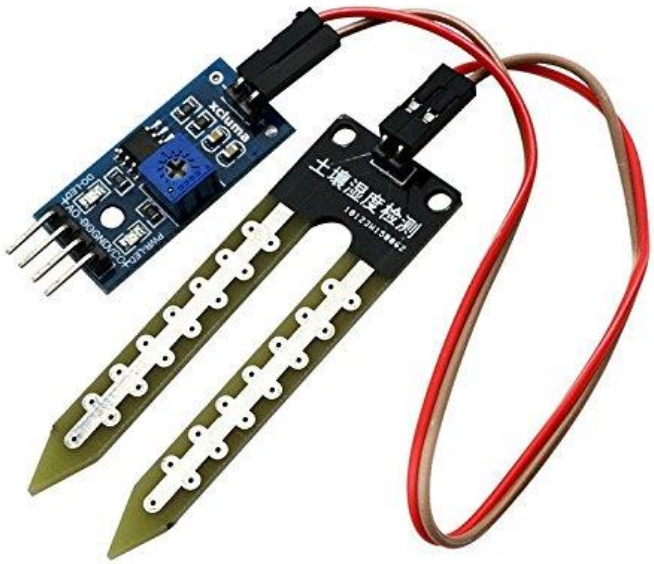


Fig: 2.3 Moisture Sensor.

2.4.1 Specification of Moisture Sensor

- Working voltage: 5V
- Working Current: <20ma
- Interface: Analog
- Output voltage signal: 0~4.2V
- Depth of detection: 37mm
- Working Temperature: 10℃~30℃
- Size: 63×20×8mm
- Arduino compatible interface
- Low power consumption
- High sensitivity
- Surface finish: Immersion Gold

2.5 Proximity Sensor

Proximity Sensor are used to detect objects and obstacles in front of sensor. Sensor keeps transmitting infrared light and when any object comes near, it is detected by the sensor by monitoring the reflected light from the object. It can be used in robots for obstacle avoidance, for automatic doors, for parking aid devices or for security alarm systems, or contact less tachometer by measuring RPM of rotation objects like fan blades.

A proximity sensor is a sensor able to detect the presence of nearby objects without any physical contact. An IR proximity sensor emits a beam of Infrared radiation and looks for changes in the field or return signal. The object being sensed is often referred to as the proximity sensor's target.

The module works well for the distance 2 ~ 30cm and a detection angle 35 °, The sensitivity of this can be adjusted by varying the potentiometer, the sensor module output port OUT port can be directly connected to the microcontroller IO can also be used to directly drive a 5V relay;



Fig: 2.4 IR Proximity Sensor.

2.5.1 Feature of Proximity Sensor

- IR transmitter.
- Ambient light protected IR receiver.
- 3 pin easy interface connectors.
- Indicator LED & Power LED.
- Distance 2cm to 30cm.
- Can differentiate between dark and light colors.
- Active Low on object detection 3.3 to 5V operation.

2.6 Motor Driver

The L298 is an integrated monolithic circuit in a 15-lead Multiwatt and PowerSO20 packages. It is a high voltage, high current dual full-bridge driver designed to accept standard TTL logic levels and drive inductive loads such as relays, solenoids, DC and stepping motors. Two enable inputs are provided to enable or disable the device independently of the input signals. The emitters of the lower transistors of each bridge are connected together and the corresponding external terminal can be used for the connection of an external sensing resistor. An additional supply input is provided so that the logic works at a lower voltage.

Almost every robot contains a DC motor. And DC motors need a motor driver for control purposes. L298N is a motor driver which can control the speed and direction of

up to two DC motors. This motor driver is one of the cheapest and the easiest way to control DC motors. One more advantage is that it can control a stepper motor as well.

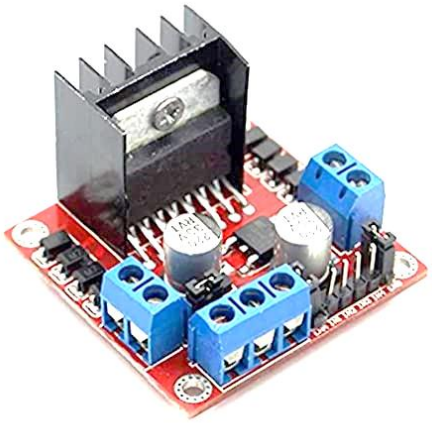


Fig: 2.5 L298N Motor Driver.

2.6.1 Features of L298N

- Operating supply voltage up to 46v
- Low saturation voltage
- Total dc current up to 4a
- Logical "0" input voltage up to 1.5 v (high noise immunity)
- Over temperature protection.

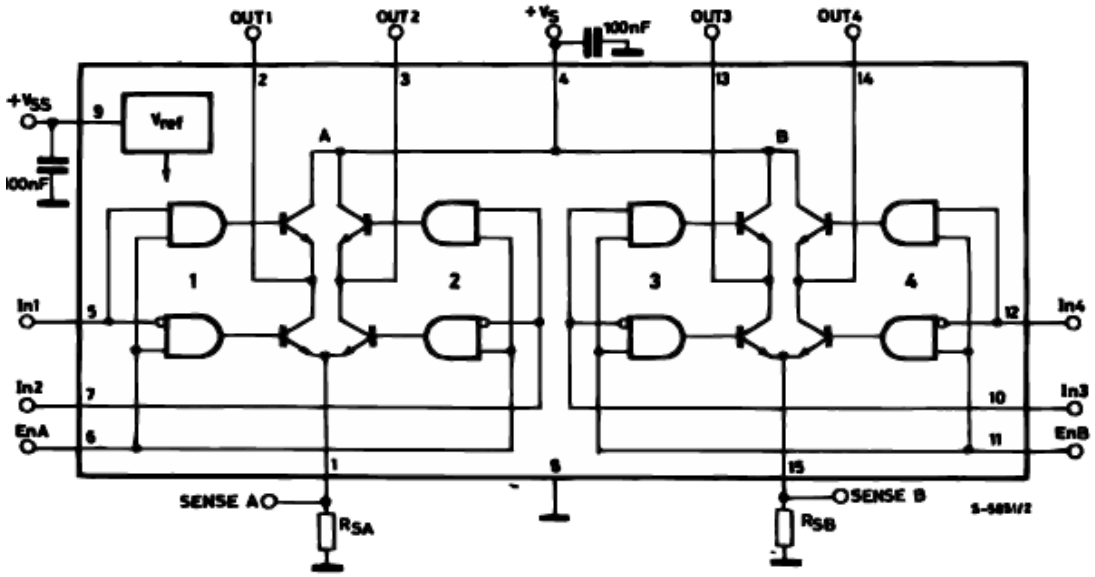


Fig: 2.6 Internal Diagram of L298N Driver.

There are two working concepts behind controlling the speed and the direction of a DC motor. Pulse width modulation is used to control the speed of the motor. H-bridge connections are used to change the direction of the motor.

The speed of the DC motor depends mainly on the input voltage it receives. So by varying the input voltage, we can vary the speed of a DC motor. This process is called Pulse Width Modulation (PWM).

In pulse width modulation, the voltage is varied by sending a series of ON-OFF pulses.

The average voltage during the PWM depends on the duty cycle. The higher the duty cycle is, the higher the average voltage is and the lower the duty cycle is, the lower the average voltage. The relation between duty cycle and average voltage is shown in the below picture.

The direction of a DC motor is dependent on the polarities of the input voltage. If we change the polarities of the input voltage, then the direction of the motors will also be changed. The most common technique for changing the polarities of the motor is called an H-bridge circuit.

An H-bridge contains 4 switches and the motor in between looking like the alphabet H. Any 2 switches are closed at the same time. The combination of these two switches helps in changing the direction of rotation of the motor. The below animation will illustrate exactly how an H-bridge connection works.

The main central processing unit of the L298N motor driver is the the L298N chip which comes with a big, black heat sink. The L298N IC is a dual channel H-bridge motor which can run two DC motors simultaneously. This makes the L298N motor driver ideal for two and four wheeled projects.

The power supply pins include 3-pins screw terminal which are used to supply the power to both the motor and logic circuitry. The pins include motor power supply (Vs), ground and 5V Logic power supply (Vss).

This motor driver also includes an on-board voltage regulator 78M05 5V. You will have to use a jumper to enable it.

There is a voltage drop of about 2V due to the H-bridge transistors. So if we want to run a 12V motor, approximately we will have to supply around 14V to the power supply pin.

The motor driver output pins for both the motors are provided on the boundary of the motor driver. There are 3.5mm screw terminals provided on both the sides to connect the DC motors.

These motors can be anywhere from 5-35V. Each terminal can supply upto 2A to the DC motor. However, this depends on the main power supply.

Using the directional control pins we can easily control the direction of rotation of the motors. There are 4 pins which control the 4 switches inside the H-bridge inside the L298N IC. The IN1 and IN2 pins are for motor A whereas the IN3 and IN4 pins are for motor B.

2.6.2 Pin Function of L298N

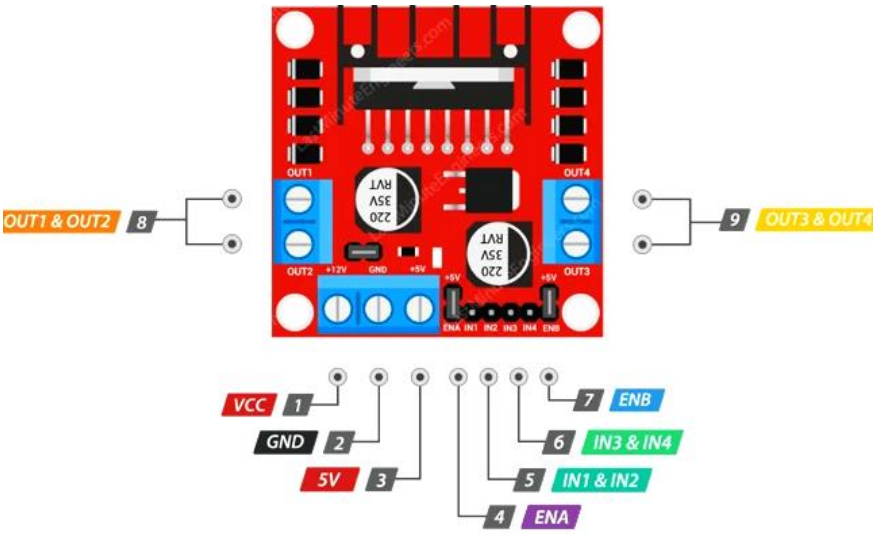


Fig: 2.7 PinOut of L298N Driver.

1. VCC pin supplies the power to the motors. It can be anywhere from 5-35V.
2. GND pin is the common ground pin.
3. 5V pin supplies the power to the logic circuitry inside the L298N IC.
4. ENA pin is the enable pin for motor A. Pulling this pin HIGH will make the motor rotate. It can also be used to control the speed of the motors.
5. IN1 and IN2 pins are used to control the spinning direction of the motor A.

6. IN3 and IN4 pins are used to control the spinning direction of the motor B.
7. ENB pin is the enable pin for motor B. Pulling this pin HIGH will make the motor B rotate.
8. OUT1 and OUT2 pins are connected to the motor A.
9. OUT3 and OUT4 pins are connected to the motor B.

2.7 Gear Motor

A gear motor is a motor designed with an integrated gearbox. Gear motors function as torque multipliers and speed reducers thus requiring less power to move a given load. The design of the gearbox structure, type of gears, lubrication and type of coupling affects its performance.

The concept of the gear motor is inspired by the patent of the German designer and entrepreneur Albert Obermoser, who in 1928 invented the so-called Vorlegemotor (gear motor). Since then, the basic model has been progressively improved and new models of gear motors have been created.

The gear motor structure regulates whether the gear motor is suitable for light, medium or heavy loads and short or long operating periods. Depending on the internal gear structure and the reduction stages, the gear motor varies the speed on the output shaft. The reduction ratio is the ratio between the input speed and the output speed; therefore, it is one of the most important characteristic values of the gearbox. The power and load capacity of a gearbox depends on the maximum torque it is capable of transmitting and it is measured in the physical unit Newton meter [Nm].



Fig: 2.8 Gear Motor.

YELLOW Plastic Gear Motor DC 3V 6V 130RPM Gear Motor Dual Shaft Smart Robot Car TT Gear Motor Double Shaft Dual Axis Geared TT Motor For Smart Robot Car Toys

130 RPM Dual Shaft BO Motor Plastic Gear Motor – BO series straight motor gives good torque and rpm at lower operating voltages, which is the biggest advantage of these motors.

Small shaft with matching wheels gives an optimized design for your application or robot. Mounting holes on the body & light weight makes it suitable for in-circuit placement. This motor can be used with 66 mm Diameter wheel for Plastic Gear Motors and 87 mm Diameter Multipurpose wheel for Plastic Gear Motors.

Low-cost geared DC Motor. It is an alternative to our metal gear DC motor. It comes with operating voltage of 3 -6V and is perfect for building small and medium robots. Available with 60 and 150 RPM.

The motor is ideal for DIY enthusiasts. This motor set is inexpensive, small, easy to install, and ideally suited for use in a mobile robot car. They are commonly used in our 2WD platforms.

2.7.1 Specification of gear motor

1. Name: TT motor
2. Color: Any
3. Rated Voltage: 5.0V DC
4. Working Voltage: 3.0V - 6.0V DC
5. Current: (3V-150mA , 6V-200mA
6. Speed: (3V-90rpm±10% , 6V-200rpm±10%
7. Torque: max. 0.8kg/cm
8. Reduction ratios: 1:48
9. Brush-type: Brush
10. Body Size: 70mm x 37mm x 23mm
11. Shaft Size: 8mm x 2mm diameter
12. Weight: 17.5 grams

2.7.2 Features of gear motor.

1. Cost-effectiveness of the injection-molding process.
1. Elimination of machining operations.
2. Low density: lightweight, low inertia.
3. Uniformity of parts.
4. Capability to absorb shock and vibration as a result of elastic compliance.
5. Ability to operate with minimum or no lubrication, due to inherent lubricity.
6. The relatively low coefficient of friction.
7. Corrosion-resistance; elimination of plating, or protective coatings.
8. The quietness of operation.
9. Tolerances often less critical than for metal gears, due in part to their greater resilience.
10. Consistency with the trend to greater use of plastic housings and other components.

2.8 Buzzer

An audio signaling device like a beeper or buzzer may be electromechanical or piezoelectric or mechanical type. The main function of this is to convert the signal from audio to sound. Generally, it is powered through DC voltage and used in timers, alarm devices, printers, alarms, computers, etc. Based on the various designs, it can generate different sounds like alarm, music, bell & siren.



Fig: 2.9 Buzzer.

The pin configuration of the buzzer is shown below. It includes two pins namely positive and negative. The positive terminal of this is represented with the '+' symbol or a longer terminal. This terminal is powered through 6Volts whereas the negative terminal is represented with the '-'symbol or short terminal and it is connected to the GND terminal.

These buzzers were invented by manufacturers of Japanese & fixed into a broad range of devices during the period of 1970s – 1980s. So, this development primarily came due to cooperative efforts through the manufacturing companies of Japanese. In the year 1951, they recognized the Application Research Committee of Barium Titanate that allows the corporations to be cooperative competitively & bring about numerous piezoelectric creations.

2.8.1 Specification of buzzer

1. The specifications of the buzzer include the following.
2. Color is black
3. The frequency range is 3,300Hz
4. Operating Temperature ranges from – 20° C to +60°C
5. Operating voltage ranges from 3V to 24V DC
6. The sound pressure level is 85dBA or 10cm
7. The supply current is below 15mA

2.8.2 Types of buzzer

A buzzer is available in different types which include the following.

1. Piezoelectric
2. Electromagnetic
3. Mechanical
4. Electromechanical
5. Magnetic

2.9 Power Switch

In electrical designing, a switch is an electrical segment that can "make" or "break" an electrical circuit, interfering with the flow or redirecting it starting with one conduit then onto the next. The system of a switch expels or reestablishes the directing way in a circuit when it is worked. A switch will have at least one arrangements of contacts, which may work at the same time, successively, or on the other hand. Switches in powerful circuits must work quickly to counteract ruinous arcing, and may incorporate unique highlights to aid quickly intruding on a substantial current.



Fig: 2.10 Power Switch.

2.10 Power Connector

Barrel connectors are ordinarily found on minimal effort purchaser hardware which can be connected to divider control by means of massive AC divider connectors. Divider connectors are generally accessible, in an assortment of intensity evaluations and voltages, making barrel connectors a typical means for interfacing capacity to little tasks. The female barrel connector can be obtained in a few assortments: PCB mounted link mount, or board mount. A portion of these connectors will have an extra contact that enables the application to identify whether a power supply is connected to the barrel jack or not, in this manner enabling the gadget to sidestep batteries and spare battery life when running on outside power. [16]

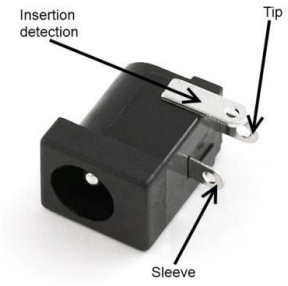


Fig: 2.11 Power Connector Port.

2.11 Diode

Diode, an electrical component that allows the flow of current in only one direction. In circuit diagrams, a diode is represented by a triangle with a line across one vertex. The most common type of diode uses a *p-n* junction. In this type of diode, one material ‘N’ in which electrons are charge carriers abuts a second material ‘P’ in which holes (places depleted of electrons that act as positively charged particles) act as charge carriers. At their interface, a depletion region is formed across which electrons

diffuse to fill holes in the *P*-side. This stops the further flow of electrons. When this junction is forward biased (that is, a positive voltage is applied to the *P*-side), electrons can easily move across the junction to fill the holes, and a current flows through the diode. When the junction is reverse biased (that is, a negative voltage is applied to the *P*-side), the depletion region widens and electrons cannot easily move across. The current remains very small until a certain voltage (the breakdown voltage) is reached and the current suddenly increases.

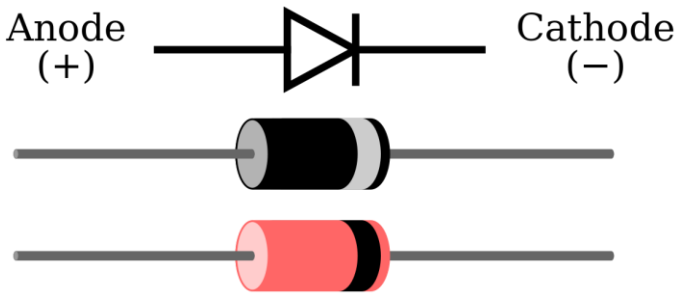


Fig: 2.12 Diode.

2.12 Resistor

A resistor is a passive two-terminal electrical component that implements electrical resistance as a circuit element. In electronic circuits, resistors are used to reduce current flow, adjust signal levels, to divide voltages, bias active elements, and terminate transmission lines, among other uses. High-power resistors that can dissipate many watts of electrical power as heat, may be used as part of motor controls, in power distribution systems, or as test loads for generators. Fixed resistors have resistances that only change slightly with temperature, time or operating voltage. Variable resistors can be used to adjust circuit elements (such as a volume control or a lamp dimmer), or as sensing devices for heat, light, humidity, force, or chemical activity.

Resistors are common elements of electrical networks and electronic circuits and are ubiquitous in electronic equipment. Practical resistors as discrete components can be composed of various compounds and forms. Resistors are also implemented within integrated circuits. The electrical function of a resistor is specified by its resistance: common commercial resistors are manufactured over a range of more than nine orders of magnitude. The nominal value of the resistance falls within the manufacturing tolerance, indicated on the component.

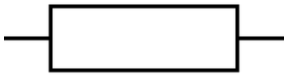


Fig: 2.13 Fixed Resistor Symbol.



Fig: 2.14 Fixed Resistor Symbol (ANSI).

2.13 Capacitor

A capacitor is a device that stores electrical energy in an electric field. It is a passive electronic component with two terminals. The effect of a capacitor is known as capacitance. While some capacitance exists between any two electrical conductors in proximity in a circuit, a capacitor is a component designed to add capacitance to a circuit. The capacitor was originally known as a condenser. This name and its cognates are still widely used in many languages, but rarely in English, one notable exception being condenser microphones, also called capacitor microphones.[8]

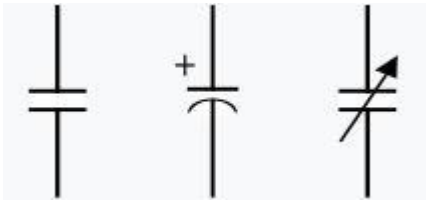


Fig: 2.15 Symbol of Capacitor.

The physical form and construction of practical capacitors vary widely and many types of capacitor are in common use. Most capacitors contain at least two electrical conductors often in the form of metallic plates or surfaces separated by a dielectric medium. A conductor may be a foil, thin film, sintered bead of metal, or an electrolyte. The non-conducting dielectric acts to increase the capacitor's charge capacity. Materials commonly used as dielectrics include glass, ceramic, plastic film, paper, mica, air, and oxide layers. Capacitors are widely used as parts of electrical circuits in many common electrical devices. Unlike a resistor, an ideal capacitor does not dissipate energy, although real-life capacitors do dissipate a small amount. When an electric potential, a voltage, is applied across the terminals of a capacitor, for example when a capacitor is connected across a battery, an electric field develops across the dielectric, causing a net positive charge to collect on one plate and net



Fig: 2.16 Different Type of Capacitors.

negative charge to collect on the other plate. No current actually flows through the dielectric. However, there is a flow of charge through the source circuit. If the condition is maintained sufficiently long, the current through the source circuit ceases. If a time-varying voltage is applied across the leads of the capacitor, the source experiences an ongoing current due to the charging and discharging cycles of the capacitor. [9]

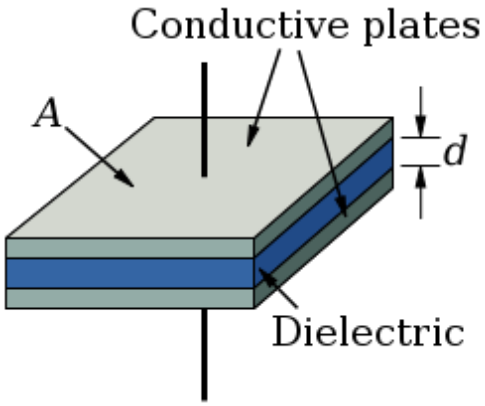


Fig: 2.17 Internal Architecture of Capacitor.

Capacitance is defined as the ratio of the electric charge on each conductor to the potential difference between them. The unit of capacitance in the International System of Units (SI) is the farad (F), defined as one coulomb per volt (1 C/V). Capacitance values of typical capacitors for use in general electronics range from about 1 pico-farad (pF) (10^{-12} F) to about 1 mille-farad (mF) (10^{-3} F). [22]

$$C = \frac{Q}{V}$$

An ideal capacitor is characterized by a constant capacitance C, in farads in the SI system of units, defined as the ratio of the positive or negative charge Q on each conductor to the voltage V between them.

A capacitance of one farad (F) means that one coulomb of charge on each conductor causes a voltage of one volt across the device. Because the conductors are close together, the opposite charges on the conductors attract one another due to their electric fields, allowing the capacitor to store more charge for a given voltage than when the conductors are separated, yielding a larger capacitance. In practical devices, charge build-up sometimes affects the capacitor mechanically, causing its capacitance to vary. In this case, capacitance is defined in terms of incremental changes. [22]

$$C = \frac{\mathrm{d}Q}{\mathrm{d}V}$$

2.14 Transistor

A transistor is a semiconductor device used to amplify or switch electronic signals and electrical power. It is composed of semiconductor material usually with at least three terminals for connection to an external circuit. A voltage or current applied to one pair of the transistor's terminals controls the current through another pair of terminals. Because the controlled (output) power can be higher than the controlling (input) power, a transistor can amplify a signal. Today, some transistors are packaged individually, but many more are found embedded in integrated circuits.

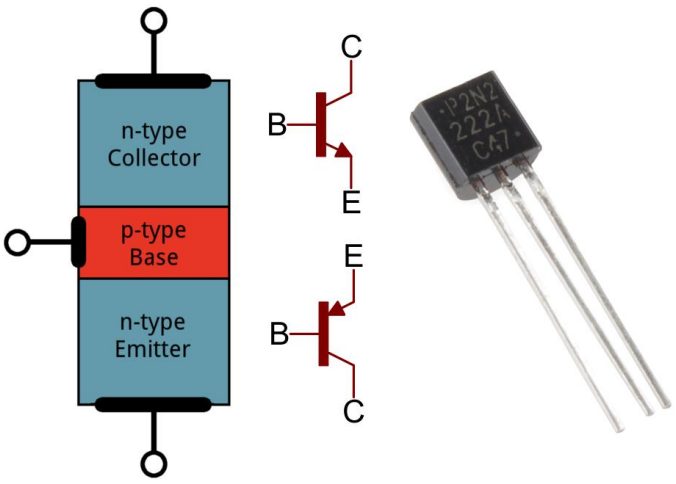


Fig: 2.18 Symbol & Internal Layer of Transistor.

Austro-Hungarian physicist Julius Edgar Lilienfeld proposed the concept of a field-effect transistor in 1926, but it was not possible to actually construct a working device at that time.[1] The first working device to be built was a point-contact transistor invented in 1947 by American physicists John Bardeen and Walter Brattain while working under William Shockley at Bell Labs. They shared the 1956 Nobel Prize in Physics for their achievement.[2] The most widely used transistor is the MOSFET (metal–oxide–semiconductor field-effect transistor), also known as the MOS transistor, which was invented by Egyptian engineer Mohamed Atalla with Korean engineer Dawon Kahng at Bell Labs in 1959.[3][4][5] The MOSFET was the first truly compact transistor that could be miniaturized and mass-produced for a wide range of uses.

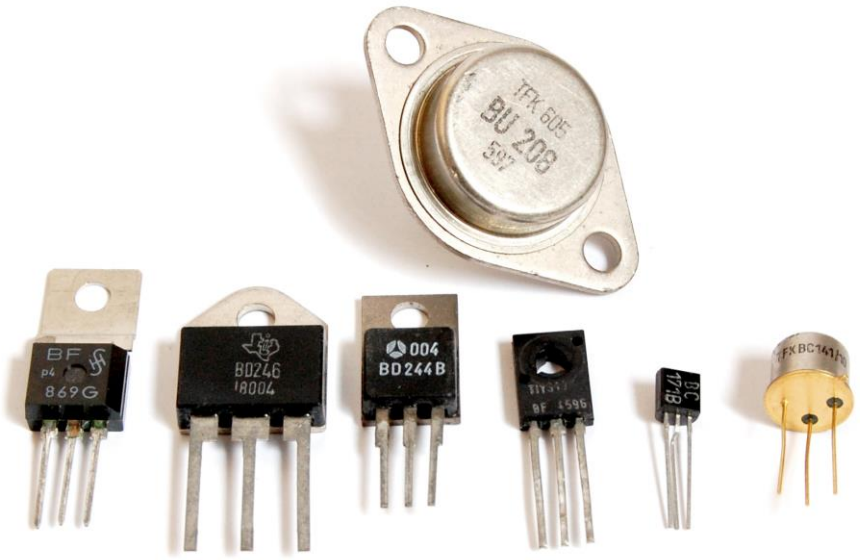


Fig: 2.19 Different Type of Transistor.

Transistors revolutionized the field of electronics, and paved the way for smaller and cheaper radios, calculators, and computers, among other things. The first transistor and the MOSFET are on the list of IEEE milestones in electronics. The MOSFET is the fundamental building block of modern electronic devices, and is ubiquitous in modern electronic systems. An estimated total of 13 sextillion MOSFETs have been manufactured between 1960 and 2018 (at least 99.9% of all transistors), making the MOSFET the most widely manufactured device in history.[11]

Most transistors are made from very pure silicon, and some from germanium, but certain other semiconductor materials can also be used. A transistor may have only one

kind of charge carrier, in a field-effect transistor, or may have two kinds of charge carriers in bipolar junction transistor devices. Compared with the vacuum tube, transistors are generally smaller, and require less power to operate. Certain vacuum tubes have advantages over transistors at very high operating frequencies or high operating voltages. Many types of transistors are made to standardized specifications by multiple manufacturers.

2.15 Vero Board

Strip board is the generic name for a widely used type of electronics prototyping board characterized by a 0.1 inch (2.54 mm) regular (rectangular) grid of holes, with wide parallel strips of copper cladding running in one direction all the way across one side of the board. It is commonly also known by the name of the original product Vero board, which is a trademark, in the UK, of British company Vero Technologies Ltd and Canadian company Pixel Print Ltd. In using the board, breaks are made in the tracks, usually around holes, to divide the strips into multiple electrical nodes. With care, it is possible to break between holes to allow for components that have two pin rows only one position apart such as twin row headers for IDCs.

Strip board is not designed for surface-mount components, though it is possible to mount many such components on the track side, particularly if tracks are cut/shaped with a knife or small cutting disc in a rotary tool.

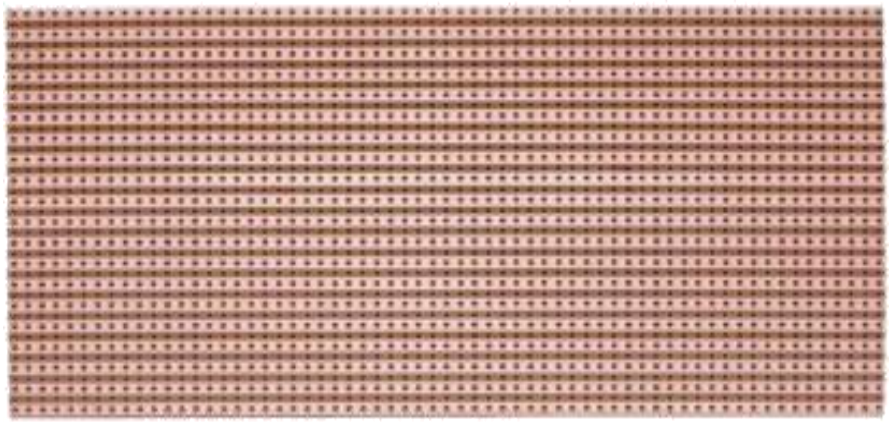


Fig: 2.20 Vero Board.

2.16 Connecting Wire

A wire is a single, usually cylindrical, flexible strand or rod of metal. Wires are used to bear mechanical loads or electricity and telecommunications signals. Wire is commonly formed by drawing the metal through a hole in a die or draw plate. Wire gauges come in various standard sizes, as expressed in terms of a gauge number. The term *wire* is also used more loosely to refer to a bundle of such strands, as in 'multi stranded wire', which is more correctly termed a wire rope in mechanics, or a cable in electricity.

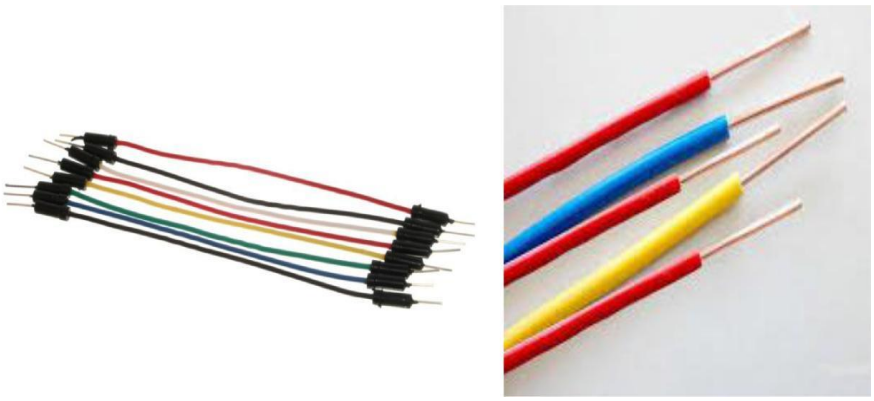


Fig: 2.21 Connecting Wire.

2.17 Arduino IDE

The Arduino Integrated Development Environment or Arduino Software (IDE) contains a text editor for writing code, a message area, a text console, a toolbar with buttons for common functions and a series of menus. It connects to the Arduino and Genuino hardware to upload programs and communicate with them.

Programs written using Arduino Software are called sketches**.** These sketches are written in the text editor and are saved with the file extension .ino. The editor has features for cutting/pasting and for searching/replacing text. The message area gives feedback while saving and exporting and also displays errors. The console displays text output by the Arduino Software, including complete error messages and other information. The bottom right-hand corner of the window displays the configured board and serial port. The toolbar buttons allow you to verify and upload programs, create, open, and save sketches, and open the serial monitor.

2.17.1 How to use Arduino IDE

- New
  Creates a new instance of the editor, with the bare minimum structure of a sketch already in place.
- Open
  Allows to load a sketch file browsing through the computer drives and folders.
- Open Recent
  Provides a short list of the most recent sketches, ready to be opened.
- Sketchbook
  Shows the current sketches within the sketchbook folder structure; clicking on any name opens the corresponding sketch in a new editor instance.
- Examples
  Any example provided by the Arduino Software (IDE) or library shows up in this menu item. All the examples are structured in a tree that allows easy access by topic or library.
- Close
  Closes the instance of the Arduino Software from which it is clicked.
- Save
  Saves the sketch with the current name. If the file hasn't been named before, a name will be provided in a "Save as.." window.
- Save as...
  Allows to save the current sketch with a different name.
- Page Setup
  It shows the Page Setup window for printing.
- Print
  Sends the current sketch to the printer according to the settings defined in Page Setup.
- Preferences
  Opens the Preferences window where some settings of the IDE may be customized, as the language of the IDE interface.
- Quit
  Closes all IDE windows. The same sketches open when Quit was chosen will be automatically reopened the next time you start the IDE.

2.18 Proteus

The Proteus Design Suite is a proprietary software tool suite used primarily for electronic design automation. The software is used mainly by electronic design engineers and technicians to create schematics and electronic prints for manufacturing printed circuit boards.

It was developed in Yorkshire, England by Labcenter Electronics Ltd and is available in English, French, Spanish and Chinese languages.

The first version of what is now the Proteus Design Suite was called PC-B and was written by the company chairman, John Jameson, for DOS in 1988. Schematic Capture support followed in 1990, with a port to the Windows environment shortly thereafter. Mixed mode SPICE Simulation was first integrated into Proteus in 1996 and microcontroller simulation then arrived in Proteus in 1998. Shape based auto-routing was added in 2002 and 2006 saw another major product update with 3D Board Visualization. More recently, a dedicated IDE for simulation was added in 2011 and MCAD import/export was included in 2015. Support for high speed design was added in 2017.

2.19 Summary

The components used are studied individually. Their purpose in the system is explained along with their ratings, pinouts and connections.

Chapter III
Hardware Development

3.1 Introduction

This chapter will be explaining about the construction of Flood protected safe house. This system has three section;

i. Flood or Water Detecting Section.
ii. Hydraulic Section.
iii. Signaling Section.

3.2 Block Diagram:

The Flood Protected Safe House's block diagram are shown in below;

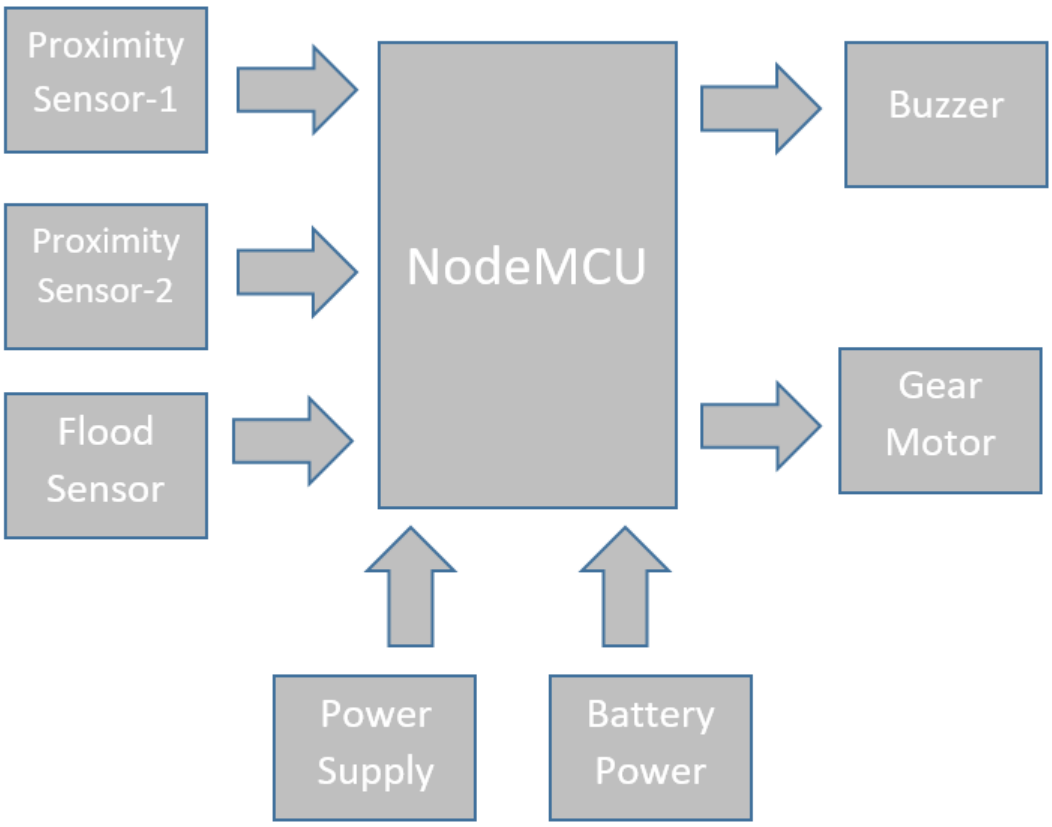


Fig: 3.1 Block Diagram of Flood Protected Safe House.

We can see in figure 3.1 there are some block for flood protected safe house. This block diagram are separated in three section. On left side has sensor part, right side has output part and bottom side has power part or source part. On left side block number-1 is

proximity sensor-1, which is triggered when house is in bottom position. Block number-2 is proximity sensor-2 , which is triggered when house is in top position. That mean two-proximity sensor is used for house positioning purpose. On right side block number-1 is buzzer block, this buzzer turn ON when flood is detected. Block number-2 is gear motor block, which is used for hydraulic purpose. When flood is detected then motor will rotated forward. And when flood is removed then motor will rotated backward. In bottom side there is two block, number-1 is AC power adapter and number-2 is DC battery source , this two block is for power management.

3.3 Circuit Diagram

Circuit diagram of "Flood Protected Safe House" is shown in below.

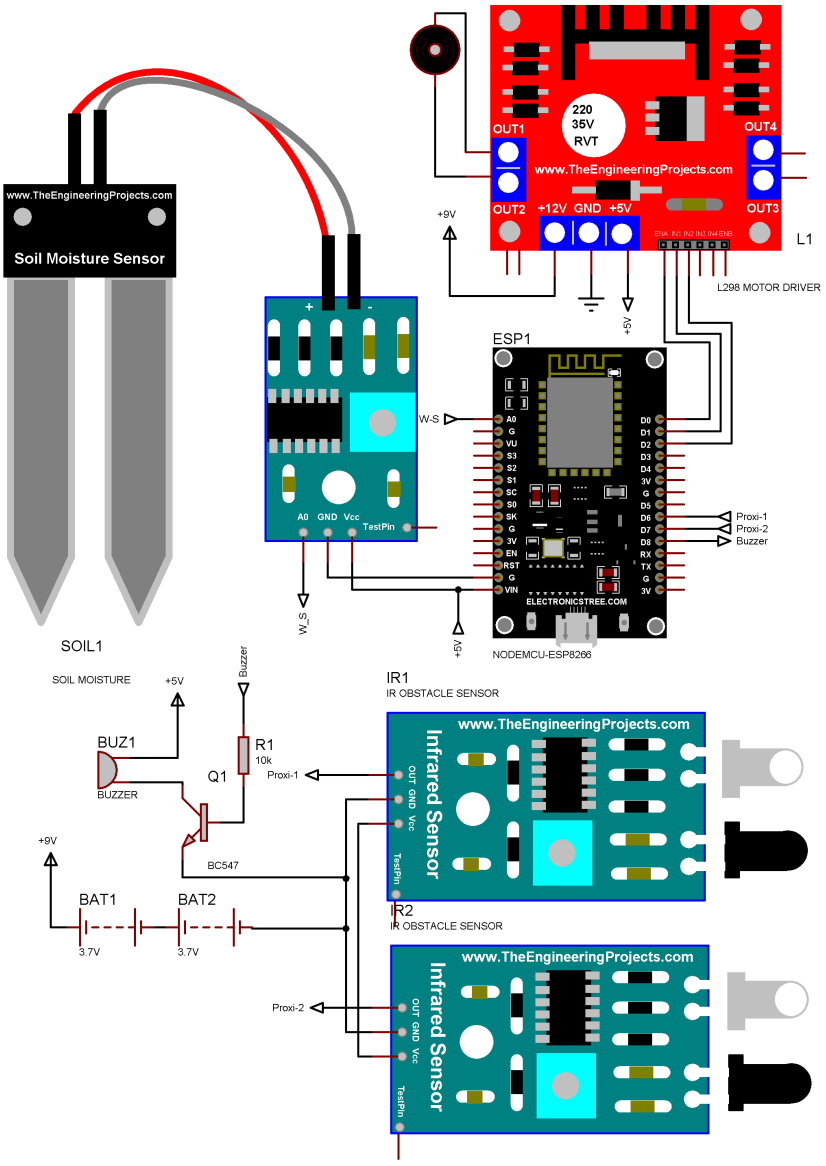


Fig: 3.2 Circuit Diagram of Flood Protected Safe House.

3.4 Designing Software

There are many circuit deigning software, we prefer “Proteus Design Suite” for deign our circuit. The Proteus Design Suite is a proprietary software tool suite used primarily for electronic design automation. The software is used mainly by electronic design engineers and technicians to create schematics and electronic prints for manufacturing printed circuit boards.

It was developed in Yorkshire, England by Labcenter Electronics Ltd and is available in English, French, Spanish and Chinese languages.

Schematic capture in the Proteus Design Suite is used for both the simulation of designs and as the design phase of a PCB layout project. It is therefore a core component and is included with all product configurations.

3.5 Construction of main Circuit

At first, we need to collect all equipment and component as list in chapter-2. Then we should arrange all component as shown in figure: 3.2. We use NodeMCU as a main component. We attached a moisture sensor for flood detecting, this sensor have four pin’s. number-1 is VCC. We connect this pin to DC 5V source. Number-2 is GND, we connect this pin to common ground. Number-3 is D0 or digital data pin we connect this pin to NodeMCU’s pin number-D5. Last pin is A0 pin or analog data pin we connect this pin to NodeMCU’s pin number-A0.

The we attached two proximity sensor with this controller for house positioning. Both proximity sensor has three pins. We connect two-proximity sensor’s VCC pin with DC 5V source. And GND pin is connected with common ground. Sensor-1 data-1 is connected with D6 and sensor-2 data-2 is connected with D7

We connect a buzzer for flood signal. Buzzer have two pin. Positive pin is connected with DC 5V and negative pin is connect with a transistor. This transistor is connect via a 10k resistor and this resistor is connected with D8.

3.6 Working Principle

When we connect our project to power source or turn on power switch, program will be start, and proximity-1 and proximity-2 is checking house position. At starting time house is in down position. When we drenched our flood sensor, then sensor is detect

water, than sensor transfer a signal to controller. Controller check house position, and turn on motor forward. Two sensor's is allows checking house position if house to arrive to maximum position then sensor-2 is send a signal to controller and controller is turn off motor. When we take back our flood sensor from water, then controller automatically change house position from top to bottom. If house is arrived to his minimum downing position then sensor-1 is send a signal to controller for stop motor.

This process will running continuously.

3.7 Hardware Image

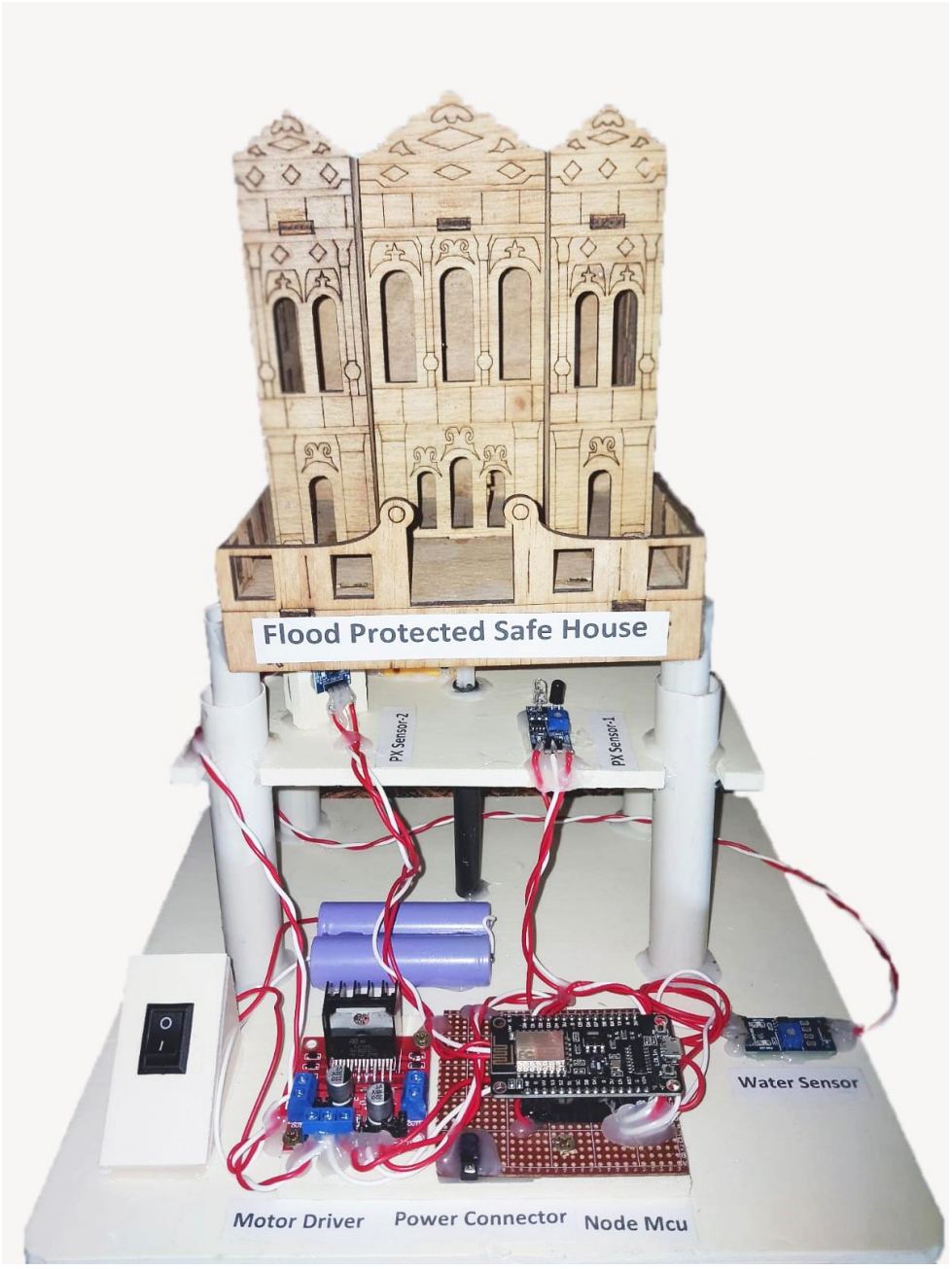


Fig: 3.3 Hardware image of Flood Protected Safe House.

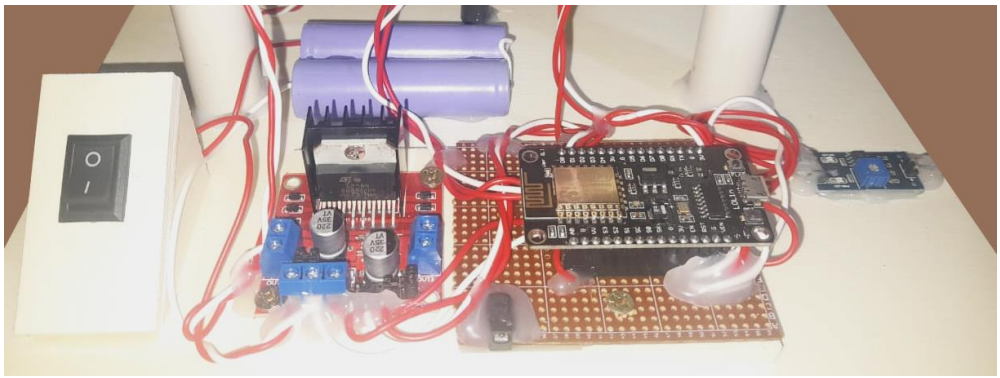


Fig: 3.4 Controller image of Flood Protected Safe House.

3.8 Summary

A circuit diagram (electrical diagram, elementary diagram, electronic schematic) is a graphical representation of an electrical circuit. A pictorial circuit diagram uses simple images of components, while a schematic diagram shows the components and interconnections of the circuit using standardized symbolic representations. The presentation of the interconnections between circuit components in the schematic diagram does not necessarily correspond to the physical arrangements in the finished device.

CHAPTER IV
RESULT AND DISCUSSION

4.1 Introduction

If there is a flood in your area, saving your home is completely impossible. To solve this problem, we are developing structures that can save houses in case of flooding. This system uses water pressure to lift the house according to the water level to prevent flooding in these cases. This is a futuristic concept where you can work before you build a house. This chapter will present all the results, calculations, and relevant discussions.

4.2 Result

Due to the precise definition of the implemented flood-proofing measures, their costs could be assessed using a cost–benefit analysis (CBA) for buildings and cultivated areas. Damage analyses for all scenarios revealed how each measure (in terms of position, characteristics, size, etc.) can directly reduce the negative impacts of flooding in low floodplains. We focused on two measures to vulnerability reduce the flood of existing buildings (preventive measures) and analyzed their level of cost-effectiveness. Concrete dam construction, a common and traditionally used type of intervention, has shown a way to significantly reduce the expected flood damage. However, this mitigation is not justified in this particular case, as this reduction would incur significant investment costs. In this regard, as a result of CBA analysis, it can be seen that it is impossible to search for the minimum value of the function in this case.

4.3 Advantages

- It can safe our hole house.
- It can safe children life.
- Fully automatic system.

4.4 Disadvantage

- Initial cos high.
- Installation process is difficult.
- Error in the programming is possible.

4.5 Cost Estimation of the Project

Table: 4.1 Price list and component quantity.

Serial No	Particulars	Quantity	Cost in BDT
01	NodeMCU	1	1600
02	Moisture Sensor	1	220
03	Proximity Sensor	2	460
04	Motor Driver	1	350
05	Gear Motor	1	100
06	Buzzer	1	20
07	Resistor 1k Ohm	1	2
08	Diode	1	2
09	Transistor	1	5
10	Vero Board	1	25
11	Power Adapter	1	450
12	Power Connector	1	10
13	Li-Io Battery	2	240
14	Rail (I & L)	4	100
15	Soldering Lead	2	80
16	Wire	3	50
17	Glue Strike	3	25
18	PVC Board	1	230
	PVC Pipe	2	30
		Total =	**3999**

4.7 Summary

Flooding is one of the very common and critical natural events that disrupts human lives globally. Around 2.2% which makes up almost 2.9% of the worlds population live in regions that have 10% flood probability in every 50 years. Moreover increase in global warming is said to further increase flooding events in near future. Though flooding leads to loss of life, it leads to even more loss of property as property is immovable unlike humans that can go to higher places. There is absolutely no way to save a house in case of flood hits the area.

CHAPTER V
CONCLUTION

5.1 Conclusions

The goal of the Flood Protecting safe house was made successfully, we get perfect result from this, we check our sensor with external water. When we immersion our sensor, in water, our house is rising his height. And when we remove our sensor from water then, our house is downing his height.

Extreme rains and impermeable ground due to population growth have caused many cities to experience flooding. Drainage networks were not designed for these new conditions, so adaptation is necessary. Implementing tanks to retain flow peaks is a well-studied alternative that has proven to have advantages over other methods in extreme rain events. In the literature, there are many techniques to rehabilitate drainage networks and reduce damage caused by floods. However, none of them were based on hydraulic simulation and considered at the same time the replacement of pipes, the installation of STs and the introduction of hydraulic control.

One of the main contributions of this work is the inclusion of hydraulic control as a complementary rehabilitation strategy to the replacement of pipes and the STs installation. For this, it has been necessary to represent in economic terms all the parameters involved in the process, including investment costs and costs associated with flood damage. In this sense, another contribution has been the inclusion of hydraulic control and its valuation in economic terms. The participation of hydraulic control has been possible to make it compatible with the part of the objective function previously defined. This formulation of the objective functions in monetary units is very useful for decision-makers in the development of a rehabilitation project.

5.2 Future Scopes of Modification

Due to continuous growth of population in the world, it is a great challenge for the upcoming generation to manage the flood protection system. For our next generation we should use this technic for protect our house. We can use water pressure for hydraulic in future. If we use this technic then does not need any electricity for hydraulic pressure.

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APPENDIX

Controller Code:

```
#define motor_speed_up 120 //Enable speed
#define motor_speed 80 //Enable speed
#define low_level 750
#define mid_level 850
#define high_level 900
#define m_t 100

int enable = 16;        //D0;
int motor_up = 5;       //D1;
int motor_down = 4;     //D2;
int p1 = 12;            //D6;    LOwer Level
int p2 = 13;            //D7;    Uper Level
int water_sensor = A0;  //14;  //D5;
int buzzer = 0;         //D3;
int green_led = 2;      //D4;
int red_led = 15;       //D8;

void setup()
{
  pinMode(enable, OUTPUT);
  pinMode(motor_up, OUTPUT);
```

```
  pinMode(motor_down, OUTPUT);
  pinMode(p1, INPUT);
  pinMode(p2, INPUT);
  pinMode(water_sensor, INPUT);
  pinMode(buzzer, OUTPUT);
  pinMode(green_led, OUTPUT);
  pinMode(red_led, OUTPUT);

  digitalWrite(motor_up, LOW);
  digitalWrite(motor_down, LOW);
  analogWrite(enable, 0);

  digitalWrite(buzzer, LOW);
  digitalWrite(green_led, LOW);
  digitalWrite(red_led, LOW);
}

void loop()
{
  /*****************************flood detected*****************************/
  if(analogRead(water_sensor) <low_level)  //flood detected
  {
    digitalWrite(buzzer, HIGH);
    digitalWrite(red_led, HIGH);
```

```
 digitalWrite(green_led, LOW);
 if((digitalRead(p1) == LOW) && digitalRead(p2) == LOW)  //H P Down
 {
  digitalWrite(motor_up, HIGH);
  digitalWrite(motor_down, LOW);
  analogWrite(enable, motor_speed_up);
  delay(m_t);
 }
 if((digitalRead(p1) == HIGH) && digitalRead(p2) == LOW)  //H P Midle
 {
  digitalWrite(motor_up, HIGH);
  digitalWrite(motor_down, LOW);
  analogWrite(enable, motor_speed_up);
  delay(m_t);
 }
 if((digitalRead(p1) == HIGH) && digitalRead(p2) == HIGH)  //H P Up
 {
  digitalWrite(motor_up, LOW);
  digitalWrite(motor_down, LOW);
  analogWrite(enable, 0);
  delay(m_t);
 }
}
/*************************Flood Clear*****************************/
```

```
if(analogRead(water_sensor) >high_level) //flood clear
{
 digitalWrite(buzzer, LOW);
 digitalWrite(red_led, LOW);
 digitalWrite(green_led, HIGH);

 if((digitalRead(p1) == HIGH) && digitalRead(p2) == HIGH)  //H P UP
 {
  digitalWrite(motor_up, LOW);
  digitalWrite(motor_down, HIGH);
  analogWrite(enable, motor_speed);
  delay(m_t);
 }
 if((digitalRead(p1) == HIGH) && digitalRead(p2) == LOW)  //H P Midle
 {
  digitalWrite(motor_up, LOW);
  digitalWrite(motor_down, HIGH);
  analogWrite(enable, motor_speed);
  delay(m_t);
 }
 if((digitalRead(p1) == LOW) && digitalRead(p2) == LOW)  //H P Up
 {
  digitalWrite(motor_up, LOW);
  digitalWrite(motor_down, LOW);
```

```
      analogWrite(enable, 0);
      delay(m_t);
    }
  }
  /*************************Flood medium************************/
  if((analogRead(water_sensor) < high_level) && (analogRead(water_sensor) > low_level)) //flood medium
  {
    digitalWrite(buzzer, LOW);
    digitalWrite(red_led, HIGH);
    digitalWrite(green_led, HIGH);

    digitalWrite(motor_up, LOW);
    digitalWrite(motor_down, LOW);
    analogWrite(enable, 0);
    delay(m_t);
  }
  digitalWrite(motor_up, LOW);
  digitalWrite(motor_down, LOW);
  analogWrite(enable, 0);
  digitalWrite(buzzer, LOW);
  digitalWrite(red_led, LOW);
  digitalWrite(green_led, LOW);
  delay(m_t);
 }
```