A

Project Report On

IOT BASED HOME AUTOMATION SYSTEM

Final year project report submitted to the department of ETC in partial fulfilment of the requirements for the Master's Degree

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By

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Certificate

This is to certify that the Dissertation Report/Project Report/Research Report/Field Study Report entitled "IOT Based Home Automation System" has been submitted **by Ashutosh Mohapatra** of PG 2nd Year ETC, Ravenshaw University, Cuttack, bearing Roll No. **21MET009** as part of the compulsory project work for the paper (2.4.4) under my supervision during the period January 2023 to May 2023 (One Semester).

Further, this is certified that the report submitted by the candidate is a bonafide research work carried out by the candidate at the Department of ETC, Ravenshaw University, Cuttack and it is not submitted elsewhere for award of any degree or diploma.

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- Khagapati Nayak (21MET003)
- Ashutosh Mohapatra (21MET009)
- Subhadarshini Baral (21MET011)

We are currently pursuing our M. Sc (ETC) in the 4th semester at Ravenshaw University, Cuttack.

Once again, we express our heartfelt appreciation to everyone who supported us in this endeavour. Your contributions have been invaluable to the success of our project.

Ashutosh Mohapatra
M. Sc (ETC) 4th Semester,
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ABSTRACT

The "IOT-based Home Automation System" project presents a comprehensive solution for automating various aspects of a home using IoT technologies. The project aims to enhance convenience, energy efficiency, and security for homeowners through the integration of smart devices and intelligent control mechanisms.

The system architecture is designed to be scalable and modular, allowing for easy expansion and integration of new devices. The implemented functionalities include remote fan and light control, remote door automation, rain detection, trace passing alarm using LDR, and automatic street light control using LDR sensors.

A user-friendly interface enables homeowners to effortlessly monitor and manage their home automation system. The system incorporates proper error handling and fault tolerance mechanisms to ensure reliable operation, even in the face of errors or abnormal conditions.

Data logging and analytics capabilities offer valuable insights for system optimization and user behaviour analysis. The project demonstrates the practicality and effectiveness of IoT-based home automation, showcasing the seamless integration of devices and the potential for future enhancements.

The project has been carried out under the guidance of Mrs. Soumyashree Panda, with the support of the faculty members at the Department of ETC & IST, Ravenshaw University.

Overall, the "IOT-based Home Automation System" project contributes to the advancement of home automation technologies and highlights the potential for a more convenient, energy-efficient, and secure living environment.

Our Group Info.

SL. NO.	Members	Project Title	Project Guide/ Co-Guide	Project Lead	Signature
1.	Ashutosh Mohapatra	Home Automation	**Guide -** Mrs. Soumyashree Panda **Co-Guide –** Mr. Prasant Gupta	Ashutosh Mohapatra	
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3.	Subhadarshini Baral				
4.	Swikruti Mishra				

CONTENTS

1. Introduction-

The rapid advancement of technology and the emergence of the Internet of Things (IoT) have revolutionized various aspects of our lives, including the way we interact with our homes. Home automation systems based on IoT offer the promise of enhanced comfort, convenience, and control over various household functions. This project, titled "IOT based Home Automation System," aims to explore the integration of IoT technologies to create an intelligent and interconnected home automation system.

The primary objective of this project is to design and develop a comprehensive home automation system that utilizes IoT principles and components to automate and control different aspects of a home. The system encompasses various devices, including remote fan and light controls, remote door automation, rain detection, trace passing alarm using Light Dependent Resistors (LDR), and automatic street light control using LDR sensors.

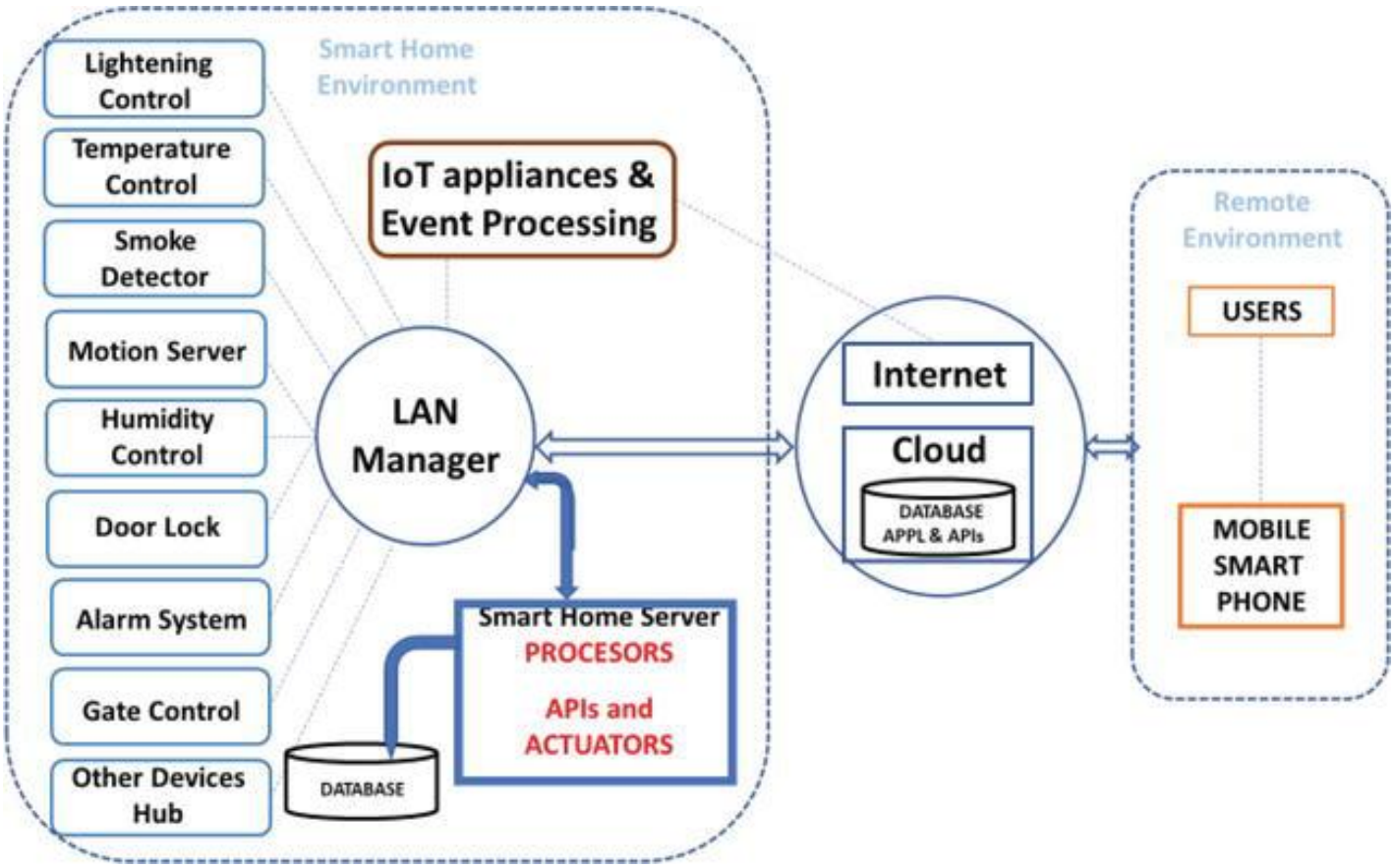
The project focuses on implementing these components by leveraging microcontrollers, IoT modules, and other hardware components, along with programming and software development. Additionally, user-friendly interfaces and controls are incorporated to ensure seamless operation and interaction with the automation system.

In the subsequent sections of this documentation, we will delve into the specific details of each component, outlining their functionalities, implementation techniques, and integration within the overall system. We will also discuss the challenges encountered, the methodologies employed for testing and validation, as well as potential future enhancements and improvements.

2.Design principle & operation –

IOT or internet of things is an upcoming technology that allows us to control hardware devices through the internet. Here we propose to use IOT in order to control home appliances, thus automating modern homes through the internet. This system uses a small ac pump and a 10watt bulb to demonstrate as house lighting and watering garden. Our user-friendly interface allows a user to easily control these home appliances through the internet. For this system we use nodeMCU Wi-Fi module. This module is interfaced with a Wi-Fi modem to get user commands over the internet. Relays are used to switch loads. The entire system is powered by a 12 V transformer. After receiving user commands over the internet, nodeMCU processes these instructions to operate these loads accordingly and display the system status on a Led. Thus, this system allows for efficient home automation over the internet.

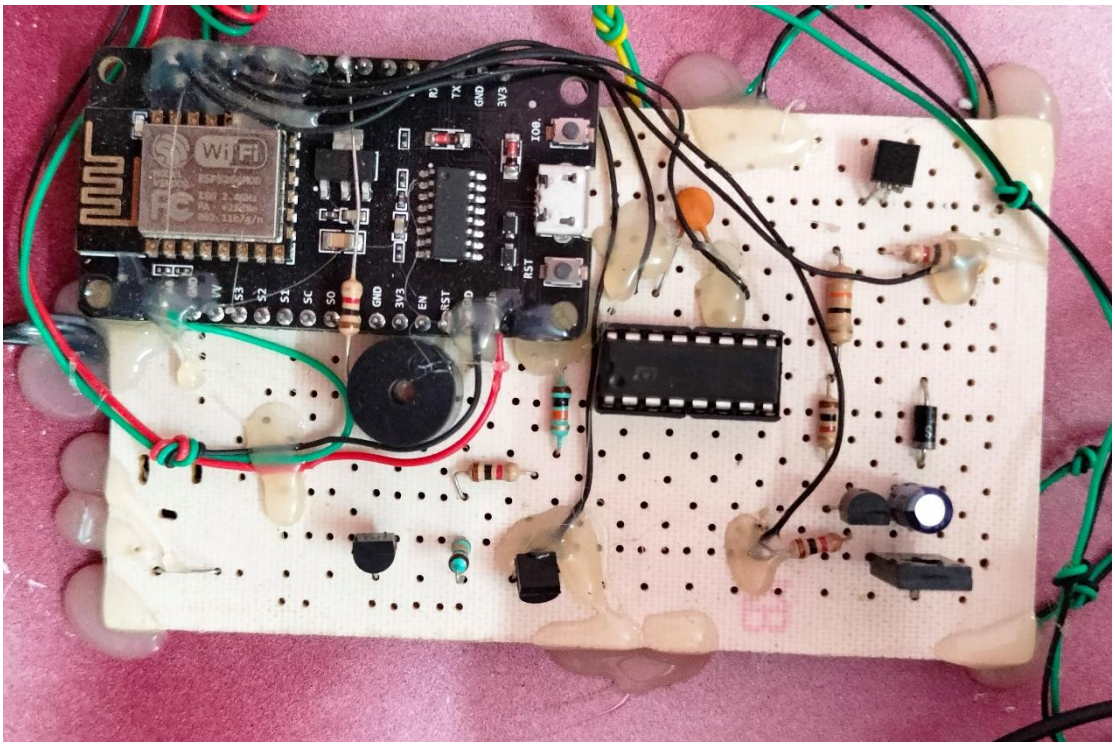
BLOCK DIAGRAM



HARDWARE SPECIFICATIONS

- ✓ Node MCU
- ✓ BT136
- ✓ moc3021
- ✓ Voltage Regulator IC
- ✓ Resistors
- ✓ Capacitors
- ✓ Cables and Connectors
- ✓ Diodes
- ✓ PCB
- ✓ LED
- ✓ Transformer/Adapter
- ✓ IC Sockets
- ✓ Thermistor
- ✓ LDR
- ✓ Lm 393 voltage comparator
- ✓ Buzzer

CIRCUIT PHOTO –



3.Circuit Description –

A) POWER SUPPLY –

In this project the power supply required is very much precession and also requires different level of power supply. Basically, the power supply used for the transmitter and receiver is arranged from a battery. Along with the battery the power supply requirement is +5Volts.

The power supply designed for catering a fixed demand connected in this project. The basic requirement for designing a power supply is as follows, The different voltage levels required for operating the devices. Here +5Volt required for operating microcontroller and other circuits etc.

The current requirement of each device or load must be added to estimate the final capacity of the power supply.

The power supply always specified with one or multiple voltage outputs along with a current capacity. As it is estimating the requirement of power is approximately as follows,

Out Put Voltage = +5Volt.

Capacity = 1000mA

The power supply is basically consisting of three sections as follows,

Step down section

Rectifier Section

Regulator section

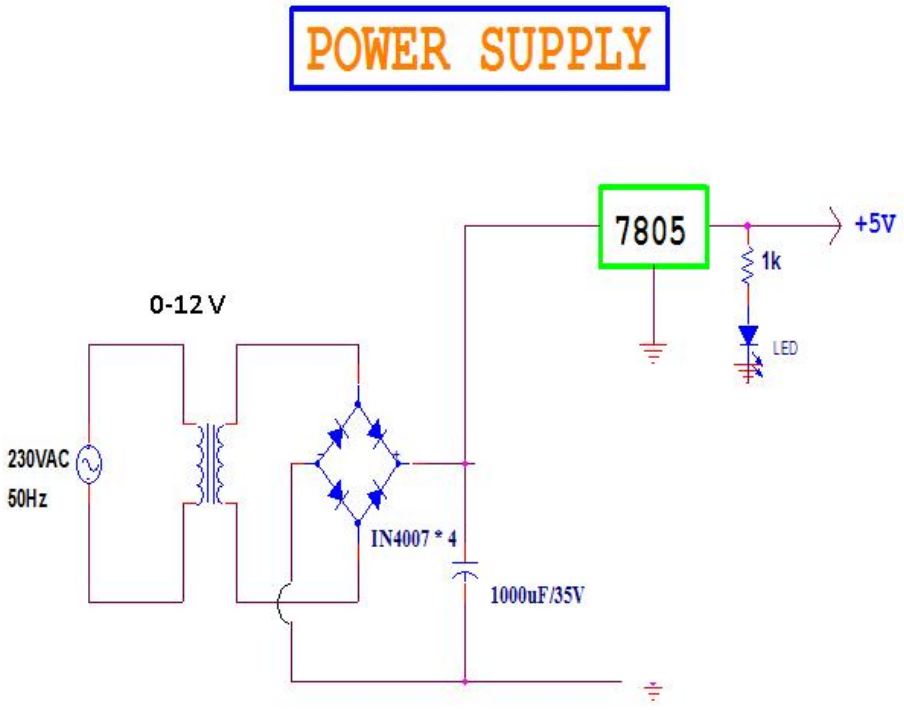
Design principle:

There are two methods for designing power supply, the average value method and peak value method. In case of small power supply peak value method is quite economical, for a particular value of DC output the input AC requirement is appreciably less. In this method the Dc output is approximately equal to V_m. The rectifier output is approximately charged to Vcc due to charging of the capacitor. The capacitance provides the backup during the discharge period. So, the value of the capacitor is calculated

Circuit connection: - In this we are using Transformer (0-12) vac, 1Amp, IC 7805, diodes IN 4007, LED & resistors. Here 230V, 50 Hz ac signal is given as input to the primary of the transformer and the secondary of the transformer is given to the bridge rectification diode. The o/p of the diode is given as i/p to the IC regulator (7805) through capacitor (1000mf/35v). The o/p of the IC regulator is given to the LED through resistors.

Circuit Explanations: - When ac signal is given to the primary of the transformer, due to the magnetic effect of the coil magnetic flux is induced in the coil(primary) and transfer to the secondary coil of the transformer due to the transformer action." Transformer is an electromechanical static device which transformer electrical energy from one coil to another without changing its frequency". Here the diodes are connected in a bridge fashion. The secondary coil of the transformer is given to the bridge circuit for rectification purposes.

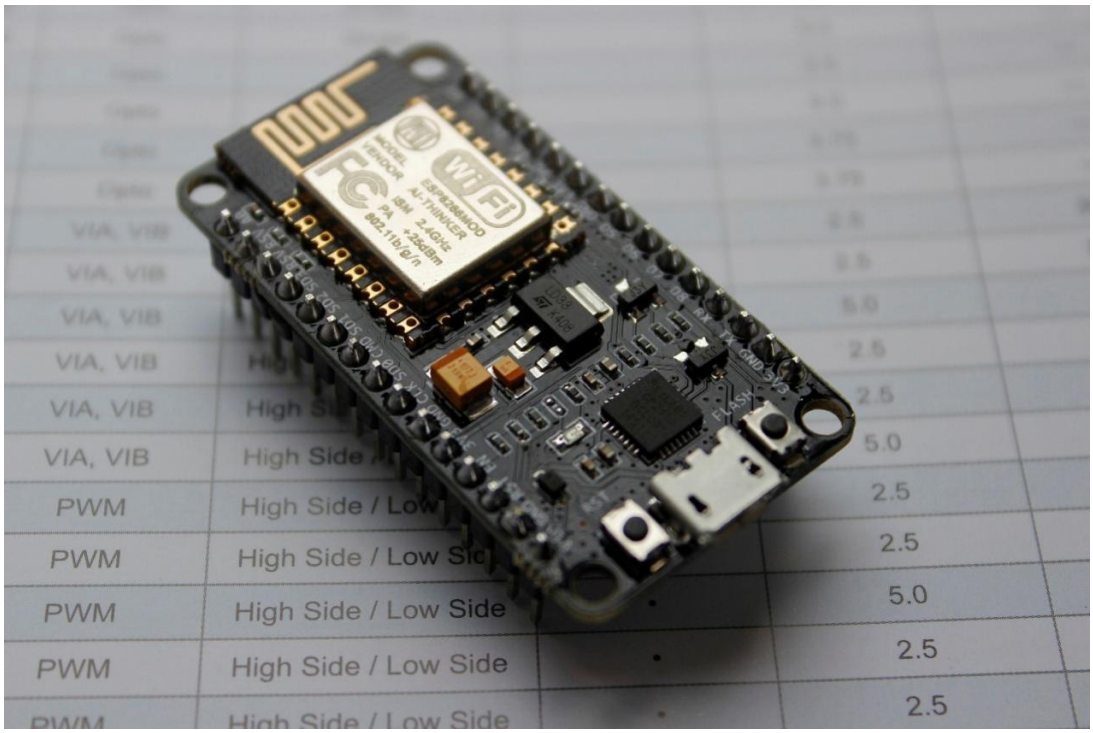
During the +ve cycle of the ac signal the diodes D2 & D4 conduct due to the forward bias of the diodes and diodes D1 & D3 does not conduct due to the reversed bias of the diodes. Similarly, during the –ve cycle of the ac signal the diodes D1 & D3 conduct due to the forward bias of the diodes and the diodes D2 & D4 does not conduct due to reversed bias of the diodes. The output of the bridge rectifier is not a power dc along with rippled ac is also present. To overcome this effect, a capacitor is connected to the o/p of the diodes (D2 & D3). Which removes the unwanted ac signal and thus a pure dc is obtained. Here we need a fixed voltage, that's for we are using IC regulators (7805)." Voltage regulation is a circuit that supplies a constant voltage regardless of changes in load current." This ICs are designed as fixed voltage regulators and with adequate heat sinking can deliver output current in excess of 1A. The o/p of the bridge rectifier is given as input to the IC regulator through capacitor with respect to GND and thus a fixed o/p is obtained. The o/p of the IC regulator (7805) is given to the LED for indication purpose through resistor. Due to the forward bias of the LED, the LED glows ON state, and the o/p are obtained from the pin no-3.



b) NODEMCU -

NodeMCU is a low-cost open source IoT platform. It initially included firmware which runs on the ESP8266 Wi-Fi SoC from Espressif Systems, and hardware which was based on the ESP-12 module. Later, support for the ESP32 32-bit MCU was added.

NodeMCU is an open-source firmware for which open source prototyping board designs are available. The name "NodeMCU" combines "node" and "MCU" (micro-controller unit). Strictly speaking, the term "NodeMCU" refers to the firmware rather than the associated development kits. Both the firmware and prototyping board designs are open source. The firmware uses the Lua scripting language. The firmware is based on the eLua project, and built on the Espressif Non-OS SDK for ESP8266. It uses many open source projects, such as lua-cjson and SPIFFS.[10] Due to resource constraints, users need to select the modules relevant for their project and build a firmware tailored to their needs. Support for the 32-bit ESP32 has also been implemented. The prototyping hardware typically used is a circuit board functioning as a dual in-line package (DIP) which integrates a USB controller with a smaller surface-mounted board containing the MCU and antenna. The choice of the DIP format allows for easy prototyping on breadboards. The design was initially based on the ESP-12 module of the ESP8266, which is a Wi-Fi SoC integrated with a Tensilica Xtensa LX106 core, widely used in IoT applications.



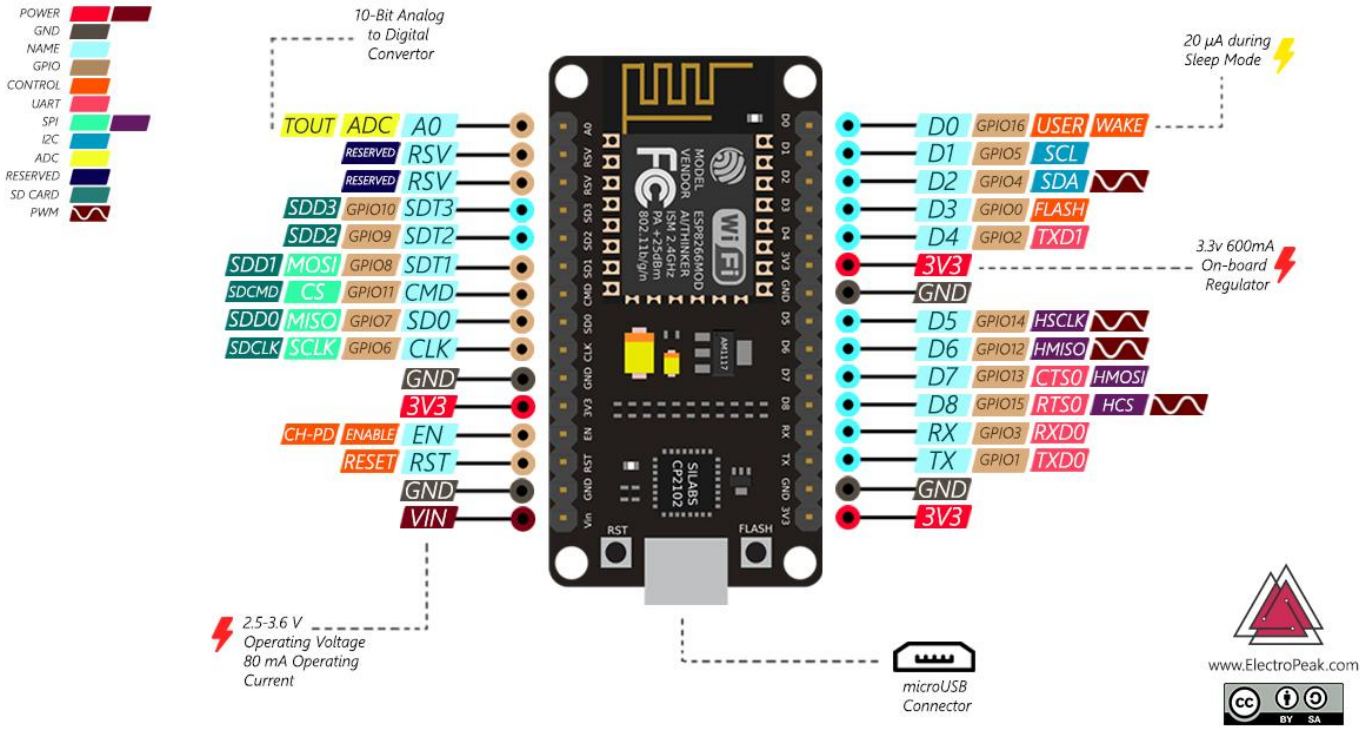
There are two available versions of NodeMCU as version 0.9 & 1.0 where the version 0.9 contains **ESP-12** and version 1.0 contains **ESP-12E** where 'E' stands for "Enhanced".

Pins -

NodeMCU provides access to the GPIO (General Purpose Input/Output) and a pin mapping table is part of the API documentation.

I/O index	ESP8266 pin
0	GPIO16
1	GPIO5
2	GPIO4
3	GPIO0
4	GPIO2
5	GPIO14
6	GPIO12
7	GPIO13
8	GPIO15
9	GPIO3
10	GPIO1
11	GPIO9
12	GPIO10

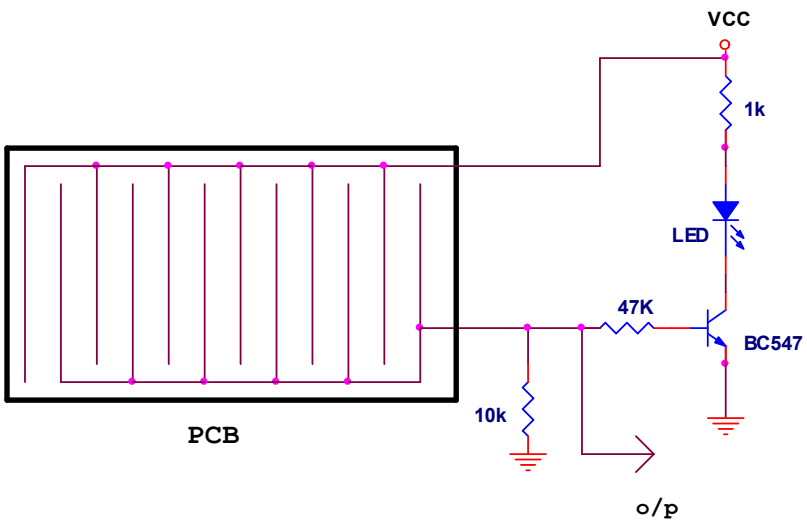
D0 (GPIO16) can only be used for GPIO read/write. It does not support open-drain/interrupt/PWM/I²C or 1-Wire.



C) RAIN DETECTOR-

In rain detector section, the sensor is used here is a general PCB for detector purpose. That PCB is a vertical strip with a small gap in between the track (as given in the ckt diagram). In one of the coppers tracks, we give a +5vdc voltage supply. At the other end of the copper track, the output is taken.

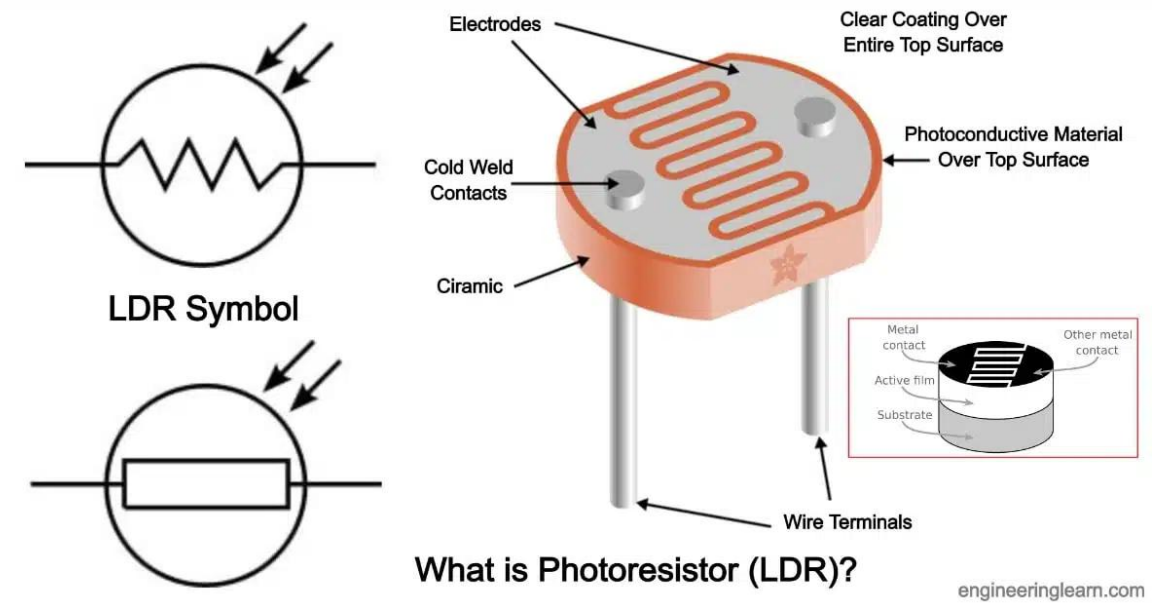
Whenever the rain water falls on the sensor, the water gets shorted in between the copper track thus a voltage is developed across the other end of the copper track thus because of the continuity of the copper track between them. The output is given to the (signal conditioning) base of the transistor through a resistance (1.5k/4.7k). The output is taken across the emitter through a 10k resistance which is grounded, and the collector is connected to Vcc. Whenever the base of the transistor is high, the transistor comes to saturation condition thus the collector current flows to the emitter and the output is obtained across the emitter. That output is given to the Microcontroller for processing according to the program stored. The controller will decide the absence of rain or not at the input.



D) TRACE PASSING ALARM –

LDR

LDR stands for **Light Dependent Resistor**. LDRs are tiny light-sensing device which is also known as **Photoresistors**. It has two terminals. LDR is a resistor whose resistance varies as the amount of light falling on it varies. The resistance of these **LDR** decreases with an increase in intensity of light and vice-versa. This property allows us to use them for making light sensing circuits and many other applications.



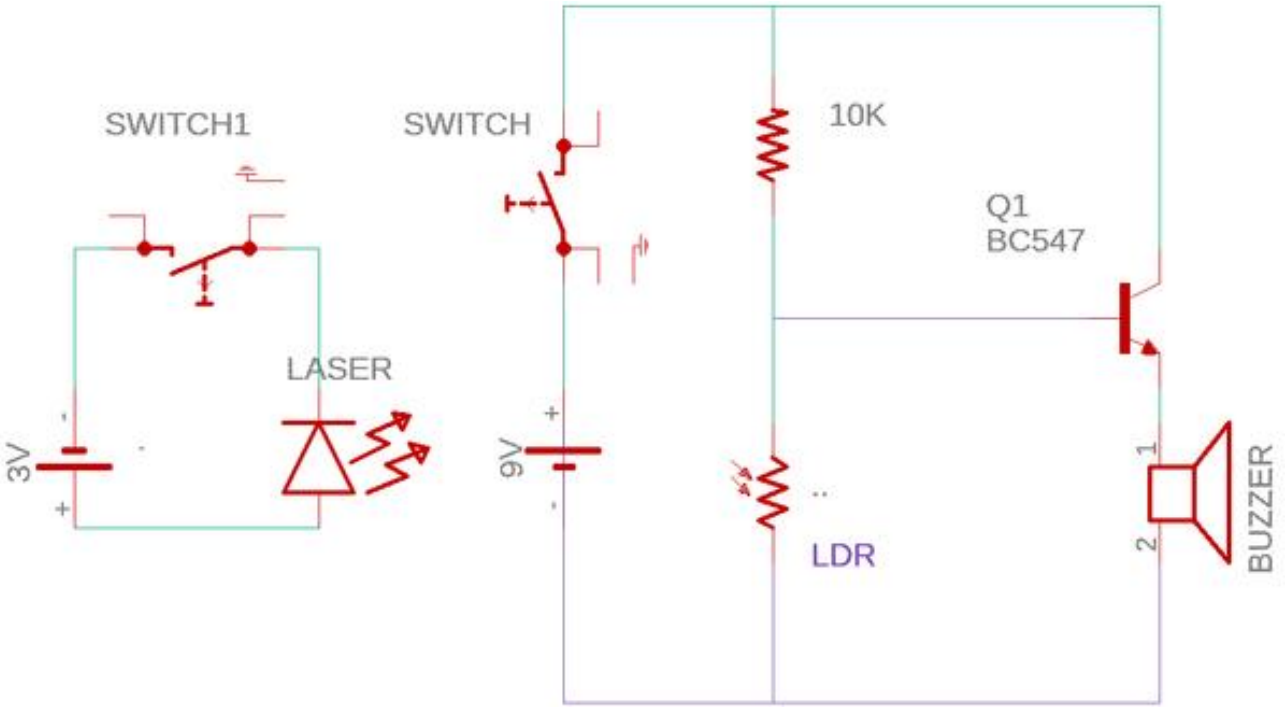
For using an LDR, we always have to make a **voltage divider circuit** and same we are using in this project. When the value of resistance of **LDR** changes in comparison to the fixed resistance, the voltage across it also changes and this helps in triggering our transistor for our project.

Laser Diode

The **LASER** in Laser Diode stands for "**Light Amplification by Stimulated Emission of Radiation**". It is also referred as a semiconductor laser. Its main feature is to emit light with the same phase and wavelength.

Laser oscillation is achieved by **amplifying** light generated through current injection between two mirrors in laser. A laser diode is an LED that amplifies and emits light using reflectors which is pointed type in nature. **Semiconductors** materials such as **InGaAlP**, **AlGaAs**, **InGaN**, and **ZnO**, etc are typically adopted as the element material in making of them.

Circuit diagram



In the above circuit diagram, we can see that the **NPN** transistor is acting as a switch whose base is connected to the **10K resistor** and one terminal of LDR. A 9volt power supply is given to the collector of the transistor. The **buzzer** is connected to the **emitter** terminal of the transistor. The emitter terminal and another terminal of **LDR** are connected to the ground with the help of an ON-OFF switch.

The laser setup is also connected to input voltage to power the laser and an ON-OFF switch is connected to it.

Working

The working of the circuit is simply based on a voltage divider circuit. As the light intensity on LDR increases its resistance decreases, so when laser light is falling on LDR, its resistance goes very low hence the power supply gets connected to the ground with the help of a 10K resistor, and in this way base of the transistor receives low value or in other words transistor is OFF.

Now as soon as light intensity decreases or its laser gets interrupted by someone, LDR resistance increases which in turn gives a high value to the base of the transistor, and hence transistor turns on, and finally, the buzzer sounds up. In this way, our project is working and providing us with a security system using a laser.

E) SMART LIGHT-

As business owners and facility managers become more conscious of energy use, the more likely they are to implement some type of lighting control system. Many of these systems are in place today already, sometimes as part of a building management system (BMS). Being able to create a set schedule for the lights (to turn them off when no one's around) helps save energy and lowers costs.

An *IoT lighting system* goes a step (sometimes several steps!) further. Imagine lights illuminating a room just minutes before a conference is scheduled to start. Or accessing information about how long a customer has been standing in a retail store aisle, and what they're looking at. These things can be accomplished with IoT lighting.

IoT smart lighting uses wireless switches, eliminating the need to wire light switches directly to fixtures. Those bulbs are then connected to a network, allowing them to be monitored and controlled from the cloud. Via the web or a mobile app, you can manage individual lights or groups of lights based on things like occupancy, external light levels, and times of day; you can also control dimming and colour-changing. And smart fixtures like these can also convey information about broken and burnt-out lighting, all in real-time.

And since lights are ubiquitous in buildings, these connected bulbs are also an excellent conduit for gathering additional data about a building. Sensors can be embedded into the fixtures for the purpose of accumulating and transmitting information about a facility, including room occupancy, air quality, and temperature, among other things. The more information you have about how your building is used, the better equipped you are to manage it more efficiently.

Some interesting potential uses for IoT lighting in commercial facilities are:

- **A lighting-based indoor positioning system:** In late 2017, Target implemented indoor positioning using Bluetooth chips embedded in LED ceiling lights. Shoppers' phones get access to an interactive store map that guides them around the aisles to products they're looking for. And Dubai's Hamdan Bin Mohammed Smart University uses IoT lighting controls to guide students to classrooms.
- **Asset tracking:** For critical assets tagged with sensors, IoT lighting can be used to locate them based on the signals they give off.
- **Monitor conditions for perishable goods:** Goods that require certain environmental conditions such as temperature and humidity levels can benefit from smart lighting solutions that are constantly monitoring the storage room or area. Alerts can be set to detect anomalies and prevent spoilage.

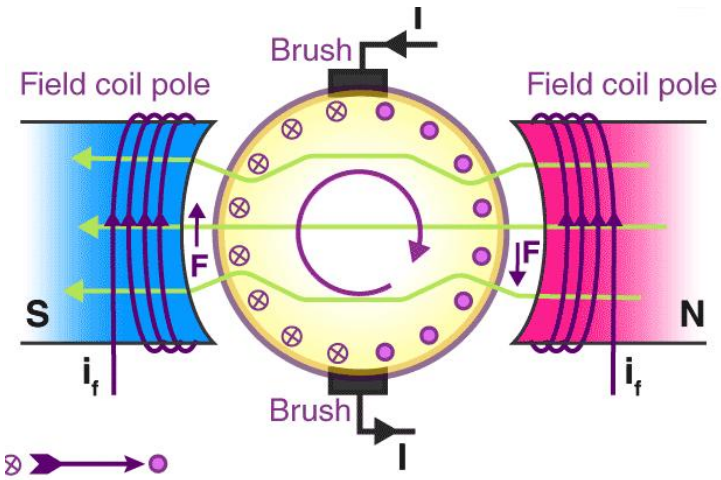
F) MOTOR DRIVER-

The D.C. Motor used in this project operates at 12 volt and carries approximately 400mA of current. The motor driver is designed to inter face the motor with micro controller. The micro controller output is +5volt and can maximum give a current of 5mA. The driver stage changes the current and voltage level suitably to drive the motor. The driver stage not only drives the motor but also helps to control the direction of rotation. As the output current (Ic) is large the driver section requires a Darlington pair to switch the load. The Darlington pair I.C. TIP 122 is used here for designing. There are four ICs used here but two of those switched for one direction and other two will be switched for opposite direction rotation of the D.C. motor. The design principle of the driver section is as follows.

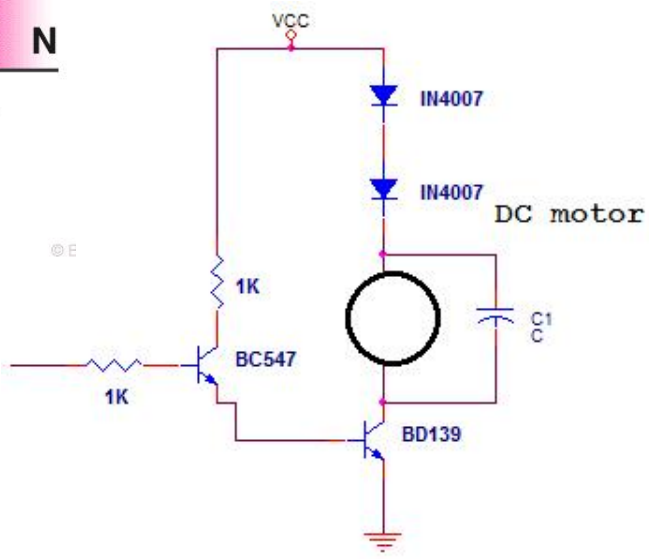
The motor takes approximately 400mA at 12-volt D.C., The power transistors can have amplification factor maximum 60 to 70 as per this assumption the base current required to switch on the transistor is approximately

Ib= (Ic/beta) =400mA/60 =6.7 mA

This current is too high to supply as a base current, more over the Microcontroller cannot supply that much current to drive the transistor so, a darling ton pair is required to limit the base current within 100 micro amp. To 2 mA.



Production of torque in a DC motor

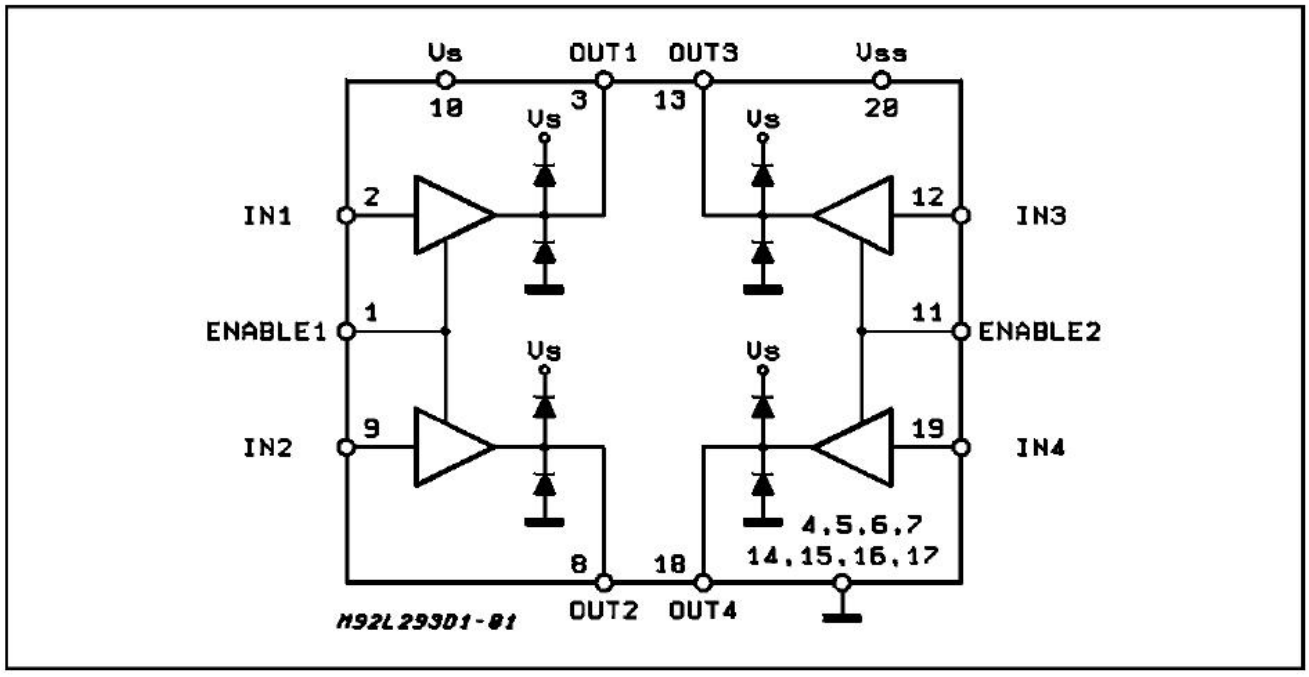


G) BIDIRECTIONAL MOTOR DRIVER

Here we drive the PMDC motor in both the direction using transistor h-bridge of ICs l293d. An H-bridge is an arrangement of transistors that allows a circuit full control over a standard electric DC motor. That is, with an H-bridge a microcontroller, logic chip, or remote control can electronically command the motor to go forward, reverse, brake, and coast.

These solid-state circuits provide power and ground connections to the motor, as did the relay circuits. The high side drivers need to be current "sources" which is what PNP transistors and P-channel FETs are good at. The low side drivers need to be current "sinks" which is what NPN transistors and N-channel FETs are good at. If you turn on the two upper circuits, the motor resists turning, so you effectively have a breaking mechanism. The same is true if you turn on both of the lower circuits. This is because the motor is a generator and when it turns it generates a voltage. If the terminals of the motor are connected (shorted), then the voltage generated counteracts the motors freedom to turn. It is as if you are applying a similar but opposite voltage to the one generated by the motor being turned. Transistors, being a semiconductor device, will have some resistance, which causes them to get hot when conducting much current. This is called not being able to sink or source very much power, i.e.: Not able to provide much current from ground or from plus voltage. It is important that the four quadrants of the H-Bridge circuits be turned on and off properly. When there is a path between the positive and ground side of the H-Bridge, other than through the motor, a

BLOCK DIAGRAM

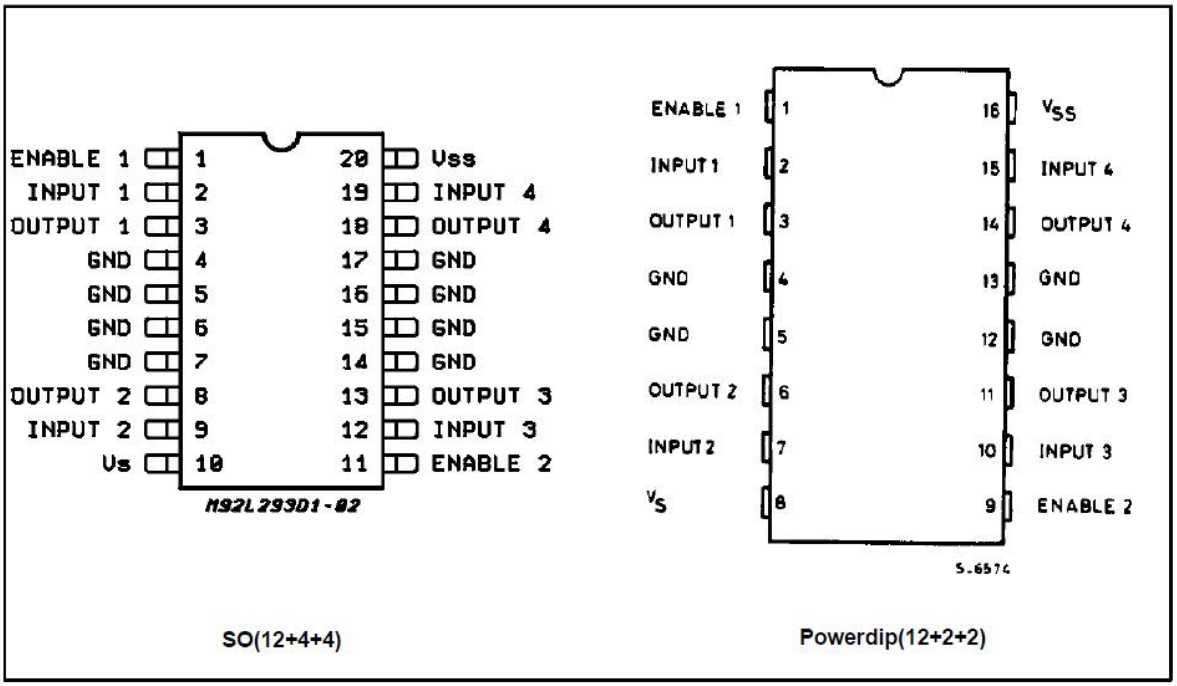


condition exists called "shoot through". This is basically a direct short of the power supply and can cause semiconductors to become ballistic, in circuits with large currents flowing. There are H-bridge chips available that are much easier, and safer, to use than designing your own H-Bridge circuit.

The L293 is an integrated circuit motor driver that can be used for simultaneous, bidirectional control of two small motors. Small means small. The L293 is limited to 600 mA, but in reality, can only handle much small currents unless you have done some serious heat sinking to keep the case temperature down. Unsure about whether the L293 will work with your motor? Hook up the circuit and run your motor while keeping your finger on the chip.

The Device is a monolithic integrated high voltage, high current four channel driver designed to accept standard DTL or TTL logic levels and drive inductive loads (such as relays solenoids, DC and stepping motors) and switching power transistors. To simplify use as two bridges each pair of channels is equipped with an enable input. A separate supply input is provided for the logic, allowing operation at a lower voltage and internal clamp diodes are included. This device is suitable for use in switching applications at frequencies up to 5 kHz. The L293D is assembled in a 16-lead plastic package which has 4 center pins connected together and used for heat sinking The L293DD is assembled in a 20-lead surface mount which has 8 center pins connected together and used

PIN CONNECTIONS (Top view)



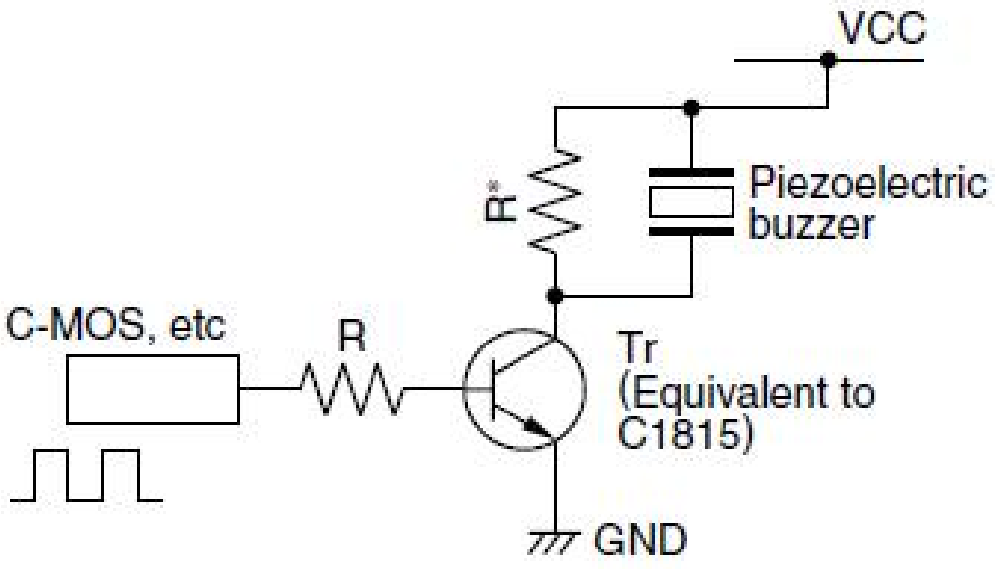
for heat sinking.

H) BUZZER DRIVER

This section interfaces one audible piezo electric buzzer with the controller. The controller activates the buzzer whenever there is any fault appears in any of the channel.

PIEZO ELECRTIC BUZZER:

It is a device that converts electrical signal to an audible signal (sound signal). The Microcontroller cannot drive directly to the buzzer, because the Microcontroller cannot give sufficient current to drive the buzzer for that we need a driver transistor (BC547), which will give sufficient current to the buzzer. Whenever a signal received to the base of the transistor through a base resistance (1.5k) is high, the transistor comes to saturation condition i.e., ON condition thus the buzzer comes to on condition with an audible sound. Similarly, whenever the signal is not received to the base of the transistor, thus the transistor is in cut-off state i.e., is in OFF state thus the buzzer does not gets activated.



* Resistor to do charging and discharging to a piezoelectric element (Value of about 1kΩ is good efficiency).

I) AUTOMATIC STREET LIGHT CONTROLLER

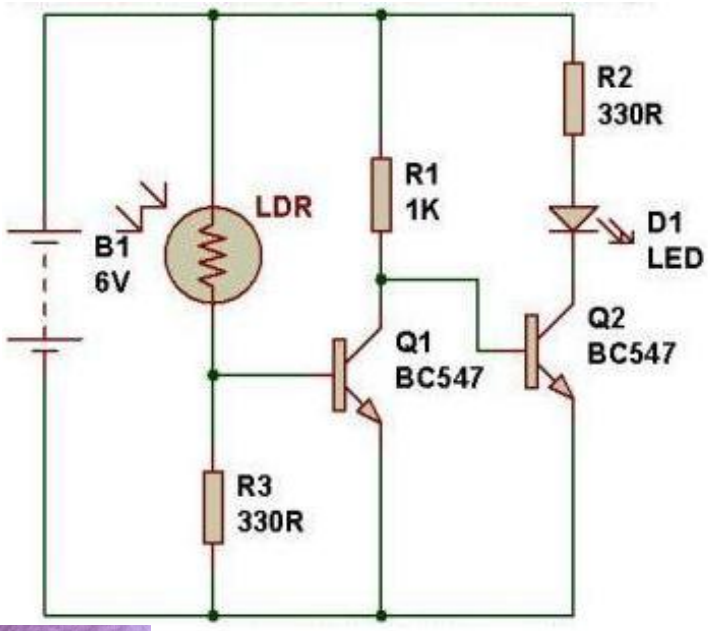
A yard light controller is one of such home automation devices. The device automates the lights connected in the yard i.e., outside and around the house. This put on the light and the dusk and put off the light in the morning. This product saves energy and also carries out routine work without any attention. This device can be used for home automation, glow signboards etc.

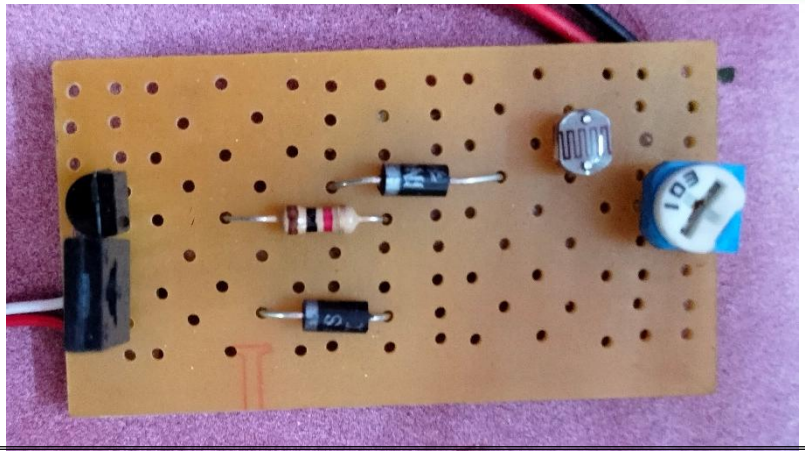
Design principle of Street light controller

These device works on the principle of light dependent resistor. The LDR - light dependent resistance is a semiconductor material which is used as a detector for light intensity. The LDR is connected as a voltage divider with a variable resistance. Once the LDR is exposed to light, then the resistance of the LDR changes as per the intensity of light. The voltage developed by the divider network (correspond the light intensity sensed at the sensor) is feed to two transistors where it compared with reference voltage (correspond the limiting value of the light intensity). If the sensed light intensity is less than the set value intensity then the yard light is switched on else the yard light is switched off.

Components List:

- ✓ BC547 -2 Transistor
- ✓ LDR
- ✓ 220-ohm, 1k Resistor
- ✓ 330e Resistor
- ✓ LED 5mm
- ✓ 1N4007 Diode
- ✓ 9v battery and snap
- ✓ PCB





4.Code-

```
#include <ESP8266WiFi.h>
//https://www.electronicwings.com/nodemcu/control-home-appliances-using-google-assistant
#include "Adafruit_MQTT.h"
#include "Adafruit_MQTT_Client.h"
#define tp          A0
#define rain        D4
#define Relay1      D0
#define Relay2      D1
#define Relay3      D2
#define Relay4      D3
int buzzer = D5; //17 pin
int voltageR1,voltageR2=0;
#define WLAN_SSID       "project1"          // Your SSID
#define WLAN_PASS       "Project1234"       // Your password

/************************* Adafruit.io Setup *********************************/
#define AIO_SERVER      "io.adafruit.com"
#define AIO_SERVERPORT  1883                   // use 8883 for SSL
#define AIO_USERNAME    "iothome55"            // Replace it with your username
#define AIO_KEY         "aio_jyKO8274CSwqXl58FIcg0RF8afdx"   // Replace with your Project Auth Key

/************ Global State (you don't need to change this!) ******************/
// Create an ESP8266 WiFiClient class to connect to the MQTT server.
WiFiClient client;
// or... use WiFiFlientSecure for SSL
//WiFiClientSecure client;
// Setup the MQTT client class by passing in the WiFi client and MQTT server and login details.
Adafruit_MQTT_Client mqtt(&client, AIO_SERVER, AIO_SERVERPORT, AIO_USERNAME, AIO_KEY);

/****************************** Feeds ***************************************/
// Setup a feed called 'onoff' for subscribing to changes.
Adafruit_MQTT_Subscribe Light1 = Adafruit_MQTT_Subscribe(&mqtt, AIO_USERNAME"/feeds/light"); // FeedName
Adafruit_MQTT_Subscribe Fan1 = Adafruit_MQTT_Subscribe(&mqtt, AIO_USERNAME"/feeds/fan"); // FeedName
Adafruit_MQTT_Subscribe Door1 = Adafruit_MQTT_Subscribe(&mqtt, AIO_USERNAME"/feeds/door");
Adafruit_MQTT_Publish party1 = Adafruit_MQTT_Publish(&mqtt, AIO_USERNAME "/feeds/party1");
Adafruit_MQTT_Publish party2 = Adafruit_MQTT_Publish(&mqtt, AIO_USERNAME "/feeds/party2");
```

```
void MQTT_connect();
uint16_t party1value,sw1 = 0;
char p1v[20]= "0";
char p2v[20]= "0";
char winner[20] = "NIL";
int updatei=0;
String rp1value;
String rp2value;
String rpartywon;
void setup() {
  Serial.begin(115200);
   pinMode(buzzer,OUTPUT);
    pinMode(rain,INPUT_PULLUP);
  pinMode(Relay1, OUTPUT);
   pinMode(Relay2, OUTPUT);
    pinMode(Relay3, OUTPUT);
    pinMode(Relay4, OUTPUT);
     digitalWrite(buzzer,LOW);
     digitalWrite(Relay1, LOW);
   digitalWrite(Relay2, LOW);
    digitalWrite(Relay3, HIGH);
     digitalWrite(Relay4, HIGH);
  // Connect to WiFi access point.
  Serial.println(); Serial.println();
  Serial.print("Connecting to ");
  Serial.println(WLAN_SSID);
  WiFi.begin(WLAN_SSID, WLAN_PASS);
  while (WiFi.status() != WL_CONNECTED) {
    delay(500);
    Serial.print(".");
  }
  Serial.println();
  Serial.println("WiFi connected");
  Serial.println("IP address: ");
  Serial.println(WiFi.localIP());
  // Setup MQTT subscription for onoff feed.
  mqtt.subscribe(&Light1);
   mqtt.subscribe(&Fan1);
    mqtt.subscribe(&Door1);
}
void loop() {
  MQTT_connect();
  voltageR1 = analogRead(tp);
  voltageR2 = map (voltageR1,0,1023,100,0);
  rp1value = voltageR2;
  rp2value = 0;
```

```
 if(voltageR2>50)
 {
   digitalWrite(buzzer,HIGH);
delay(1000);
}
sw1=digitalRead(rain);
if(sw1==LOW)
{
   digitalWrite(buzzer,HIGH);
 rp2value = 100;
delay(1000);
}
 else {
digitalWrite(buzzer,LOW);
  }
  if(updatei==0){
  updateparty();;
  updatei=1;
}
Serial.print(F("PARTY 1 COUNT: ")); Serial.println(rp1value);
Serial.print(F("PARTY 2 COUNT: ")); Serial.println(rp2value);
 delay(500);
 rp1value.toCharArray(p1v, rp1value.length() + 1);
 rp2value.toCharArray(p2v, rp2value.length() + 1);
 delay(500);
  updateparty();
  delay(5000);
Adafruit_MQTT_Subscribe *subscription;
while ((subscription = mqtt.readSubscription(5000))) {
  if (subscription == &Light1) {
    Serial.print(F("Got: "));
    Serial.println((char *)Light1.lastread);
    int Light1_State = atoi((char *)Light1.lastread);
    digitalWrite(Relay1, !(Light1_State));
  }
   if (subscription == &Fan1) {
    Serial.print(F("Got: "));
    Serial.println((char *)Fan1.lastread);
    int Fan1_State = atoi((char *)Fan1.lastread);
    digitalWrite(Relay2, !(Fan1_State));
  }
   if (subscription == &Door1) {
    Serial.print(F("Got: "));
    Serial.println((char *)Door1.lastread);
    int Door1_State = atoi((char *)Door1.lastread);
    digitalWrite(Relay3, LOW);
```

```
      delay (1000);
       digitalWrite(Relay3, HIGH);
       delay (2000);
       digitalWrite(Relay4, LOW);
      delay (1000);
       digitalWrite(Relay4, HIGH);
    }
  }
}
void MQTT_connect() {
  int8_t ret;
  // Stop if already connected.
  if (mqtt.connected()) {
    return;
  }
  Serial.print("Connecting to MQTT... ");
  uint8_t retries = 3;
  while ((ret = mqtt.connect()) != 0) { // connect will return 0 for connected
    Serial.println(mqtt.connectErrorString(ret));
    Serial.println("Retrying MQTT connection in 5 seconds...");
    mqtt.disconnect();
    delay(5000);  // wait 5 seconds
    retries--;
    if (retries == 0) {
      // basically die and wait for WDT to reset me
      while (1);
    }
  }
  Serial.println("MQTT Connected!");
}
void updateparty() {
  if (!party1.publish(p1v)) {
    Serial.println(F("PARTY 1 Failed"));
  } else {
    Serial.println(F("PARTY 1 OK!"));
  }
 if (!party2.publish(p2v)) {
    Serial.println(F("PARTY 2 Failed"));
  } else {
    Serial.println(F("PARTY 2 OK!"));
  }
}
```

5.Future Expansion-

This project has a vast field for expansion. The controller is designed with latest technology of communication and control. This project is designed with constraint of time and cost. This project can be modified and expanded in the following fields,

- The controller can be interfaced to with sensor to send back the information to the user regarding its initial position.
- The music generator can be replaced with multiple voice stack. So, a status message can be sent back to the user.
- Multiple devices can be controlled by single command.
- A timer base control unit can be developed so that ON TIMER and OFF TIMER can be implemented.
- A SMS base protection system or security system can be combined with this Design.

6.Conclusion –

In conclusion, our project on "IOT-based Home Automation System" has successfully achieved the goal of creating an efficient and user-friendly solution for home automation. Through careful planning and implementation, we have developed a scalable and modular system that enhances convenience, energy efficiency, and security for homeowners.

The functionalities of remote fan and light control, remote door automation, rain detection, trace passing alarm using LDR, and automatic street light control using LDR sensors have provided homeowners with greater control and safety. Our user-friendly interface allows for easy monitoring and management of the system.

The system operates reliably with proper error handling and fault tolerance mechanisms in place. Data logging and analytics capabilities offer insights for system optimization and user behaviour analysis.

Overall, our project demonstrates the practicality and effectiveness of IoT-based home automation. We acknowledge potential future enhancements, such as integrating additional devices and exploring advanced analytics.