Smart Lighting System and Security for Smart-Home

Major Project Report (IOT-2083)

Bachelor of Technology

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CERTIFICATE

This is to certify that the Case Study Project Report entitled as "**Smart Lighting System and Security for Smart Home** " submitted by, Vishal Singh (0108IO211064), in the partial fulfilment of the requirements for the award of degree of Bachelor of Technology in the Specialization of Internet Of Things (IOT) from Samrat Ashok Technological Institute , Vidisha (M.P.) is a record work carried out by him under my supervision and guidance. The matter presented in this report has not been presented by them elsewhere for any other degree.

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CANDIDATE’S DECLARATION

I, Vishal Singh (0108IO211064), hereby declare that the work which is being presented in the Project entitled “**Smart Lighting System and Security for Smart Home**” submitted in partial fulfilment of the requirement for the award of the degree of Bachelor in Technology. The work has been carried out at Samrat Ashok Technological Institute, Vidisha is an authentic record of my own work carried out under the guidance of Dr. S.K. Shrivastava , Department of Information and Technology , SAMRAT ASHOK TECHNOLOGICAL INSTITUTE, VIDISHA
(M.P.) The matter embodied in this report has not been submitted by us for the award of any other degree.

Date: 25/04/2025

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IOT BASED SMART HOME AUTOMATION

Abstract

The project proposes an efficient implementation for IOT (Internet of Things) used for monitoring and controlling the home appliances via World Wide Web. Home automation system uses the portable devices as a user interface. They can communicate with home automation network through an Internet gateway, by means of low power communication protocols like Zigbee, Wi-Fi etc. This project aims at controlling home appliances via Smartphone using Wi-Fi as communication protocol and raspberry pi as server system. The user here will move directly with the system through a web-based interface over the web, whereas home appliances like lights, fan and door lock are remotely controlled through easy website. An extra feature that enhances the facet of protection from fireplace accidents is its capability of sleuthing the smoke in order that within the event of any fireplace, associates an alerting message. The server will be interfaced with relay hardware circuits that control the appliances running at home. The communication with server allows the user to select the appropriate device. The communication with server permits the user to pick out the acceptable device. The server communicates with the corresponding relays. If the web affiliation is down or the server isn't up, the embedded system board still will manage and operate the appliances domestically. By this we provide a climbable and price effective Home Automation system.

highlights of projects

1:-Touch switch based lighting .

2:-Mobile operated lighting system.

3:-visitor counter based lighting system.

4:-automated street lighting system.

5:-lgp leakage detection system.

6:-fire alert system.

7:-iot based data monitoring system.

1. INTRODUCTION

The Internet of Things (IOT) is still in its infancy and as such there is not yet a consistent all embracing definition of it. However at the most simplistic level it relates to the connection of a variety of devices to the Internet and the Machine-to Machine (M2M) interfaces used between these devices. These interfaces will provide new opportunities through the additional sharing of data from the devices to inform government processes and services. One of the earliest examples of this can be seen in the Health domain and the TGF Health Profile v1.0 highlights how there is an increasing use of remote sensors and devices in the provision of Home and Community healthcare. Depending on who you talk to, the Internet of Things (IOT) is defined in different ways, and it encompasses many aspects of life—from connected homes and cities to connected cars and roads (yes, roads) to devices that track an individual's behavior and use the data collected for "push" services. Some mention one trillion Internet-connected devices by 2025 and define mobile phones as the "eyes and ears" of the applications connecting all of those connected "things." Depending on the context, others give examples that are less phone-centric, speak of a class of devices that do not exist today or point to Google's augmented-reality smart glasses as an indication of things to come. Everyone, however, thinks of the IOT as billions of connections (a sort of "universal global neural network" in the cloud) that will encompass every aspect of our lives. All of this public discussion suggests the IOT is finally becoming a hot topic within the mainstream media. Many recent articles point to the IOT as the interaction and exchange of data (lots of it) between machines and objects, and now there are product definitions reflecting the same concept.

CHAPTER 2
INTERNET OF THINGS (IOT)

2.1 INTERNET OF THING(IOT)

Internet of Things (IOT) is an big concept in the technology world. We want more succour in our life. nowaday Internet has became a most important part in our life. This IOT is depend on cooperation of consolation and Internet . IOT is a network of physical devices connected to each other for exchange of data and information through sensors & actuators. These actuators & sensors are implant on to these devices which allow them to exchange data . In easy language, IOT means the devices which is connect to the internet to make our life so simple. The things is called internet of things devices like cameras, sensors, chips or such more physical devices.IOT is pass to be an essential part of our life in an future. By IOT, isolated remote objects can be controlled on this network. You catch about to smart homes. The smart homes ideaa is based on Internet of Things. But IOT is not complete yet to particular home as there are various applications of IOT whereas smart.IOT covers a dicided number of domains, protocols and applications. There shall be advanced communication between the devices with better connectivity & services. The embedded devices should provide future automation in almost every area ranging from house to cities. These devices collect crucial information employing newest technologies and then exchange this information to other devices. 16 years of internet of thing has passed still the actual idea was to connect devices since the 80s. The idea was known as submerged data . The Internet of Things was identified by Kevin Ashton in the year of 1999 then work doing by Procter and Gamble. Ashton which work in the area of supply chain optimization and desired to attract senior management's attention to a new exciting technology which is called as RFID

IOT lifecycle which is based on the following phases :

- Create –The physical devices which work to collect information from its surroundings which can be used for insights.
- Communicate –The assemble data is transferred to the desired location through the network.
- Aggregate –The devices cluster the assemble data.
- Analyze –The cluster data is analyzed to generate some patterns.
- Act – This is based on the information, compatible actions are performed

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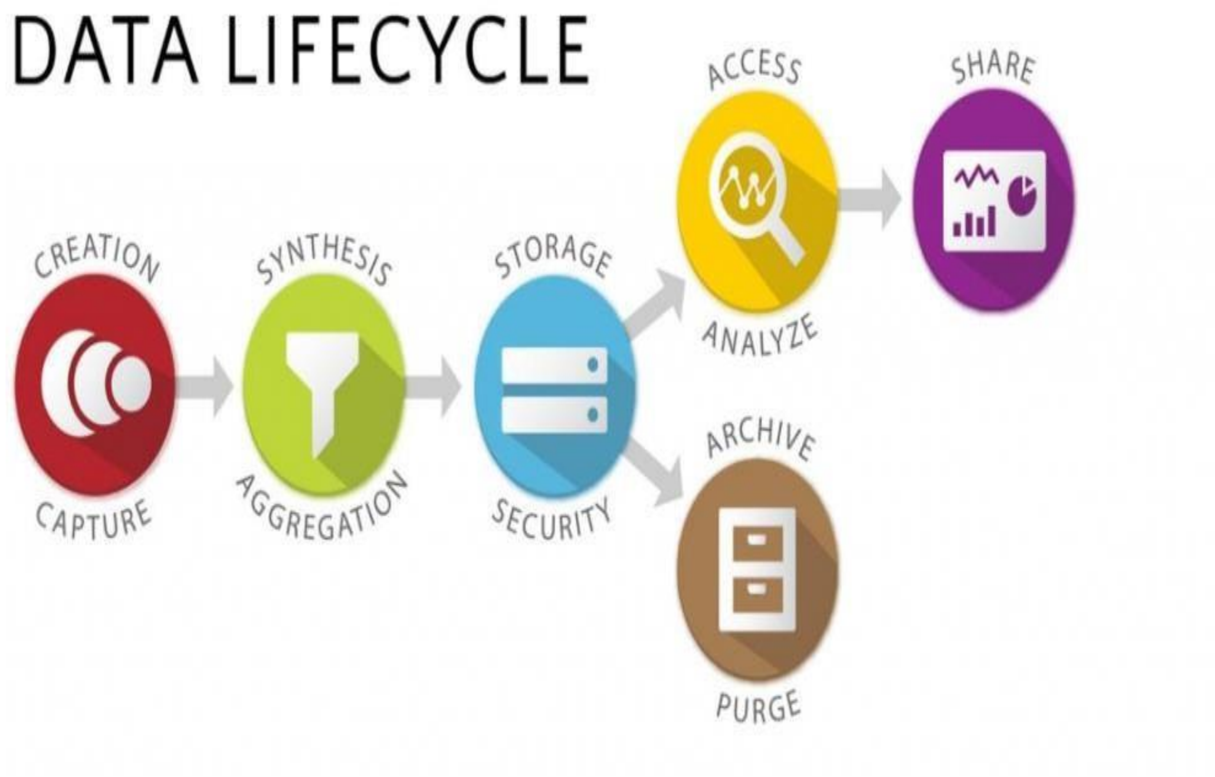

Figure 2.1 Iot Life Cycle Phase

2.2 Iot Architecture:

IOT architecture layers following are :

- IOT Device Layer (The client side)
- IOT Getaway Layer (Operators on the server side)
- IOT Platform Layer (A pathway for connecting clients and operators)

The architecture of IOT is mainly referred to as four-stage :

Stage 1 includes the sensor & actuator.

Stage 2 includes the congregation systems and analog-to-digital converter.

Stage 3 data has processed is done by some technology.

Stage 4 data is collected to data center systems.

Stage 1 : Networked Thing

In the first stage, the data is aggregated by the sensors from the adjoining environment or from an object and exchange into useful one. An actuator also behave according to the change in physical conditions. The sensors & actuators are used in almost every field from industries to hospital. The oppourtunity of IOT is increasing bit by bit according to the behest. The processing capacity of IOT devices is bounded. The data can be refined at the sensor.

Stage 2 : Sensor Data Aggregation Systems & Analog-To-Digital Data Conversion

In the second stage, there is the internet gateway. The data assembled by the sensors is in signal form. It is converted in digital format use by data acquisition systems(DAS) for further preparing. The DAS operate analog to digital conversions along with association of data. The Internet gateway obtaining this clumped and computerized data and provide routing for it over the wireless or wired network. The analog data is converted in ducktail one as the analog streams create extra volumes of data. Also the analog data requires specialized softwares for transforming based on its timings and structures.

Stage 3 : The Appearance Of Edge It Systems

After the data is digitized and clumped, this enters to the third stage for more altering. IT systems behave this manu paliting through explained analysis. These IT systems more oftenly edge IT systems may be at off white at on white. This is firmly linked to the old phases in the building of an Architecture of IOT. as a result of the venue of edge IT systems is near to the one where sensors & actuators are creating ,situated a wiring closet. Similarly, the settling in remote offices is too possible.

Stage 4 : Analysis, storage of data and management

It is the stage in which the data is stored at data base and cloud. The data don't require immediate report and requires more detailed processing is transferred to data centers which have more advanced IT systems to perform fully analysis. This kind of handle takes place on the situation. Different IOT devices have distinct architecture.

2.3 Characteristic Of Internet Of Things(Iot) :

- IOT Intelligence
- IOT Connectivity
- IOT Dynamic Nature
- IOT Enormity
- IOT Sensing
- IOT Diversity
- IOT Security

2.3.1 IOT Intelligence – It is a combination of hardware and software along with complex algorithms and reckoning. The potential of IOT is enhanced due to its intelligence which enable them to respond and act according to the condition. The interplay between different devices is only because of its intelligence.

2.3.2 IOT Connectivity – Connectivity in IOT enables it to connect various quatidin use objects. This offering to overall intelligence of IOT network. This furthermore makes way for new market opportunities by creating network of smart objects & applications. besides, the mesh will be spare obtainable and compatible.

2.3.3 IOT Dynamic Nature – IOT devices hook data from its adjoining environment. This is gone by the dynamic changes that take place around these devices. The plight of IOT devices change dynamically like connected or disconnected and also due to temperature, speed and location. .

2.3.4 IOT Enormity – In the close future, the numerics of devices connected to the network for communication will be much larger than it is this day.It will became complex to manage and handle data from these gadget. A emblem propose that more than 4 million latest devices are connected every day and the number is only going to increase.

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2.3.5 IOT Sensing – This play an important parts in IOT without which the changes in the environment cannot be detected and uniformed. These sensors interplay with the encircling to detect and gather data. The information that is touched by the transmitter is basically the input from the environment that can provide some valuable information.

2.3.6 IOT Diversity – Diversity or heterogeneity is one of the important characteristics of IOT. The IOT devices have unlike hardware platforms and network and they are capable to communicate with other devices through different networks. The IOT network is capable to support connectivity in dissimilar networks. The requirements for this diversity is modularity, extensibility, scalability and interoperability.

2.3.7 IOT Security – in present scenario there are some security and privacy issues with IOT network which with more development in this field will be faded. It is most important to secure data while it is being transferred between devices.

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2.4 Application Of Internet Of Thing(Iot):

The applications of IOT technologies are various, because it is adjustable to many technology that is capable of providing relevant information about its, the execution of an activity and even about the environmental conditions that we ought to monitor and control at a distance.

2.4.1. Wearables

Virtual glasses, fitness bands to monitor for example calorie expenditure and heartrate, or GPS tracking belts, are some example of wearable devices that we have been using for some time now. Companies such as Google , Samsung and apple others have developed and introduce the Internet of Things and the application there of into our daily lives.

These are small and energy systematic devices, which are equipped with sensors, with the necessary parts for measurements and readings, and with software to collect and organize data and information

2.4.2. Health

The use of sensors associated to suffer, allow doctors to monitor a sickperson condition outside the hospital and in real-time. Through continuously watching certain metrics and automatic alerts on their crucial signs, the Internet of Things assist to improve the care for patients and the prevention of lethal events in high-risk patients. Another profit is the integration of IOT technology is hospital beds, giving way to smart beds, have with special sensors to observe vital signs, blood pressure, oximeter and body temperature, etc.

2.4.3. Traffic monitoring

The Internet of things can be too useful in the management of vehicular traffic in large cities, contributing to the concept of smart cities. When we use our smart phones as sensors, which collect and share data from our vehicles through applications such as Waze or Google navigator, we are using the Internet of Things to inform us and at the same time contribute to traffic monitoring, showing the result of the different routes, and stuff and improving the information on the different routes to the same destination, distance, estimated time .

2.4.4. Agriculture

The quality of soil is crucial to make good quality of crops, and the Internet of Things give farmers the possibility to access detailed knowledge and valuable information of their soil condition.By the implementation of IOT sensors, a notable amount of data can be obtained on the state and rank of the soil. Information such as soil moisture stage, the presence of certain nutrients , level of acidity temperature and many chemical characteristics, helps farmers to control irrigation, make water uses more efficient, explain the best times to start sowing, and even locate the presence of diseases in plants and soil.

2.4.5. Hospitality

The application of the IOT to the hospital industry brings with it interesting improvements in the quality of the service. With the fulfillment of electronic cues, which are sent at first hand to the mobile devices of each guest, it is possible to automate various interactions. Thus, the location of the visitor, the sending of proffer or information on occupation of interest, the awareness of orders to the room or *room_service* , the robotic charge of accounts to the room or the request of personal hygiene supplies, are persuit that can be easy way to managed through integrated applications .

2.5 FUTURE APPLICATION OF IOT

2.5.1 Gesture Control Armband

A wearable device unlikely , the gesture power armband senses muscle activities so that you can control any device connected to the IOT infrastructure just with your motion or signing. The armband is supplied with electrodes to detect muscle activity and detect contraction and relaxation of them when the hand is in movement. These motion are then redirected to software at the backend that decodes and translates them into commands and achieve the action. Imagine existence on the shoes of Tony Stark and just pointing at your tablet’s screen to open and close apps

2.5.2 Smart Glass

This application proves that the application of the IOT technology need not always be preempted to something massive or global but something as minute as personal care can make tremendous impact on us. For those of you who don't swallow adequate water day to day, these glasses can be our reminder calls. The glass monitors your water utilization and frequently reminds you to have aqua. Apart from this, it can sense the prevailing temperatures and maintain appropriate temperatures of the aqua. Once you identify the device to your smart-phone.

2.5.3 Smart Eye

A device straight from the Iron Man movies! The smart eye technology is very similar to Google's most ambitious work – the Glass. This technology is furnished with sensors and connectivity options from Wi-Fi to Bluetooth to provide many benefit and accessibility features right in front of your eye but without cause anything. You can open navigator, read mails or messages, browse the internet, capture moments and do more with these futuristic glasses.

2.5.4 Smart Farming

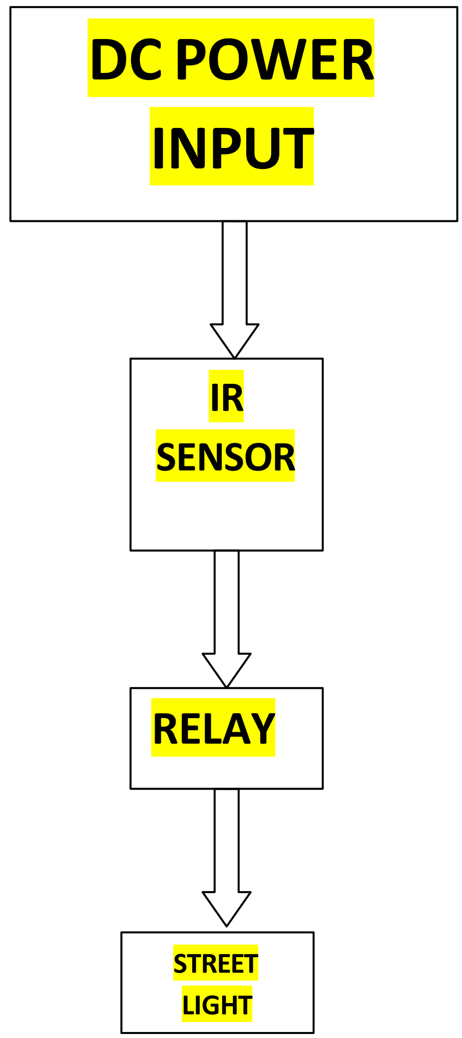
Technology that doesn't set out basic purposes or doesn't work on grass-root level concerning and Occuring as an perfect solution to some extending concerns in agriculture is smart farming, locus the application of IOT devices and ecosystem will enable farmers to knows more information about their crops yields, infestation of pests, rainfall ,soil nutrition and more for them to take any corrective measures. This also gives them ideas on modified farming techniques acquise to prevailing conditions to make the best harvest. Though this technology is a game changer, we require to work more on implementing at the right places and educating farmers about it.

2.5.5 Tier Air Pressure Detection

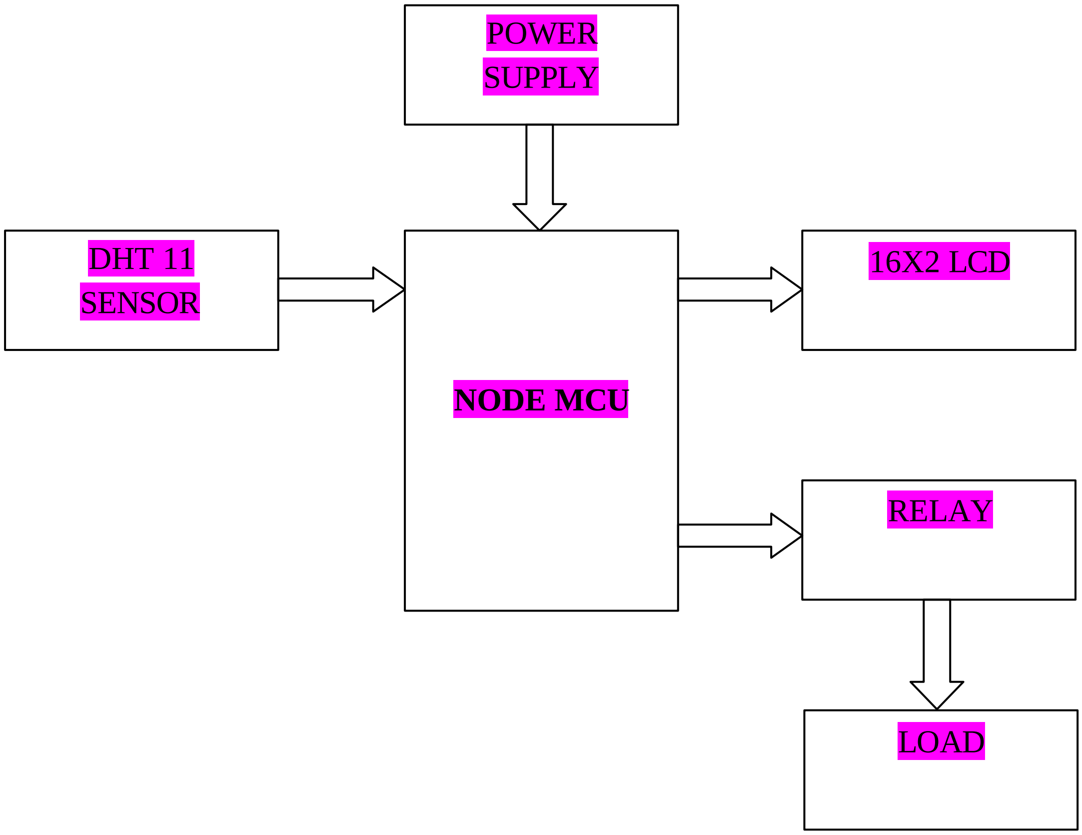
This is one of the most unique utilization of IOT, where in the technology can sense the air pressure in your car tiers and give you information on under inflation. In this technology, the detector are embedded on the tiers which detect drops in air pressures and immediately send out signals to take appropriate actions. This technology is built with an intention to foster safer handling conditions, where too people can be warned of under-inflated tiers.

3:-BLOCK DIAGRAM

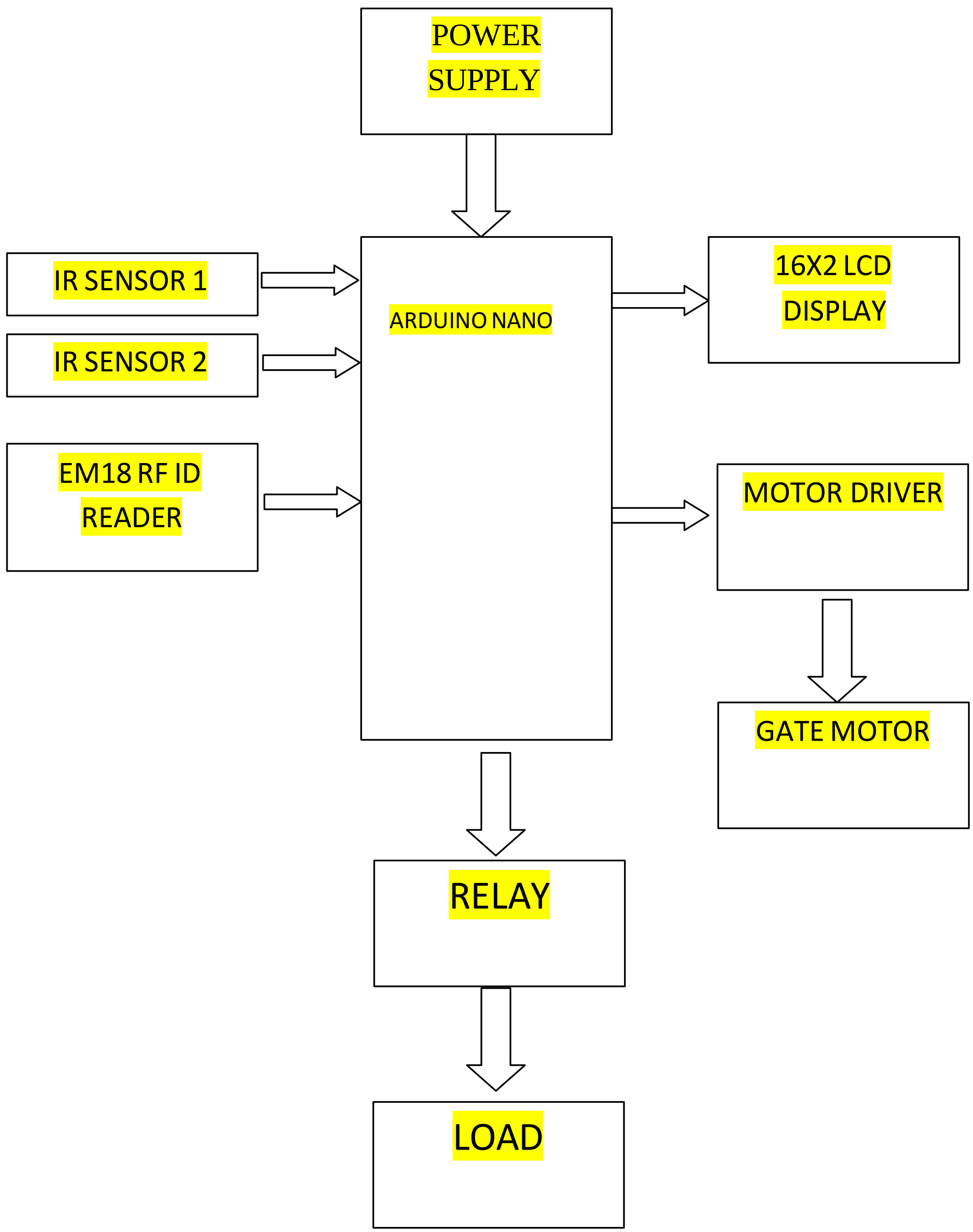
1:-Block Diagram For Auto Street Lighting



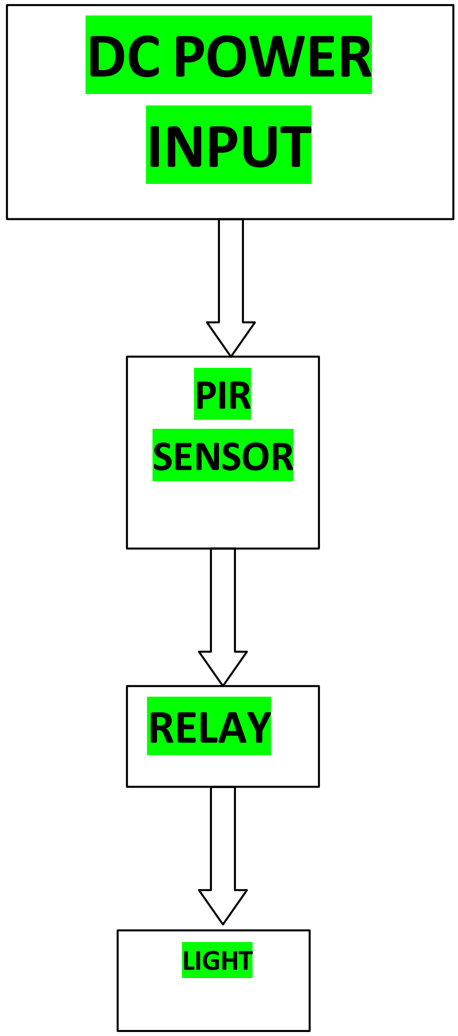
2:-Block Diagram Of Iot Based Load



3:-Block Diagram Of Counter Based light and door opening system

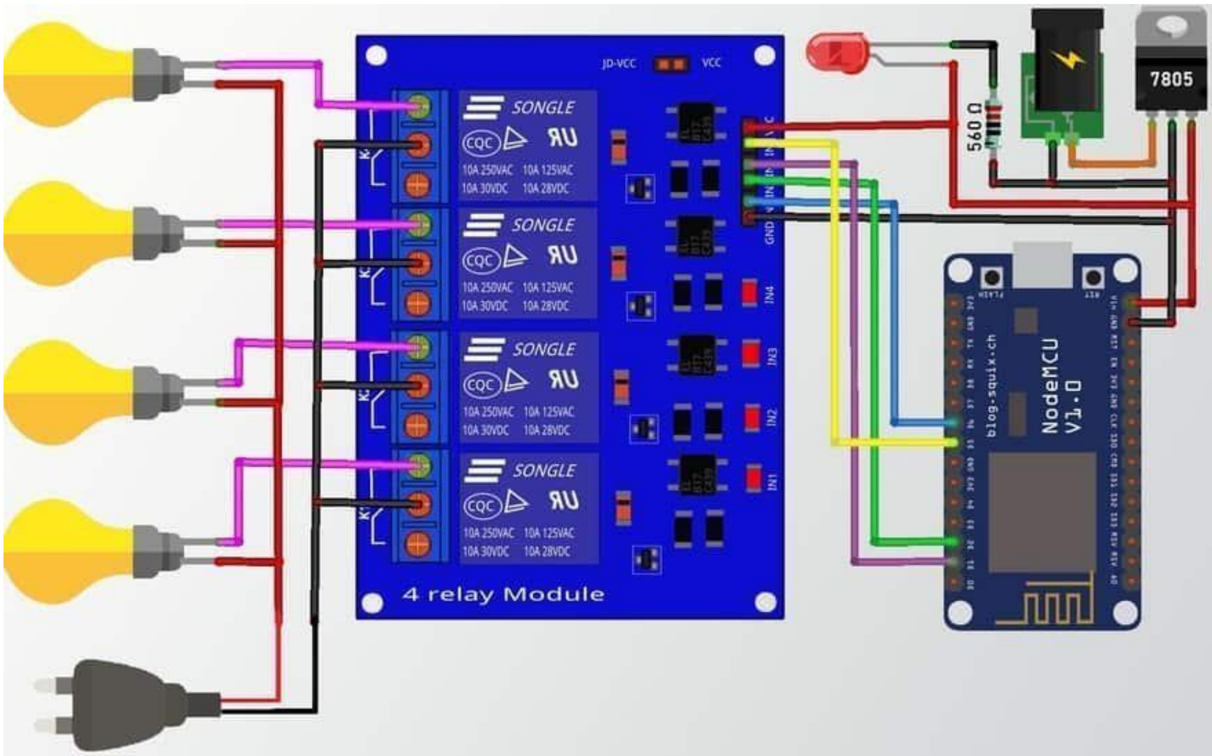


4:-Block Diagram Of PIR Sensor Based Lighting



4:-Circuit And Software Use In Project

1:IOT BASED HOME AUTOMATION



4.2 Program Use In Project

1:-CODE FOR IOT BASED HOME AUTOMATION

```
//#define BLYNK_TEMPLATE_ID "TMPL3zqlWhd6q"
//#define BLYNK_TEMPLATE_NAME "iot home automation"
//#define BLYNK_AUTH_TOKEN "xOvYAVuPAZT0dcz12823cWRLPKPxDq7k"

#define BLYNK_TEMPLATE_ID "TMPL3JKyRAlEB"
#define BLYNK_TEMPLATE_NAME "IOT BASE HOME AUTOMATION"
#define BLYNK_AUTH_TOKEN "hAKsIX8WC3B5ZYrnwLK9e80UOp-RAHcL"



#include <LiquidCrystal_I2C.h>
LiquidCrystal_I2C lcd(0x27, 16, 2); // 0x3F
#include <Wire.h>

#define BLYNK_PRINT Serial
#include <ESP8266WiFi.h>
#include <BlynkSimpleEsp8266.h>

#define A D0
#define B D1
#define C D2
//#define D D8
```

```
int c1=0;
int c2=0;
int c3=0;
//int            c4=0;
#include "DHT.h"
#define DHTPIN D5
#define DHTTYPE DHT11

char auth[] = BLYNK_AUTH_TOKEN;
char ssid[] = "data";
char pass[] = "data1234";

void lcd_startup()
{
  lcd.clear();
  lcd.setCursor(0, 0);
  lcd.print("IOT BASED SMART");
  lcd.setCursor(0, 1);
  lcd.print("HOME AUTOMATION");
delay(2000);
}
```

```
BLYNK_WRITE(V0)

{
  bool value1 = param.asInt();
  // Check these values and turn the A ON and OFF
  {
    digitalWrite(A, 1);
    c1=1;

    delay(100);
  }
  else
  {
    digitalWrite(A, 0);
    c1=0;

  }
}

//Get the button values
BLYNK_WRITE(V1) {
  bool value2 = param.asInt();
  // Check these values and turn the B ON and OFF
  if (value2 == 1) {
```

```
    digitalWrite(B, 1);
   c2=1;


    delay(100);
  }
  else
  {


    digitalWrite(B, 0);
   c2=0;


  }
}



BLYNK_WRITE(V2) {
  bool value3 = param.asInt();
  // Check these values and turn the B ON and OFF
  if (value3 == 1)
  {



    digitalWrite(C, 1);
  c3=1;
```

```
    delay(100);
  }
  else
  {

    digitalWrite(C, 0);
   c3=0;

  }
}

/*

BLYNK_WRITE(V3) {
  bool value4 = param.asInt();
  // Check these values and turn the B ON and OFF
  if (value4 == 1) {

    digitalWrite(D, 1);
   c4=1;
    delay(100);
  }
  else
  {
```

```
    digitalWrite(D, 0);
  c4=0;
  }
}
*/

void setup()
{
 Wire.begin(2,0);



  //Set the relay pins as output pins
 // pinMode(1, FUNCTION_3);
 // pinMode(3, FUNCTION_3);

  pinMode(A, OUTPUT);
  pinMode(B,  OUTPUT);
  pinMode(C, OUTPUT);
  //pinMode(D, OUTPUT);
digitalWrite(A, LOW);
digitalWrite(B, LOW);
digitalWrite(C, LOW);
//digitalWrite(D,  LOW);
```

```
lcd.init();

lcd.backlight();

Serial.begin(9600);

dht.begin();

//Serial.begin(9600);

Blynk.begin(auth, ssid, pass);


}



void loop()


{

float h = dht.readHumidity();

float t = dht.readTemperature();

if (isnan(h) || isnan(t))

  {

    Serial.println(F("Failed to read from DHT sensor!"));

    return;

  }
```

```
lcd.clear();
lcd.setCursor(0, 0);
lcd.print("  L1  L2  L3 ");
lcd.setCursor(0, 1);
lcd.print("  ");
lcd.print(c1);
lcd.print("  ");
lcd.print(c2);
lcd.print("  ");
lcd.print(c3);
delay(1500);

lcd.clear();
lcd.setCursor(0, 0);
lcd.print("Temp:");
lcd.print(t);
lcd.print(" degree");
lcd.setCursor(0, 1);
lcd.print("Humidity:");
lcd.print(h);
lcd.print(" %");
delay(1500);

Blynk.virtualWrite(V3, h);
```

```
Blynk.virtualWrite(V4, t);

}
```

2:-CODE FOR VISITOR COUNTER BASED LIGHTING

```
#include <LiquidCrystal.h>

LiquidCrystal lcd(3,4,5,6,7,8);


#define m11 11
#define m12 12
#define relay1 A0
#define relay2 A1

#define BUZZ 13

#define inp A3
#define oup A2
int count=0;
String a;
void setup()
```

```
{
  pinMode(BUZZ, OUTPUT);
  pinMode(relay1, OUTPUT);
  pinMode(relay1, OUTPUT);
  pinMode(m11, OUTPUT);
  pinMode(m12, OUTPUT);
  pinMode(inp, INPUT);
  pinMode(oup, INPUT);
  Serial.begin(9600);
  lcd.begin(16,2);
  lcd.clear();
  lcd.print("Visitor Counter");
  lcd.setCursor(0,1);
  lcd.print(" based lighit");
  delay(2000);



 digitalWrite(BUZZ,HIGH);
 delay(2000);
 digitalWrite(BUZZ,LOW);
```

```
}

void loop()

{



while(Serial.available())


{
a= Serial.readString();// read the incoming data as string
//Serial.println("STUDENT RFID CARD ");
//Serial.println(a);
lcd.clear();
lcd.print(a);
digitalWrite(BUZZ, HIGH);
delay(1500);
digitalWrite(BUZZ, LOW);

}



if(a=="5A001DC0BB3C")//
```

```
{ a=("0");
 lcd.clear();
 lcd.print("  WELCOME");
 lcd.setCursor(0,1);
 lcd.print(" GATE OPEN");
 digitalWrite(m11,1);
 digitalWrite(m12,0);
 delay(800);
 digitalWrite(m11,0);
 digitalWrite(m12,0);
 delay(4000);
 digitalWrite(m11,0);
 digitalWrite(m12,1);
 delay(800);
 digitalWrite(m11,0);
 digitalWrite(m12,0);
}

if (digitalRead(inp)==0)
{
  IN();
}

else if (digitalRead(oup)==0)
{
```

```
  OUT();
}

 if((count>0)&& (count<=5))
  { digitalWrite(relay1,HIGH);
    digitalWrite(relay2,0);
    lcd.clear();
    lcd.print("PERSON IN THE ");
    lcd.setCursor(0,1);
    lcd.print("ROOM: ");
    lcd.print(count);
    delay(50);
}

if(count>5)
  { digitalWrite(relay1,HIGH);
    digitalWrite(relay2,1);
    lcd.clear();
    lcd.print("PERSON IN THE ");
    lcd.setCursor(0,1);
    lcd.print("ROOM: ");
    lcd.print(count);
    delay(50);
```

```
   }

else if (count<=0)

  { digitalWrite(relay1,LOW);
   lcd.clear();
   lcd.print("NOBODY IN THE ");
   lcd.setCursor(0,1);
   lcd.print("ROOM: ");
   lcd.print(count);
   delay(50);


 }

  }


void IN()
{
   count++;
   lcd.clear();
   lcd.print("Person In Room:");
   lcd.setCursor(0,1);
   lcd.print(count);
```

```
    digitalWrite(BUZZ,HIGH);

    delay(2000);

    digitalWrite(BUZZ,LOW);

   // delay(1500);

}


void OUT()

{

  if (count>=1)

  {count--;}

    lcd.clear();

    lcd.print("Person In Room:");

    lcd.setCursor(0,1);

    lcd.print(count);

    digitalWrite(BUZZ,HIGH);

    delay(2000);

    digitalWrite(BUZZ,LOW);

   // delay(1500);

}
```

3:-CODE FOR ESP32 CAM

```
#include <ESP32Servo.h>

#include "esp_camera.h"

#include <WiFi.h>

Servo myservo;

int pos = 0;

#define servopin 14



// Select camera model

//#define CAMERA_MODEL_WROVER_KIT

//#define CAMERA_MODEL_ESP_EYE

//#define CAMERA_MODEL_M5STACK_PSRAM

//#define CAMERA_MODEL_M5STACK_WIDE

#define CAMERA_MODEL_AI_THINKER


#include "camera_pins.h"


#define RED 13

#define GREEN 2

#define LOCK 4


const char* ssid = "data"; //WiFi SSID

const char* password = "data1234"; //WiFi Password
```

```
void startCameraServer();


boolean matchFace = false;
boolean openLock = false;
long prevMillis=0;
int  interval = 6000;  //DELAY


void setup()
{
myservo.attach(14);
myservo.write(90);
pinMode(LOCK,OUTPUT);
pinMode(RED,OUTPUT);
pinMode(GREEN,OUTPUT);
  digitalWrite(LOCK,LOW);
  digitalWrite(RED,HIGH);
  digitalWrite(GREEN,LOW);


  Serial.begin(115200);
  Serial.setDebugOutput(true);
  Serial.println();


  camera_config_t config;
  config.ledc_channel = LEDC_CHANNEL_0;
  config.ledc_timer = LEDC_TIMER_0;
```

```
config.pin_d0 = Y2_GPIO_NUM;
config.pin_d1 = Y3_GPIO_NUM;
config.pin_d2 = Y4_GPIO_NUM;
config.pin_d3 = Y5_GPIO_NUM;
config.pin_d4 = Y6_GPIO_NUM;
config.pin_d5 = Y7_GPIO_NUM;
config.pin_d6 = Y8_GPIO_NUM;
config.pin_d7 = Y9_GPIO_NUM;
config.pin_xclk = XCLK_GPIO_NUM;
config.pin_pclk = PCLK_GPIO_NUM;
config.pin_vsync = VSYNC_GPIO_NUM;
config.pin_href = HREF_GPIO_NUM;
config.pin_sscb_sda = SIOD_GPIO_NUM;
config.pin_sscb_scl = SIOC_GPIO_NUM;
config.pin_pwdn = PWDN_GPIO_NUM;
config.pin_reset = RESET_GPIO_NUM;
config.xclk_freq_hz = 20000000;
config.pixel_format = PIXFORMAT_JPEG;
//init with high specs to pre-allocate larger buffers
if(psramFound()){
  config.frame_size = FRAMESIZE_UXGA;
  config.jpeg_quality = 10;
  config.fb_count = 2;
} else {
  config.frame_size = FRAMESIZE_SVGA;
```

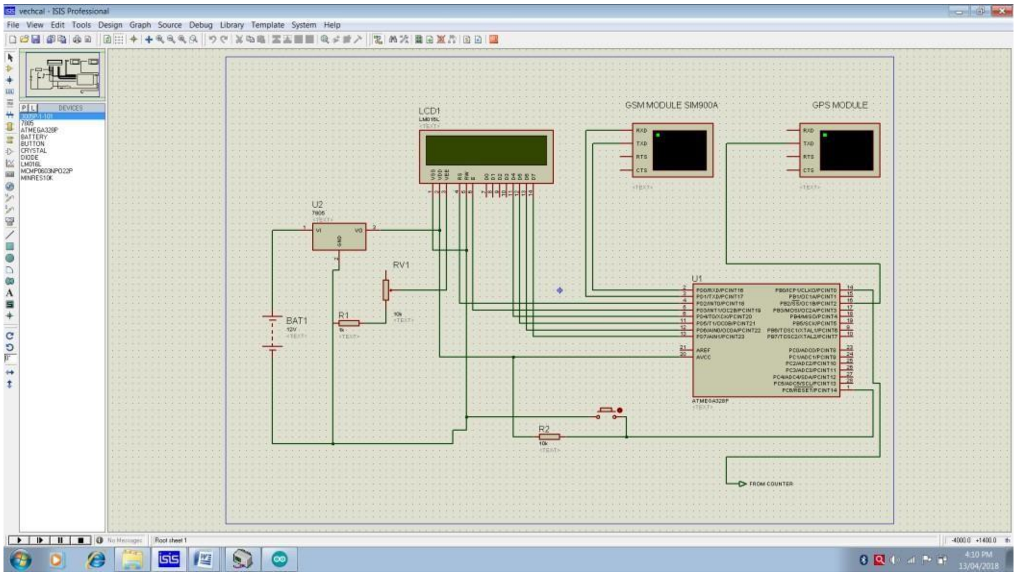
```
    config.jpeg_quality = 12;
    config.fb_count = 1;
  }

#if defined(CAMERA_MODEL_ESP_EYE)
  pinMode(13, INPUT_PULLUP);
  pinMode(14, INPUT_PULLUP);
#endif

  // camera init
  esp_err_t err = esp_camera_init(&config);
  if (err != ESP_OK) {
    Serial.printf("Camera init failed with error 0x%x", err);
    return;
  }

  sensor_t * s = esp_camera_sensor_get();
  //initial sensors are flipped vertically and colors are a bit saturated
  if (s->id.PID == OV3660_PID) {
    s->set_vflip(s, 1);//flip it back
    s->set_brightness(s, 1);//up the blightness just a bit
    s->set_saturation(s, -2);//lower the saturation
  }
  //drop down frame size for higher initial frame rate
  s->set_framesize(s, FRAMESIZE_QVGA);
```

```
#if defined(CAMERA_MODEL_M5STACK_WIDE)
  s->set_vflip(s, 1);
  s->set_hmirror(s, 1);
#endif

  WiFi.begin(ssid, password);

  while (WiFi.status() != WL_CONNECTED) {
    delay(500);
    Serial.print(".");
  }
  Serial.println("");
  Serial.println("WiFi connected");

  startCameraServer();

  Serial.print("Camera Ready! Use 'http://");
  Serial.print(WiFi.localIP());
  Serial.println("' to connect");
}

void loop() {
  if(matchFace==true && openLock==false)
  {
```

```
  openLock=true;
  myservo.write(0);
  digitalWrite(LOCK,HIGH);
  digitalWrite(GREEN,HIGH);
  digitalWrite(RED,LOW);
  prevMillis=millis();
  Serial.print("UNLOCK DOOR");
 }
 if (openLock == true && millis()-prevMillis > interval)
 { myservo.write(90);
  openLock=false;
  matchFace=false;
  digitalWrite(LOCK,LOW);
  digitalWrite(GREEN,LOW);
  digitalWrite(RED,HIGH);
  Serial.print("LOCK DOOR");
  }
}
```

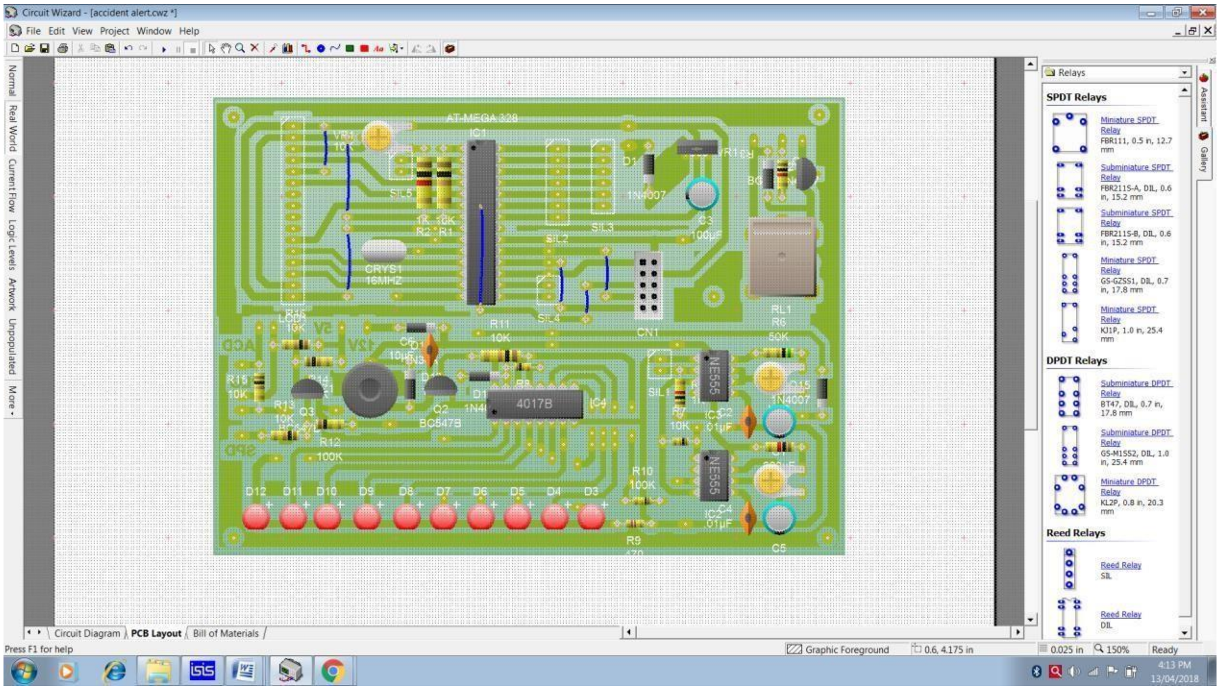
4.3 SOFTWARE USE FOR CIRCUIT DESIGN

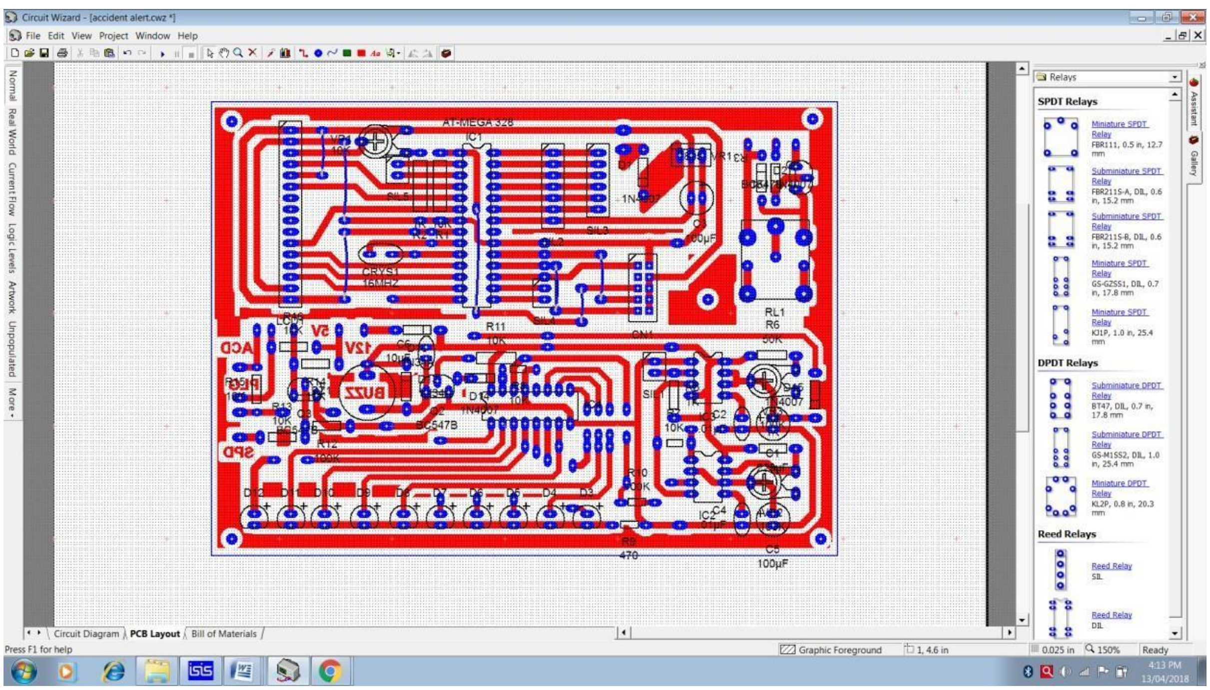
1:-PROTEUS



4.4 SOFTWARE USE FOR PCB LAYOUT DESIGN

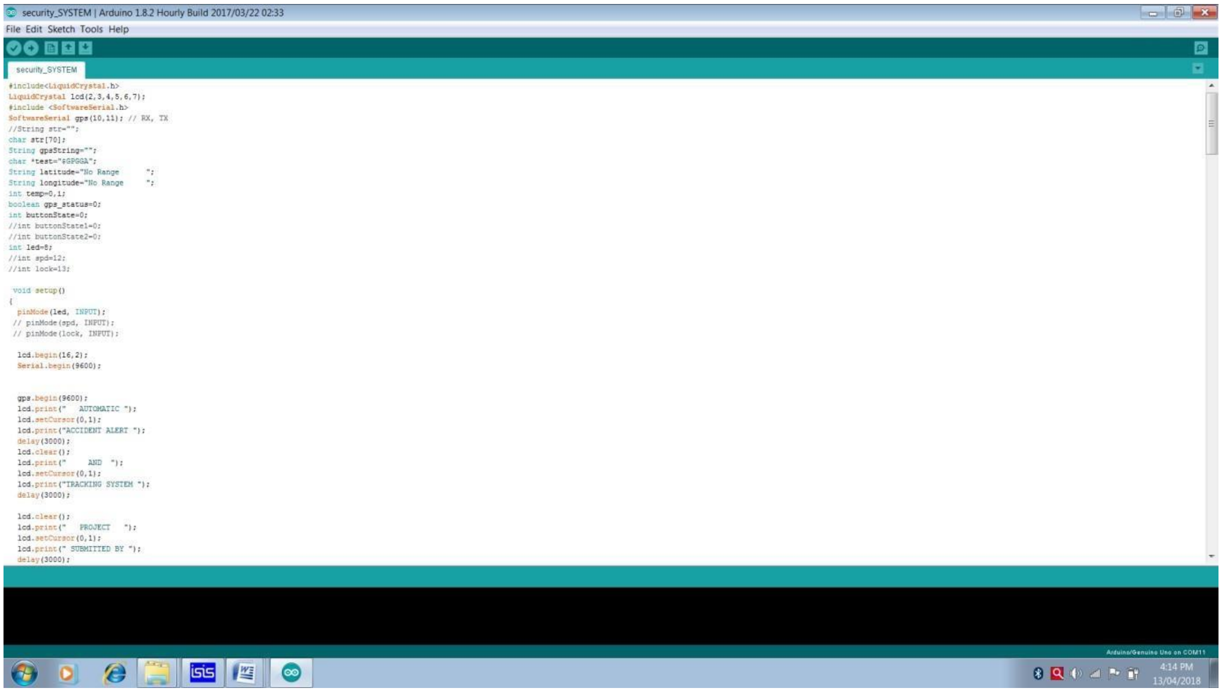
1:-CIRCUIT WIZARD

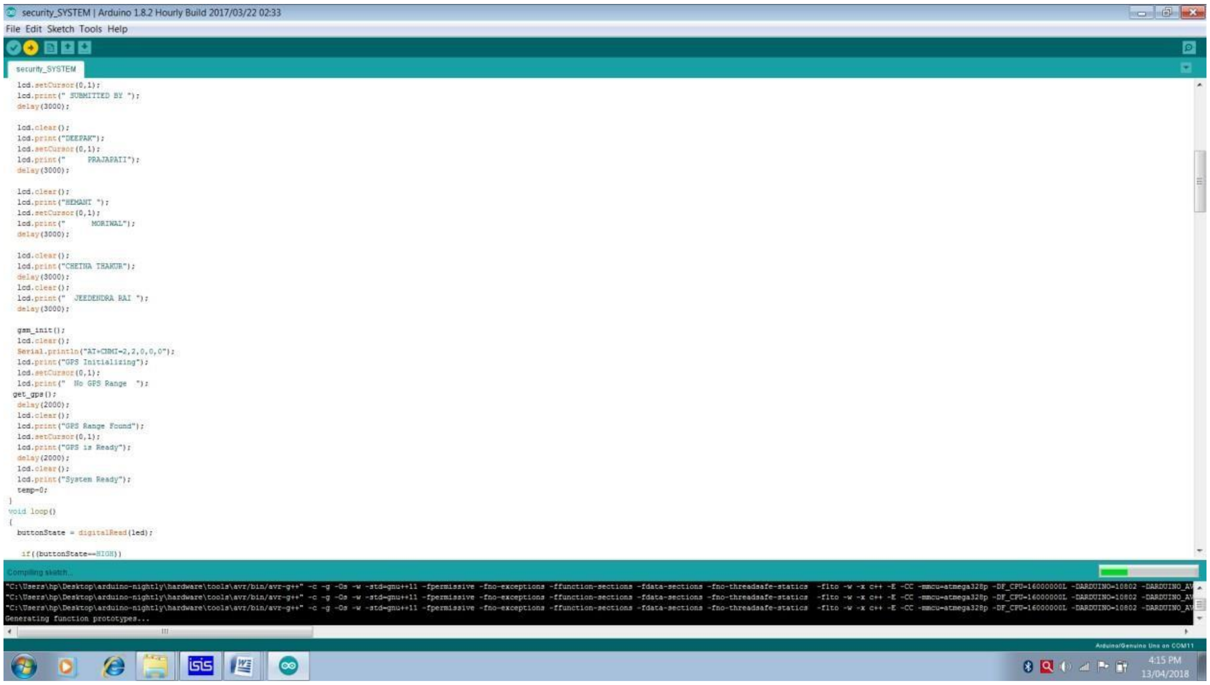




4.5 SOFTWARE USE FOR PROGRAMING

1:-Arduino Id





5:-PRINTED CIRCUIT BOARD DESIGN

A printed circuit board, or PCB, is used to mechanically support and electrically connect electronic components using conductive pathways, tracks or signal traces etched from copper sheets laminated onto a non-conductive substrate. It is also referred to as printed wiring board (PWB) or etched wiring board. A PCB populated with electronic components is a printed circuit assembly (PCA), also known as a printed circuit board assembly (PCBA). Printed circuit boards are used in virtually all but the simplest commercially-produced electronic devices.

PCBs are inexpensive, and can be highly reliable. They require much more layout effort and higher initial cost than either wire wrap or point-to-point construction, but are much cheaper and faster for high-volume production; the production and soldering of PCBs can be done by totally automated equipment. Much of the electronics industry's PCB design, assembly, and quality control needs are set by standards that are published by the IPC organization.

- **Chemical etching**

Chemical etching is done with ferric chloride, ammonium per sulfate, or sometimes hydrochloric acid. For PTH (plated-through holes), additional steps of electro less deposition are done after the holes are drilled, then copper is electroplated to build up the thickness, the boards are screened, and plated with tin/lead. The tin/lead becomes the resist leaving the bare copper to be etched away.

The simplest method, used for small scale production and often by hobbyists, is immersion etching, in which the board is submerged in etching solution such as ferric chloride. Compared with methods used for mass production, the etching time is long. Heat and agitation can be applied to the bath to speed the etching rate. In bubble etching, air is passed through the etchant bath to agitate the solution and speed up etching. Splash etching uses a motor-driven paddle to splash boards with etchant; the process has become commercially obsolete since it is not as fast as spray etching. In spray etching, the etchant solution is distributed over the boards by nozzles, and recirculated by pumps. Adjustment of the nozzle pattern, flow rate, temperature, and etchant composition gives predictable control of etching rates and high production rates.

As more copper is consumed from the boards, the etchant becomes saturated and less effective; different etchants have different capacities for copper, with some as high as 150 grams of copper per litre of solution. In commercial use, etchants can be regenrated to restore their activity, and the dissolved copper recovered and sold. Small-scale etching requires attention to disposal of used etchant, which is corrosive and toxic due to its metal content.

The etchant removes copper on all surfaces exposed by the resist. "Undercut" occurs when etchant attacks the thin edge of copper under the resist; this can reduce conductor widths and cause open-circuits. Careful control of etch time is required to prevent undercut. Where metallic plating is used as a resist, it can "overhang" which can cause short-circuits between adjacent traces when closely spaced. Overhang can be removed by wire-brushing the board after etching.

- **Lamination**

Some PCBs have trace layers inside the PCB and are called multi-layer PCBs. These are formed by bonding together separately etched thin boards.

➢ Drilling

Holes through a PCB are typically drilled with small-diameter drill bits made of solid coated tungsten carbide. Coated tungsten carbide is recommended since many board materials are very abrasive and drilling must be high RPM and high feed to be cost effective. Drill bits must also remain sharp to not mar or tear the traces. Drilling with high-speed-steel is simply not feasible since the drill bits will dull quickly and thus tear the copper and ruin the boards. The drilling is performed by automated drilling machines with placement controlled by a drill tape or drill file. These computer-generated files are also called numerically controlled drill (NCD) files or "Excellon files". The drill file describes the location and size of each drilled hole. These holes are often filled with annular rings (hollow rivets) to create vias. Vias allow the electrical and thermal connection of conductors on opposite sides of the PCB. When very small vias are required, drilling with mechanical bits is costly because of high rates of wear and breakage. In this case, the vias may be evaporated by lasers. Laser-drilled vias typically have an inferior surface finish inside the hole. These holes are called micro vias. It is also possible with controlled-depth drilling, laser drilling, or by pre-drilling the individual sheets of the PCB before lamination, to produce holes that connect only some of the copper layers, rather than passing through the entire board. These holes are called blind vias when they connect an internal copper layer to an outer layer, or buried vias when they connect two or more internal copper layers and no outer layers.

The walls of the holes, for boards with 2 or more layers, are made conductive then plated with copper to form plated-through holes that electrically connect the conducting layers of the PCB. For multilayer boards, those with 4 layers or more, drilling typically produces a smearof the high temperature decomposition products of bonding agent in the laminate system. Before the holes can be plated through, this smear must be removed by a chemical de-smear process, or by plasma-etch. Removing (etching back) the smear also reveals the interior conductors as well.

6. PARTS USE IN PROJECT

- **Electrical resistance**

The electrical resistance of an electrical conductor is the opposition to the passage of an electric current through that conductor. The inverse quantity is electrical conductance, the ease with which an electric current passes. Electrical resistance shares some conceptual parallels with the mechanical notion of friction. The SI unit of electrical resistance is the ohm (Ω), while electrical conductance is measured in Siemens (S).

An object of uniform cross section has a resistance proportional to its resistivity and length and inversely proportional to its cross-sectional area. All materials show some resistance, except for superconductors, which have a resistance of zero.

The resistance (R) of an object is defined as the ratio of voltage across it (V) to current through it (I), while the conductance (G) is the inverse:

$$R = \frac{V}{I}, \qquad G = \frac{I}{V}, \qquad G = \frac{1}{R}$$

For a wide variety of materials and conditions, V and I are directly proportional to each other, and therefore R and G are constant (although they can depend on other factors like temperature or strain). This proportionality is called Ohm's law, and materials that satisfy it are called "Ohmic" materials.

In other cases, such as a diode or battery, V and I are not directly proportional, or in other words the I–V curve is not a straight line through the origin, and Ohm's law does not hold. In this case, resistance and conductance are less useful concepts, and more difficult to define. The ratio V/I is sometimes still useful, and is referred to as a "chordal resistance" or "static resistance",[1][2] as it corresponds to the inverse slope of a chord between the origin and an I–V curve. In other situations, the derivative $\frac{dV}{dI}$ may be most useful; this is called the "differential resistance

Capacitor

A capacitor (originally known as a condenser) is a passive two-terminal electrical component used to store energy electrostatically in an electric field. The forms of practical capacitors vary widely, but all contain at least two electrical conductors (plates) separated by a dielectric (i.e., insulator). The conductors can be thin films of metal, aluminum foil or disks, etc. The 'non conducting' dielectric acts to increase the capacitor's charge capacity. A dielectric can be glass, ceramic, plastic film, air, paper, mica, etc. Capacitors are widely used as parts of electrical circuits in many common electrical devices. Unlike a resistor, a capacitor does not dissipate energy. Instead, a capacitor stores energy in the form of an electrostatic field between its plates.

When there is a potential difference across the conductors (e.g., when a capacitor is attached across a battery), an electric field develops across the dielectric, causing positive charge (+Q) to collect on one plate and negative charge (-Q) to collect on the other plate. If a battery has been attached to a capacitor for a sufficient amount of time, no current can flow through the capacitor. However, if an accelerating or alternating voltage is applied across the leads of the capacitor, a displacement current can flow.

An ideal capacitor is characterized by a single constant value for its capacitance. Capacitance is expressed as the ratio of the electric charge (Q) on each conductor to the potential difference (V) between them. The SI unit of capacitance is the farad (F), which is equal to one coulomb per volt (1 C/V). Typical capacitance values range from about 1 pF (10^{-12} F) to about 1 mF (10^{-3} F).

The capacitance is greater when there is a narrower separation between conductors and when the conductors have a larger surface area. In practice, the dielectric between the plates passes a small amount of leakage current and also has an electric field strength limit, known as the breakdown voltage. The conductors and leads introduce an undesired inductance and resistance.

Capacitors are widely used in electronic circuits for blocking direct current while allowing alternating current to pass. In analog filter networks, they smooth the output of power supplies. In resonant circuits they tune radios to particular frequencies. In electric power transmission systems they stabilize voltage and power flow.

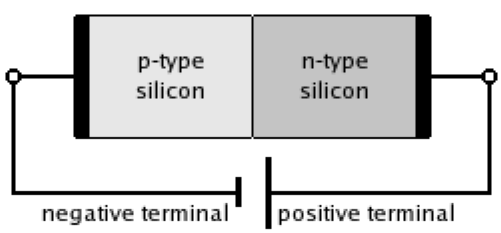
P–n junction diode

A p–n junction is a boundary or interface between two types of semiconductor material, p-type and n-type, inside a single crystal of semiconductor. It is created by doping, for example by ion implantation, diffusion of dopants, or by epitaxy (growing a layer of crystal doped with one type of dopant on top of a layer of crystal doped with another type of dopant). If two separate pieces of material were used, this would introduce a grain boundary between the semiconductors that severely inhibits its utility by scattering the electrons and holes. p–n junctions are elementary "building blocks" of most semiconductor electronic devices such as diodes, transistors, solar cells, LEDs, and integrated circuits; they are the active sites where the electronic action of the device takes place. For example, a common type of transistor, the bipolar junction transistor, consists of two p–n junctions in series, in the form n–p–n or p–n–p.

Properties of a p–n junction

The p–n junction possesses some interesting properties that have useful applications in modern electronics. A p-doped semiconductor is relatively conductive. The same is true of an n-doped semiconductor, but the junction between them can become depleted of charge carriers, and hence non-conductive, depending on the relative voltages of the two semiconductor regions. By manipulating this non-conductive layer, p–n junctions are commonly used as diodes: circuit elements that allow a flow of electricity in one direction but not in the other (opposite) direction. This property is explained in terms of forward bias and reverse bias, where the term bias refers to an application of electric voltage to the p–n junction. PN junction operation in forward-bias mode, showing reducing depletion width. Both p and n junctions are doped at a 1e15/cm3 doping level, leading to built-in potential of ~0.59 V. Reducing depletion width can be inferred from the shrinking charge profile, as fewer dopants are exposed with increasing forward bias.With a battery connected this way, the holes in the P-type region and the electrons in the N-type region are pushed toward the junction. This reduces the width of the depletion zone. The positive potential applied to the P-type material repels the holes, while the negative potential applied to the N-type material repels the electrons. As electrons and holes are pushed toward the junction, the distance between them decreases. This lowers the barrier in potential. With increasing forward-bias voltage, the depletion zone eventually becomes thin enough that the zone's electric field cannot counteract charge carrier motion across the p–n junction, as a consequence reducing electrical resistance. The electrons that cross the p–n junction into the P-type material (or holes that cross into the N-type material) will diffuse in the near-neutral region. Therefore, the amount of minority diffusion in the near-neutral zones determines the amount of current that may flow through the diode.Only majority carriers (electrons in N-type material or holes in P-type) can flow through a semiconductor for a macroscopic length. With this in mind, consider the flow of electrons across the junction. The forward bias causes a force on the electrons pushing them from the N side toward the P side. With forward bias, the depletion region is narrow enough that electrons can cross the junction and inject into the P-type material. However, they do not continue to flow through the P-type material indefinitely, because it is energetically favorable for them to recombine with holes. The average length an electron travels through the P-type material before recombining is called the diffusion length, and it is typically on the order of micrometers.Although the electrons penetrate only a short distance into the P-type material, the electric current continues uninterrupted, because holes (the majority carriers) begin to flow in the opposite direction. The total current (the sum of the electron and hole currents) is constant in space, because any variation would cause charge buildup over time (this is Kirchhoff's current law). The flow of holes from the P-type region into the N-type region is exactly analogous to the flow of electrons from N to P (electrons and holes swap roles and the signs of all currents and voltages are reversed).Therefore, the macroscopic picture of the current flow through the diode involves electrons flowing through the N-type region toward the junction, holes flowing through the P-type region in the opposite direction toward the junction, and the two species of carriers constantly recombining in the vicinity of the junction. The electrons and holes travel in opposite directions, but they also have opposite charges, so the overall current is in the same direction on both sides of the diode, as required.The Shockley diode equation models the forward-bias operational characteristics of a p–n junction outside the avalanche (reverse-biased conducting) region.

Reverse bias mode



A silicon p–n junction in reverse bias.

Connecting the P-type region to the negative terminal of the battery and theN-type region to the positive terminal corresponds to reverse bias. If a diode is reverse-biased, the voltage at the cathode is higher than that at the anode. Therefore, no current will flow until the diode breaks down. Reverse-bias usually refers to how a diode is used in a circuit. The connections are illustrated in the diagram to the right.

Because the p-type material is now connected to the negative terminal of the power supply, the 'holes' in the P-type material are pulled away from the junction, causing the width of the depletion zone to increase. Likewise, because the N-type region is connected to the positive terminal, the electrons will also be pulled away from the junction. Therefore, the depletion region widens, and does so increasingly with increasing reverse-bias voltage. This increases the voltage barrier causing a high resistance to the flow of charge carriers, thus allowing minimal electric current to cross the p–n junction. The increase in resistance of the p–n junction results in the junction behaving as an insulator. The strength of the depletion zone electric field increases as the reverse-bias voltage increases. Once the electric field intensity increases beyond a critical level, the p–n junction depletion zone breaks down and current begins to flow, usually by either the Zener or the avalanche breakdown processes. Both of these breakdown processes are non-destructive and are reversible, as long as the amount of current flowing does not reach levels that cause the semiconductor material to overheat and cause thermal damage. This effect is used to one's advantage in Zener diode regulator circuits. Zener diodes have a certain – low – breakdown voltage. A standard value for breakdown voltage is for instance 5.6 V. This means that the voltage at the cathode can never be more than 5.6 V higher than the voltage at the anode, because the diode will break down – and therefore conduct – if the voltage gets any higher. This in effect regulates the voltage over the diode. Another application of reverse biasing is Varicap diodes, where the width of the depletion zone (controlled with the reverse bias voltage) changes the capacitance of the diode.

➢ Voltage regulator ic

A voltage regulator is designed to automatically maintain a constant voltage level. A voltage regulator may be a simple "feed-forward" design or may include negative feedback control loops. It may use an electromechanical mechanism, or electronic components. Depending on the design, it may be used to regulate one or more AC or DC voltages. Electronic voltage regulators are found in devices such as computer power supplies where they stabilize the DC voltages used by the processor and other elements. In automobile alternators and central power station generator plants, voltage regulators control the output of the plant. In an electric power distribution system, voltage regulators may be installed at a substation or along distribution lines so that all customers receive steady voltage independent of how much power is drawn from the line.

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The 78xx (sometimes L78xx, LM78xx, MC78xx...) is a family of self-contained fixed linear voltage regulator integrated circuits. The 78xx family is commonly used in electronic circuits requiring a regulated power supply due to their ease-of-use and low cost. For ICs within the family, the xx is replaced with two digits, indicating the output voltage (for example, the 7805 has a 5 volt output, while the 7812 produces 12 volts). The 78xx line are positive voltage regulators: they produce a voltage that is positive relative to a common ground. There is a related line of 79xx devices which are complementary negative voltage regulators. 78xx and 79xx ICs can be used in combination to provide positive and negative supply voltages in the same circuit. 78xx ICs have three terminals and are commonly found in the TO220 form factor, although smaller surface-mount and larger TO3 packages are available. These devices support an input voltage anywhere from a couple of volts over the intended output voltage, up to a maximum of 35 to 40 volts depending on the make, and typically provide 1 or 1.5 amperes of current (though smaller or larger packages may have a lower or higher current rating).

Part Number	Output Voltage (V)	Minimum Input Voltage (V)
7805	+5	7.3
7806	+6	8.3
7808	+8	10.5
7810	+10	12.5
7812	+12	14.6
7815	+15	17.7

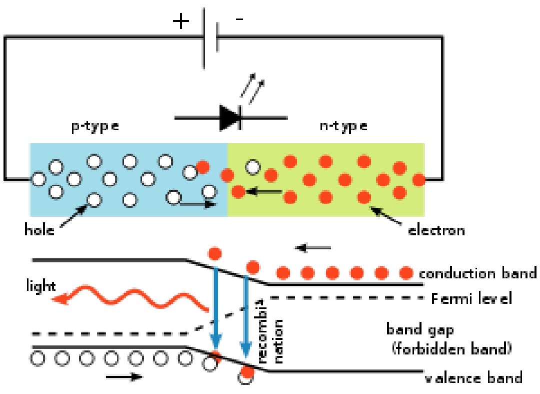
7818	+18	21.0
7824	+24	27.1

➢ Light-emitting diode

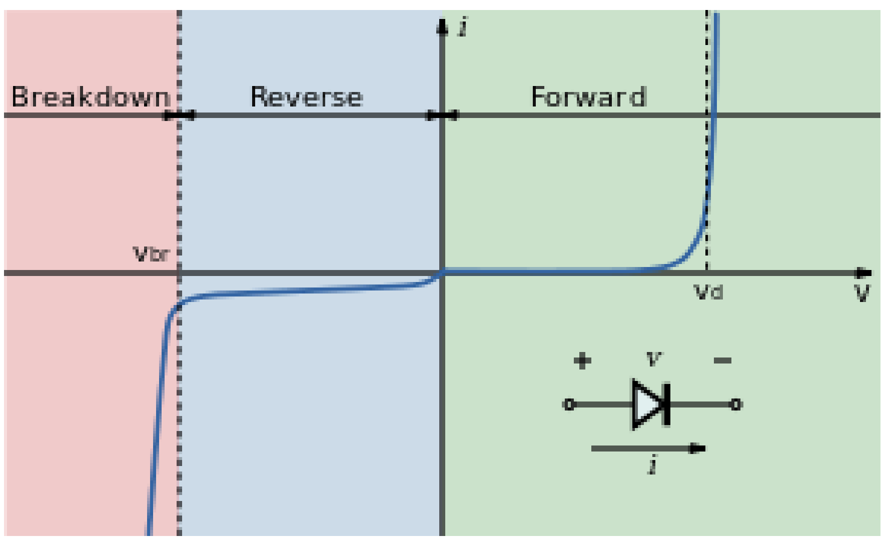
A light-emitting diode (LED) is a two-lead semiconductor light source that resembles a basic pn-junction diode, except that an LED also emits light. When an LED's anode lead has a voltage that is more positive than its cathode lead by at least the LED's forward voltage drop, current flows. Electrons are able to recombine with holes within the device, releasing energy in the form of photons. This effect is called electroluminescence, and the color of the light (corresponding to the energy of the photon) is determined by the energy band gap of the semiconductor. An LED is often small in area (less than 1 mm^2), and integrated optical components may be used to shape its radiation pattern. Appearing as practical electronic components in 1962, the earliest LEDs emitted low-intensity infrared light. Infrared LEDs are still frequently used as transmitting elements in remote-control circuits, such as those in remote controls for a wide variety of consumer electronics. The first visible-light LEDs were also of low intensity, and limited to red. Modern LEDs are available across the visible, ultraviolet, and infrared wavelengths, with very high brightness. Early LEDs were often used as indicator lamps for electronic devices, replacing small incandescent bulbs. They were soon packaged into numeric readouts in the form of seven-segment displays, and were commonly seen in digital clocks. Recent developments in LEDs permit them to be used in environmental and task lighting. LEDs have many advantages over incandescent light sources including lower energy consumption, longer lifetime, improved physical robustness, smaller size, and faster switching. Light-emitting diodes are now used in applications as diverse as aviation lighting, automotive headlamps, advertising, general lighting,traffic signals, and camera flashes. However, LEDs powerful enough for room lighting are still relatively expensive, and require more precise current and heat management than compact fluorescent lamp sources of comparable output.

LEDs have allowed new text, video displays, and sensors to be developed, while their high switching rates are also useful in advanced communications technology.

Technology



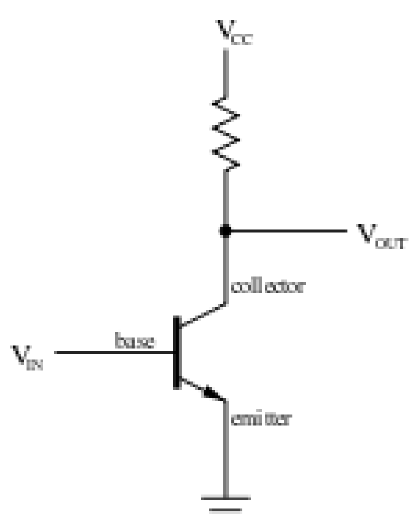
The inner workings of an LED, showing circuit (top) and band diagram (bottom)



➢ **Transistor**

A transistor is a semi-conductor device used to amplify and switch electronic signals and electrical power. It is composed of semiconductor material with at least three terminals for connection to an external circuit. A voltage or current applied to one pair of the transistor's terminals changes 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. The transistor is the fundamental building block of modern electronic devices, and is ubiquitous in modern electronic systems. Following its development in 1947 by John Bardeen, Walter Brattain, and William Shockley, the transistor revolutionized the field of electronics, and paved

Simplified operation

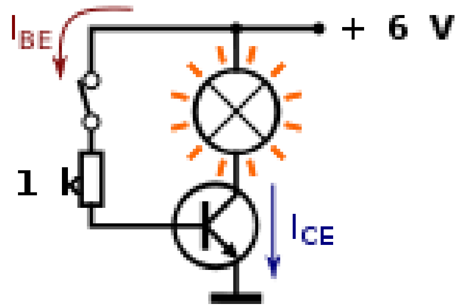


A simple circuit diagram to show the labels of a n–p–n bipolar transistor

The essential usefulness of a transistor comes from its ability to use a small signal applied between one pair of its terminals to control a much larger signal at another pair of terminals. This property is called gain. A transistor can control its output in proportion to the input signal; that is, it can act as an amplifier. Alternatively, the transistor can be used to turn current on or off in a circuit as an electrically controlled switch, where the amount of current is determined by other circuit elements. There are two types of transistors, which have slight differences in how they are used in a circuit. A bipolar transistor has terminals labeled base, collector, and emitter. A small current at the base terminal (that is, flowing between the base and the emitter) can control or switch a much larger current between the collector and emitter terminals. For a field-effect transistor, the terminals are labeled gate, source, and drain, and a voltage at the gate can control a current between source and drain.

The image to the right represents a typical bipolar transistor in a circuit. Charge will flow between emitter and collector terminals depending on the current in the base. Because internally the base and emitter connections behave like a semiconductor diode, a voltage drop develops between base and emitter while the base current exists. The amount of this voltage depends on the material the transistor is made from, and is referred to as V_{BE}.

Transistor as a switch



Transistors are commonly used as electronic switches, both for high-power applications such as switched-mode power supplies and for low-power applications such as logic gates.

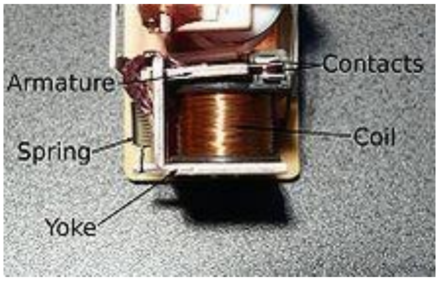
In a grounded-emitter transistor circuit, such as the light-switch circuit shown, as the base voltage rises, the emitter and collector currents rise exponentially. The collector voltage drops because of reduced resistance from collector to emitter. If the voltage difference between the collector and emitter were zero (or near zero), the collector current would be limited only by the load resistance (light bulb) and the supply voltage. This is called saturation because current is flowing from collector to emitter freely. When saturated, the switch is said to be on. Providing sufficient base drive current is a key problem in the use of bipolar transistors as switches. The transistor provides current gain, allowing a relatively large current in the collector to be switched by a much smaller current into the base terminal. The ratio of these currents varies depending on the type of transistor, and even for a particular type, varies depending on the collector current. In the example light-switch circuit shown, the resistor is chosen to provide enough base current to ensure the transistor will be saturated.

- **Relay**

A relay is an electrically operated switch. Many relays use an electromagnet to mechanically operate a switch, but other operating principles are also used, such assolid-state relays. Relays are used where it is necessary to control a circuit by a low-power signal (with complete electrical isolation between control and controlled circuits), or where several circuits must be controlled by one signal. The first relays were used in long distance telegraph circuits as amplifiers: they repeated the signal coming in from one circuit and re-transmitted it on another circuit. Relays were used extensively in telephone exchanges and early computers to perform logical operations. A type of relay that can handle the high power required to directly control an electric motor or other loads is called a contactor. Solid-state relays control power circuits with no moving parts, instead using a semiconductor device to perform switching. Relays with calibrated operating characteristics and sometimes multiple operating coils are used to protect electrical circuits from overload or faults; in modern electric power

Systems these functions are performed by digital instruments still called "protective relays".

Basic design and operation



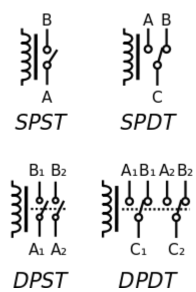
A simple electromagnetic relay consists of a coil of wire wrapped around a soft iron core, an iron yoke which provides a low reluctance path for magnetic flux, a movable iron armature, and one or more sets of contacts (there are two in the relay pictured). The armature is hinged to the yoke and mechanically linked to one or more sets of moving contacts. It is held in place by a spring so that when the relay is de-energized there is an air gap in the magnetic circuit. In this condition, one of the two sets of contacts in the relay pictured is closed, and the other set is open. Other relays may have more or fewer sets of contacts depending on their function. The relay in the picture also has a wire connecting the armature to the yoke. This ensures continuity of the circuit between the moving contacts on the armature, and the circuit track on the printed circuit board (PCB) via the yoke, which is soldered to the PCB.

When an electric current is passed through the coil it generates a magnetic field that activates the armature, and the consequent movement of the movable contact(s) either makes or breaks (depending upon construction) a connection with a fixed contact. If the set of contacts was closed when the relay was de-energized, then the movement opens the contacts and breaks the connection, and vice versa if the contacts were open. When the current to the coil is switched off, the armature is returned by a force, approximately half as strong as the magnetic force, to its relaxed position. Usually this force is provided by a spring, but gravity is also used commonly in industrial motor starters. Most relays are manufactured to operate quickly. In a low-voltage application this reduces noise; in a high voltage or current application it reduces arcing.

When the coil is energized with direct current, a diode is often placed across the coil to dissipate the energy from the collapsing magnetic field at deactivation, which would otherwise generate a voltage spike dangerous to semiconductor circuit components. Some automotive relays include a diode inside the relay case. Alternatively, a contact protection network consisting of a capacitor and resistor in series (snubber circuit) may absorb the surge. If the coil is designed to be energized with alternating current (AC), a small copper "shading ring" can be crimped to the end of the solenoid, creating a small out-of-phase current which increases the minimum pull on the armature during the AC cycle.[1]

A solid-state relay uses a thyristor or other solid-state switching device, activated by the control signal, to switch the controlled load, instead of a solenoid. An opto coupler (a light-emitting diode (LED) coupled with a photo transistor) can be used to isolate control and controlled circuits

Pole and throw type:-



Circuit symbols of relays. (C denotes the common terminal in SPDT and DPDT types.)

Since relays are switches, the terminology applied to switches is also applied to relays; a relay switches one or more *poles*, each of whose contacts can be *thrown* by energizing the coil in one of three ways:

- Normally-open (NO) contacts connect the circuit when the relay is activated; the circuit is disconnected when the relay is inactive. It is also called a Form A contact or "make" contact. NO contacts may also be distinguished as "early-make" or NOEM, which means that the contacts close before the button or switch is fully engaged.

- Normally-closed (NC) contacts disconnect the circuit when the relay is activated; the circuit is connected when the relay is inactive. It is also called a Form B contact or "break" contact. NC contacts may also be distinguished as "late-break" or NCLB, which means that the contacts stay closed until the button or switch is fully disengaged.
- Change-over (CO), or double-throw (DT), contacts control two circuits: one normally-open contact and one normally-closed contact with a common terminal. It is also called a Form C contact or "transfer" contact ("break before make"). If this type of contact utilizes a "make before break" functionality, then it is called a Form D contact.

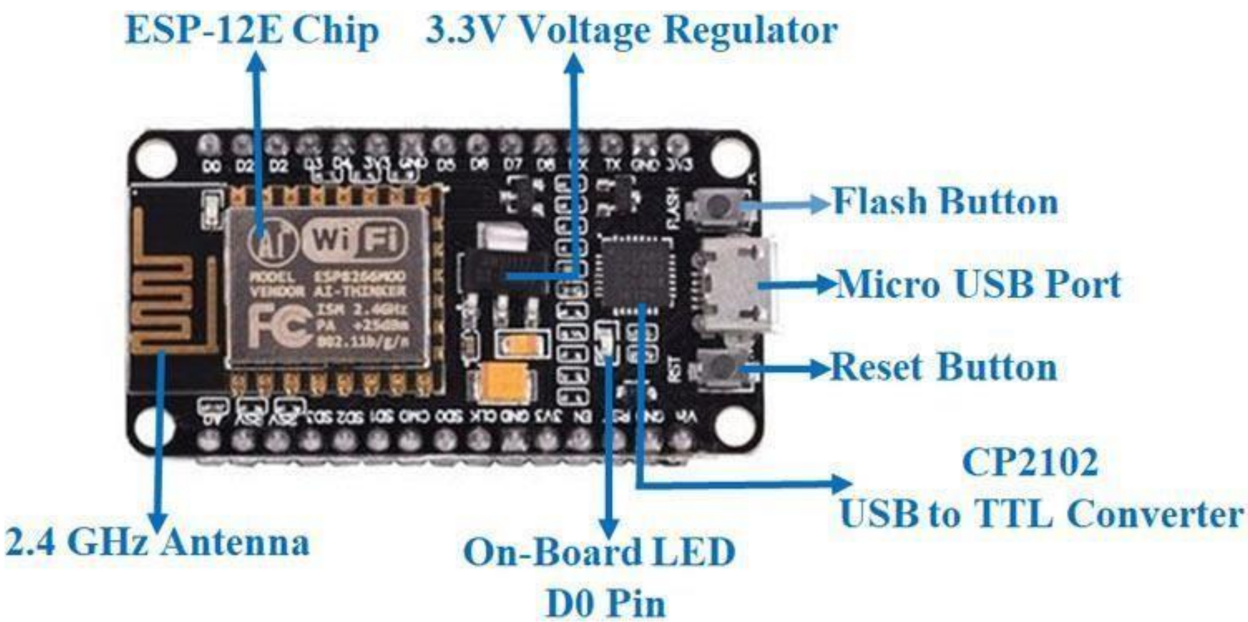
The following designations are commonly encountered:

- SPST – Single Pole Single Throw. These have two terminals which can be connected or disconnected. Including two for the coil, such a relay has four terminals in total. It is ambiguous whether the pole is normally open or normally closed. The terminology "SPNO" and "SPNC" is sometimes used to resolve the ambiguity.
- SPDT – Single Pole Double Throw. A common terminal connects to either of two others. Including two for the coil, such a relay has five terminals in total.
- DPST – Double Pole Single Throw. These have two pairs of terminals. Equivalent to two SPST switches or relays actuated by a single coil. Including two for the coil, such a relay has six terminals in total. The poles may be Form A or Form B (or one of each).
- DPDT – Double Pole Double Throw. These have two rows of change-over terminals. Equivalent to two SPDT switches or relays actuated by a single coil. Such a relay has eight terminals, including the coil.

The "S" or "D" may be replaced with a number, indicating multiple switches connected to a single actuator. For example 4PDT indicates a four pole double throw relay (with 12 terminals).

EN 50005 are among applicable standards for relay terminal numbering; a typical EN 50005-compliant SPDT relay's terminals would be numbered 11, 12, 14, A1 and A2 for the C, NC, NO, and coil connections, respectively.

➢ NodeMCU ESP8266



The **NodeMCU ESP8266 development board** comes with the ESP-12E module containing ESP8266 chip having Tensilica Xtensa 32-bit LX106 RISC microprocessor. This microprocessor supports RTOS and operates at 80MHz to 160 MHz adjustable clock frequency. NodeMCU has 128 KB RAM and 4MB of Flash memory to store data and programs. Its high processing power with in-built Wi-Fi / Bluetooth and Deep Sleep Operating features make it ideal for IoT projects. NodeMCU can be powered using Micro USB jack and VIN pin (External Supply Pin). It supports UART, SPI, and I2C interface.

Applications of NodeMCU

- Prototyping of IoT devices
- Low power battery operated applications
- Network projects
- Projects requiring multiple I/O interfaces with Wi-Fi and Bluetooth functionalities

7. CONCLUSION

By using this application we can control home appliance. This have been implemented using multiple ways such as The Internet, electrical switch, and Graphical User Interface (GUI). By using phones and tablets we can reduce the cost. The system is suitable for remotely controlling the appliances. Here, we have introduced the event of a home management and security system exploitation using Arduino and Internet of Things technology. The system is suitable for real- time home safety monitoring and controlling the home appliances. The various future applications may be used by controlling various household devices of house with internet, Industrial automation and management through internet, machine-driven fireplace exit systems and improvement of security problems in extremely restricted areas.

8. REFERENCES

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