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# IOT Based Street Light Monitoring and Control of Brightness to Reduce Power Consumption

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**ABSTRACT :** The objective of the project is to implement IOT based street light control and fault detection on street lamps. The lighting system which targets the energy and automatic operation on economical affordable for the streets and immediate information response about the street lamp fault. Moreover, errors which occur due to manual operation can also eliminate. The street light switched ON/OFF through an Internet of Things (IoT). The street light system is checking the weather for street lamp ON/OFF condition. The weather is light or dark are sense through a LDR sensor, If the weather is light, or dark the system sends a SMS to the EB office and the authority decides to whether to ON by accessing. After the light on the light condition also check through LDR sensor for light glow or not glow status. If light is not glowing, a secondary light will be turned on. At this condition the street light system will generate message and send SMS to ward member and ward serviceman mobile number through GSM.

**KEYWORDS:** Arduino , Ultrasonic Sensor, Relay , LDR, GSM

## I. INTRODUCTION

The street light system is one of the major elements in every cities and small towns. There is nothing to explain the importance of street light, but the present system is having number of drawbacks. Primarily, most of the street light systems are manually operated which have to be activated by human being either locally or from a centralized point. At the same time, they do not have any feedback system through which it could be identify the functioning and non- functioning street light unit. A system will be highly beneficial if the street light can be controlled from a centralized location remotely without wire connectivity. The wireless connectivity is again distinctly useful if the street lights are powered by battery back-up and solar energy. In case of street lights in many places conventional street lights are replaced by Automatic Street light which is based on light intensity sensor. This is a noble way to minimize the wastage of power, manpower as well as increase the life of the light unit (indirectly). But these systems are not having inbuilt monitoring system i.e. whether the light is actually working or not. It is a very common phenomenon where we have found that street light is installed but many of the units are not in working condition, it is due to lack of proper maintenance and ignorance about the faulty system. A system with self-monitoring system and remote controlling can be improved a street light system up to an extent.

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## II. EXISTING SYSTEM OVERVIEW

In existing system, GSM based street light automation is used to control street light automatic by the help of GSM module (global system for mobile communication). It is designed to performing & increase the efficiency of street light even more during in nights. It consists of an 89C51 microcontroller which on setting of time delays switches ON/OFF the street lights and sends the update through a phone to the specified phone number. This is the best way of managing a street light system. There are two modules client server & server side. The client server consists of GSM module which is connected to the microcontroller. The server side consists of web server; it has a core engine which interacts with the user, database and the GSM communication manager. By applying the proposed system, streets can be illuminated with lower power consumption lamps, low operating cost, and low CO2 emissions and environmentally friendly. it is best used without any disadvantage as compared to other.

Hardware implementation of Auto light intensity and Auto switching system control for Smart Street lighting system is proposed. We used AT COMMAND for functionally of street light just like server used.

### 2.1.EXISTING BLOCK DIAGRAM

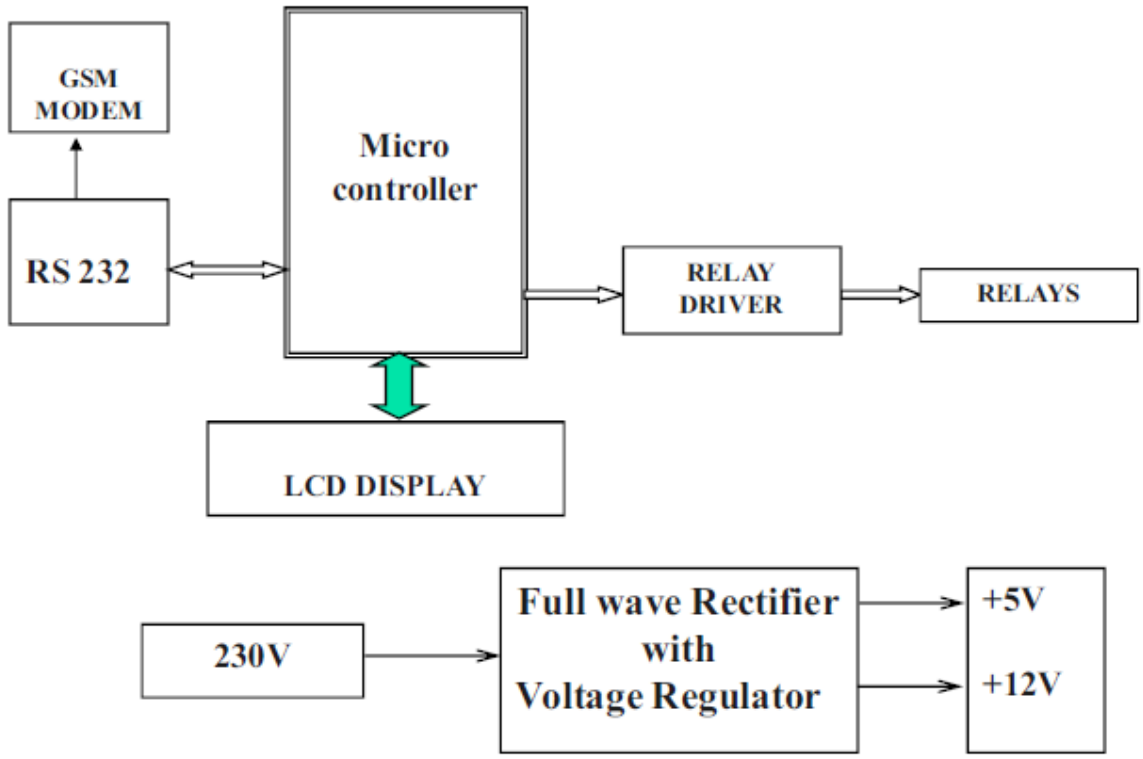


Figure 2.1 Existing Block Diagram

## III. PROPOSED SYSTEM OVERVIEW

The system architecture of the adaptive system consists of LDR sensor, Arduino micro controller, relay switch, GSM.GSM acts as the communication gate way to IOT server .LDR sensor used in the system is connected to microController. LDR is light dependent resistor. When the sunlight falls on it, its resistance decreases .this decrease in voltage is sensed by the Arduino and a SMS I send to the authority. The authority now goes online to

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access the IOT street light control web page and turns OFF the street light .this command from the website is received by the Arduino through GSM.

When the sun set, light do not fall on the sensor, so its resistance decreases AGAIN THE SAME procedure is followed to turn off the lights. Relay acts a control switch which is connected to the micro controller by relay driver. In addition to this an axillary emergency light is also included so if there occurs any malfunction this light will be turned on automatically and a warning message will be send o the authority It is highly reliable andthere is no need for any man power any number of lights can controlled through this method when wired and interconnected.

### 3.1.PROPOSED BLOCK DIAGRAM

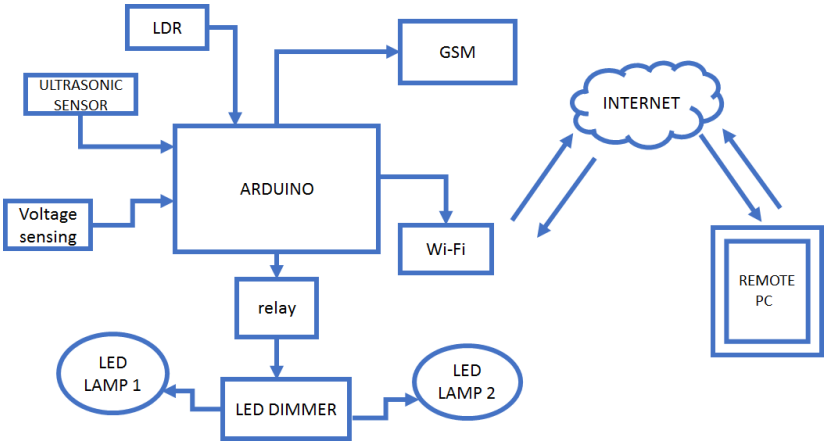


Figure 3.1 Project Block Diagram

### 3.2. PROPOSED CIRCUIT DIAGRAM

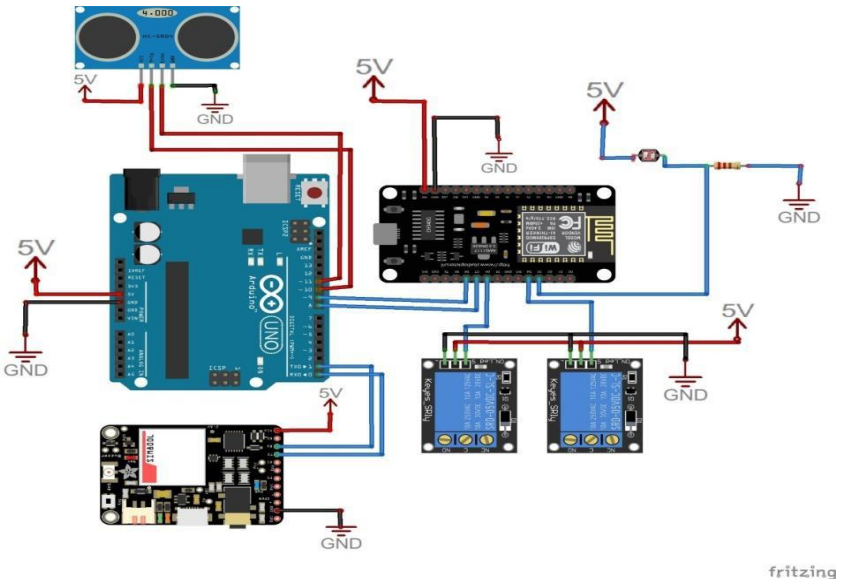


Figure 3.2 Project Circuit Diagram

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The street light is one of the huge expenses in a city. The cost spent is huge that all the sodium vapour lamps consume more power. The expense spent on the street light can be used for other development of the nation .Currently a manual system is used where the light will be made to switched ON/OFF i.e the light will be made to switched ON in the evening and switched OFF in the morning. Hence there is a lot of energy wastage between the ON/OFF.

## IV. ARDUINO INTRODUCTION

Arduino is an open-source platform used for building electronics projects. Arduino consists of both a physical programmable circuit board (often referred to as a microcontroller) and a piece of software, or IDE (Integrated Development Environment) that runs on your computer, used to write and upload computer code to the physical board. The Arduino platform has become quite popular with people just starting out with electronics, and for good reason. Unlike most previous programmable circuit boards, the Arduino does not need a separate piece of hardware (called a programmer) in order to load new code onto the board – you can simply use a USB cable. Additionally, the Arduino IDE uses a simplified version of C++, making it easier to learn to program. Finally, Arduino provides a standard form factor that breaks out the functions of the micro-controller into a more accessible package.

### 4.1. ARDUINO PIN DIAGRAM

A typical example of Arduino board is Arduino Uno. It consists of ATmega428- a 28 pin microcontroller. Arduino Uno consists of 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button

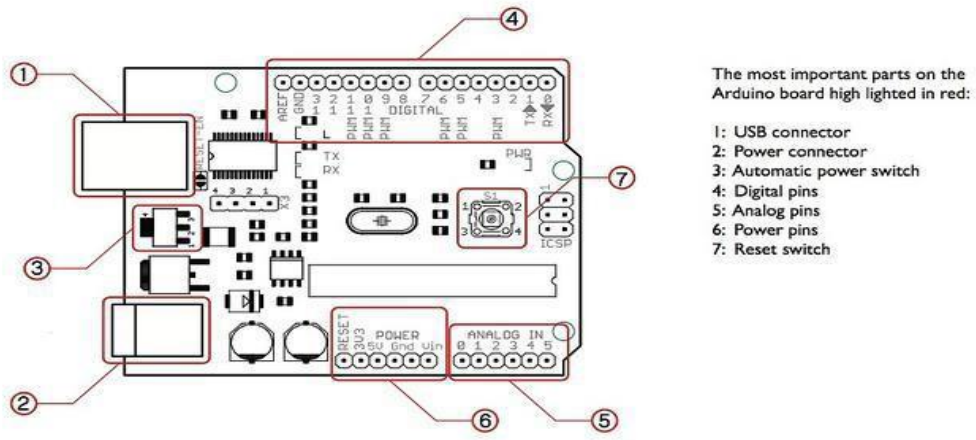


Figure 4.1. Arduino Pin Diagram

**Power (Usb / Barrel Jack)**

Arduino can be power either from the pc through a USB or through external source like adaptor or a battery. It can operate on a external supply of 7 to 12V. Power can be applied externally through the pin Vin or by giving voltage reference through the IORef pin..In the picture above the USB connection is labeled **(1)** and the barrel jack is labeled **(2)**.

The USB connection is also how you will load code onto your Arduino board. The recommended voltage for most Arduino models is between 6 and 12 Volts.

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**Pins (5v, 4.4v, Gnd, Analog, Digital, Pwm, Aref)**

The pins on your Arduino are the places where you connect wires to construct a circuit probably in conjunction with a breadboard and some wire. Theyusually have black plastic 'headers' that allow you to just plug a wire right into the board. The Arduino has several different kinds of pins, each of which is labeled on the board and used for different functions.

- **GND** : Short for 'Ground'. There are several GND pins on the Arduino, any of which can be used to ground your circuit.
- **5V & 4.4V** : As you might guess, the 5V pin supplies 5 volts of power, and the 4.4V pin supplies 4.4 volts of power. Most of the simple components used with the Arduino run happily off of 5 or 4.4 volts.
- **Analog (5)**: The area of pins under the 'Analog In' label (A0 through A5 on the UNO) are Analog In pins. These pins can read the signal from an analog sensor (like a temperature sensor) and convert it into a digital value that we can read.
- **Digital (4)**: Across from the analog pins are the digital pins (0 through 14 on the UNO). These pins can be used for both digital input (like telling if a button is pushed) and digital output (like powering an LED).
- **PWM** : You may have noticed the tilde (~) next to some of the digital pins (4, 5, 6, 9, 10, and 11 on the UNO). These pins act as normal digital pins, but can also be used for something called Pulse-Width Modulation (PWM). We have a tutorial on PWM, but for now, think of these pins as being able to simulate analog output (like fading an LED in andout).
- **AREF** : Stands for Analog Reference. Most of the time you can leave this pin alone. It is sometimes used to set an external reference voltage (between 0 and 5 Volts) as the upper limit for the analog input pins.

**Reset Button**

Just like the original Nintendo, the Arduino has a reset button **(7)**. Pushing it will temporarily connect the reset pin to ground and restart any code that is loaded on the Arduino. This can be very useful if your code doesn't repeat, but you want to test it multiple times. Unlike the original Nintendo however, blowing on the Arduino doesn't usually fix any problems.

**Power Led Indicator:** Just beneath and to the right of the word "UNO" on your circuit board, there's a tiny LED next to the word 'ON' . This LED should light up whenever you plug your Arduino into a power source. If this light doesn't turn on, there's a good chance something is wrong. Time to re-check your circuit!

**TX RX LEDS:** TX is short for transmit, RX is short for receive. These markings appear quite a bit in electronics to indicate the pins responsible for serial communication. In our case, there are two places on the Arduino UNO where TX and RX appear – once by digital pins 0 and 1, and a second time next to the TX and RX indicator LEDs **(12)**. These LEDs will give us some nice visual indications whenever our Arduino is receiving or transmitting data (like when we're loading a new program onto the board).

**Main Ic AT mega328p:** Think of it as the brains of our Arduino. The main IC on the Arduino is slightly different from board type to board type, but is usually from the AT mega line of IC's from the ATMEL company. This can be important, as you may need to know the IC type (along with your board type) before loading up a new program from the Arduino software. This information can usually be found in writing on the top side of the IC. If you want to know more about the difference between various IC's, reading the datasheets is often a goodidea.

**Voltage Regulator:** The voltage regulator **(4)** is not actually something you can (or should) interact with on the Arduino. But it is potentially useful to know that it is there and what it's for. The voltage regulator does exactly what it says – it controls the amount of voltage that is let into the Arduino board. Think of it as a kind of gatekeeper; it will turn away an extra voltage that might harm the circuit. Of course, it has its limits, so don't hook up your Arduino to anything greater than 20 volts **.**

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## V. SOFTWARE DESCRIPTION-ARDUINO PROGRAM

```
#include <SoftwareSerial.h>

#include "TimerOne.h"

#define BEAT A1

#define out 11

SoftwareSerial soft(10, 11); // Rx, int sms_send=0;
const int ap1 = A5; const int
ap2 = A4; const int ap3 = A3;
int sv1 = 0;
int ov1 = 0;
 int sv2 = 0;
int ov2= 0;
int sv3 = 0;
int ov3= 0;
String utc = "";  // hhmmss.00

String lat = ""; // DDMM.MMMM N/S String lon = ""; //
DDMM.MMMM E/W String alt = "";  // x meters
unsigned int f,d,e,flag1=0,count=0,flag=0,in1,counter=0,Normal=0,in2; void setup() {
 pinMode(out, OUTPUT); Serial.begin(9600);
soft.begin(9600); Serial.println("AT"); delay(1000);
Serial.println("AT+CMGF=1"); delay(1000);
Serial.println("AT+CNMI=1,2,0,0"); delay(1000);
}

void loop() { analogReference(EXTERNAL); sv1 =
  analogRead(ap1);
  ov1 = map(sv1, 0, 1023, 0, 255);

   delay(2);

      sv2 = analogRead(ap2);

      ov2 = map(sv2, 0, 1023, 0, 255);

      delay(2);
          sv3 = analogRead(ap3);

          ov3 = map(sv3, 0, 1023, 0, 255);

//              Serial.print("Xsensor1 = " );

// Serial.print(sv1);

// Serial.print("\t output1 = ");

// Serial.println(ov1);
```

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```
//

//  Serial.print("Ysensor2 = " );

//  Serial.print(sv2);

//  Serial.print("\t output2 = ");

//  Serial.println(ov2);

//

//  Serial.print("Zsensor3 = " );

//  Serial.print(sv3);

//  Serial.print("\t output3 = ");

//  Serial.println(ov3);

// delay(2000); Serial.println(ov3); int
  a=ov3; if(a<148)
  {
    tone(7, 494, 300);

  in1 = analogRead(BEAT); if((in1>616)&&(flag==0))
    {

      count++; flag=1;
 }

 else if((in1>616)&&(flag==1))

 {

   flag=0;

 }

 Serial.println(count); counter++;
 if(counter > 3000)
 {

   callback(); counter = 0;
 }

 f =(count*2/60);

 if((f > 50) && (f < 80))

 {
```

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```
Normal=1;
                    }

 else
 {
 Normal=0;
 }
 if(sms_send == 0)
          {

        getGPS(); Serial.println("AT"); delay(1000);
     Serial.println("AT+CMGF=1");
      delay(1000); Serial.print("AT+CMGS=");
          Serial.print(""); Serial.print("9942782333");
          Serial.println(""); delay(2000);
          Serial.print("VEHICLE UNSTABLE, CHANCES FORACCIEND");

   Serial.print("Time: "); Serial.println(utc);
  Serial.print("Latitude: "); Serial.println(lat);
  Serial.print("Longitude: "); Serial.println(lon);
  Serial.print("Altitude: "); Serial.println(alt);
             delay(2000); Serial.write(0x1a);
          Serial.write(0x0d);
          Serial.write(0x0a); delay(2000);
          sms_send = 1;
      }

  }

      else

        {

      sms_send = 0;

    }
}

void callback()

{

  if(Normal == 1)

 {
}
```

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```
else

{

Serial.println("AT"); delay(1000); Serial.println("AT+CMGF=1"); delay(1000); Serial.print("AT+CMGS=");
Serial.print(""); Serial.print("9942782333"); Serial.println("");
  delay(2000); Serial.print("Normal condition");
  Serial.print("pluse:");
     Serial.print(f); delay(2000);
     Serial.write(0x1a); Serial.write(0x0d);
        Serial.write(0x0a); delay(2000);
       Serial.println("AT"); delay(1000);
         Serial.println("AT+CMGF=1"); delay(1000);
           Serial.print("AT+CMGS="); Serial.print("");
           Serial.print("9942782333"); Serial.println("");
           delay(2000); Serial.print("Abnormal condition");
           Serial.print("pluse:");
              Serial.print(f); delay(2000);
           Serial.write(0x1a);
           Serial.write(0x0d);
           Serial.write(0x0a);
}

  if(flag1 == 0)

  {

    digitalWrite(out,HIGH); // toggle LED pin flag1 = 1;
  }

  else

  {

    digitalWrite(out,LOW); // toggle LED pin flag1 = 0;
  }

    count=0;

}
void getGPS() { int index;
    // Look for $GPGGA

                if ( soft.find("$GPGGA,") ) {

   // Parse message for time and position utc =
   soft.readStringUntil(',');
    lat = soft.readStringUntil(',');
    lat.concat(soft.readStringUntil(',')); lon =
    soft.readStringUntil(','); lon.concat(soft.readStringUntil(','));
     // Flush data up until altitude for ( int i  0; i < 3;
```

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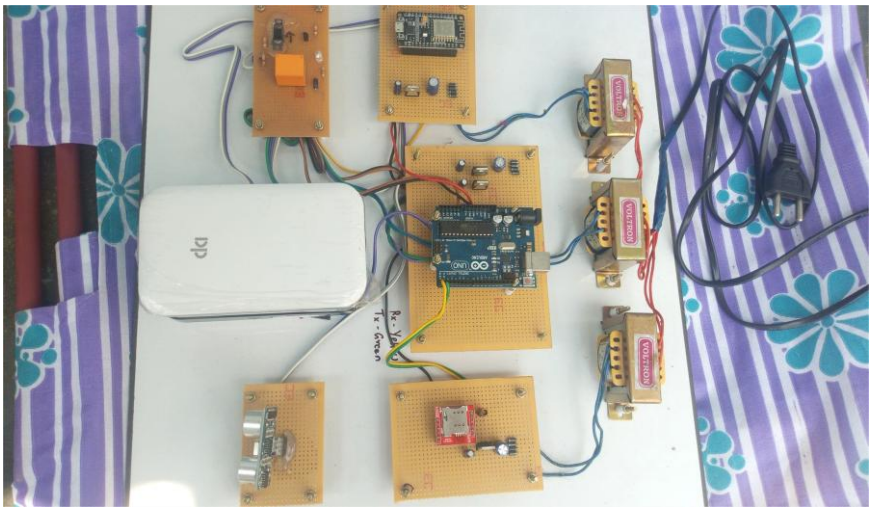
```
            i++ ) { soft.readStringUntil(',');
    }

    // Parse altitude data

    alt = soft.readStringUntil(','); alt.concat(soft.readStringUntil(','));
    // Flush rest of message soft.readStringUntil('\r');
  }

}
```

## VI. HARDWARE IMPLEMENTATION



## VII. RESULTS

- A prototype of the proposed system was implemented using Arduino and Node MCU 12E Wi-Fi module
- The system has a street light model which can be power on and off from a website from a remote location using IoT also it monitors the light intensity around it and sends this data to a web server
- Along with this a fault identification and SMS alert system was also implemented using GSM module The project was tested in a laboratory environment and the desired output was also achieved.

## VIII. CONCLUSION

IOT based street light control using LDR helps to save a large amount of electric power which is wasted in conventional street lighting system. The automatic switching operation observed using the developed control circuit is found to be very efficient and the maintenance cost is very less. The circuit controls the turning ON or OFF the street light. The street lights have been successfully controlled by microcontroller. With commands from the controller the lights will be ON when it receives a on command through IOT as per the feedbaSck given early. Furthermore the drawback of the street light system by just using timer controller has been overcome, where the system depends on both timer and LDR sensor. The system is cost efficient, reliable, prevents manual ON and OFF of lights, prevents energy wastage.

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## REFERENCES

[1] Monali Y. Khachane, February 2018, "Intelligent Street Lighting System", International Journal of Engineering Research in Computer Science and Engineering (IJERCSE), vol. 5, no. 2, pp. 587- 593.
[2] Archana.G, Aishwarya.N, Anitha.J, Vijay Kumar, 2018, "Intelligent Street Light System", International Journal of Recent Advances in Engineering & Technology, vol. 3, no. 4, pp. 16-21.
[3] K.Y.Rajput, Gargeyee Khatav, Monica Pujari, Priyanka Yadav, March. 2016, "Intelligent Street Lighting System Using Gsm", International Journal of Engineering Science Invention, vol. 2, no. 3, PP.60-69.
[4] Harshita Gupta, Prasad Thorve,Naman Tripathi, Vina M. Lomte, Dec-2017, "Energy-efficient Intelligent Street Lighting System", International Research Journal of Engineering and Technology, vol. 04, no. 12, pp. 508-513.
[5] Richu Sam Alex, R Narciss Starbell, April 2014, "Energy Efficient Intelligent Street Lighting System Using ZIGBEE and Sensors", International Journal of Engineering and Advanced Technology, vol. 3, no. 4, pp. 01-10.
[6] Shubhangi Gandh, Ashwin Malpe, Shubham Toshniwal, Sharvari Tantarpale, February-2016, "REVIEW STUDY OF INTELLIGENT STREET LIGHT SYSTEM", International Journal of Scientific & Engineering Research, Volume 7, Issue 2, pp. 92-98.
[7] Sakshi Anand, Dr. Neelu Jain, February 2015, "Intelligent Street Light System using Wireless Transmission: A Review", International Journal of Advanced Research in Electronics and Communication Engineering, vol. 4, no. 2, pp. 04-13.
[8] Archana M, Mahalahshmi.R, April 2014, "E – Street: LED Powered Intelligent Street Lighting System with Automatic Brightness Adjustment Based On Climatic Conditions and Vehicle Movements", International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering, vol. 3, no. 2, pp. 01-10.
[9] Moeenuddin Md. Mohsin, Ishwar S. Jadhav, February 2017, "High Efficiency Intelligent Street Lighting System Using a Zigbee Network and GSM", International Journal for Research in Applied Science & Engineering Technology (IJRASET), vol. 5, no. 2, pp. 45-53.
[10] Sharmitha D and Maithili P, 2017, "SOLAR POWERED INTELLIGENT STREET LIGHTING SYSTEM FOR HIGHWAY APPLICATION", International Journal of Pure and Applied Mathematics, vol. 116, no. 11, pp. 151- 160.