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Research Paper

Street Light Monitoring Using IOT

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Abstract

In the current scenario street lights are turned as an imperative ingredient. As we know plenty of electricity is squandered by street lights. So there is a necessity to rescue power as much as possible. As there exists decay in energy which is proportional to escalate the price of electricity. It is the necessity to save energy, street light monitoring system is fully automated to ameliorate the effectiveness of switching operations of street light monitoring. The Street Light Monitoring System focus is to model an astute advancement in technology by utilizing wireless technology (GSM). Each and every street light is supervised by the server based operated system which sends a information using wireless network (GSM Module) which incorporates client server solicitation which leads for effective supervision and energy economy dominance of street light monitoring system is very crucial. [1]

Keywords: *IoT, GSM Module, LDR, Street Lights, Atmega Microcontroller*

1. Introduction

In the current scenario, street lighting is one of the paramount segments of a city or rural infrastructure where the foremost concern is to brighten the city or rural streets during unilluminated hours of the day. A Street light or lamp is preferred as an originator of illumination on the roadside or walkway, which can be turned on at a definite time periods during dark hours. Lighting is repeatedly substantial electrical load in workrooms, however cost of illuminating energy utilization is less when collated with personnel costs. Thus its energy frugality prospective is usually forsaken. [1]

Studies have flaunted that concerning 4500MW of power is particularly consumed in India on public illumination. Hitherto, the quantity of street lights in rural and city is comparatively less. Accordingly street lights are comparatively uncomplicated although with the evolution of urbanization operation of street lights escalated speedily.[2]

Street light Monitoring and supervision is an automated system delineated to improve the effectiveness and exactness of an action by automatically controlling the street lights. The system moreover encompasses with client server technique where a user can forthwith his/her reciprocal actions with the web based requisitions to handle the street light of any location from distinct locality. Street light Monitoring system with the help of Microcontroller and GSM Technology has been progressed to lessen the utility of power in city public street lighting system. It is incorporated with examined circuits of street lights as well as discrete lights with network employable protocols. For most versions of lights, accordant hardware with definite protocols is utilized. [3]

- In the current scenario street light system is not pliable.
- Most of the supervision is physical, whereas few are automated build on environment limitations.
- Non automatic system results to inaccuracy which leads for deterioration of power.

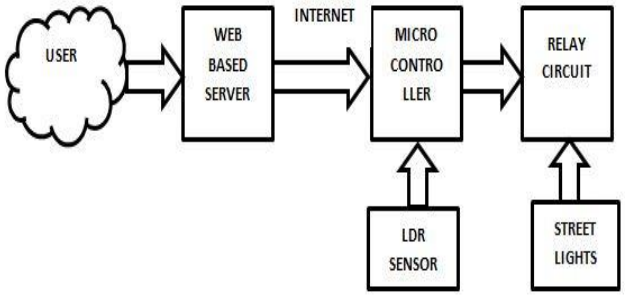


Figure 1: Representation of Street Light Monitoring System using IoT

2. System Architecture

A. Hardware Requirements

i.) LDR (Light Dependent Resistor).

The foremost postulate of LDR is when the severity of light is low than light is turned on or else it will be turned off. LDR is employed to assess the light potency based on environment and condition of street light. [4]

The LDR Module is incorporated with two LDR's out of which one is instated on acme of street light and the other is situated below the street light to monitor and scrutinize the lamp healthy conditions. The consequences of LDR will be consigned to Microcontroller which will be further do the action of transferring data to the communication module (GSM) which sends to control Centre. Control Centre is used to supervise the status of the light along with its operating conditions. [4]

ii.) GSM Module (SIM800A).

SIM800A Module is introduced in the street light monitoring application which can mediate voice, SMS, data information with less power utilization. An interface between GSM Module and RS232 authorizes an effortless connection with Computer/Laptop with the help of Microcontroller having a baud rate of 9600. The established Serial communication leads to transfer the commands with the help of transmitter and receiver devices established in the monitoring process of street lights. [5]

The GSM Module is boasted with intramural TCP/IP pile to authorize us to interact with internet, where it requires microcontroller to drive it.

Figure 2: GSM Module (SIM800A)

iii.) ATMEGA328 (Microcontroller)

The main function of Microcontroller (ATMEGA328) is to observer the behavior of street light under variety of environment conditions and verifying the healthy conditions of street light repercussion and transmitting the data to the GSM Module (transmitter/receiver). 8 bit Microcontroller is considered for speed processing which can be operated in the range of 1.8 – 5 V with a frequency of 0 – 4MHz. [6]

B. Software Requirements

i.) Microcontroller (ATMEGA328p).

ATMEGA328p is opted for the process of flash firmware onto the GSM module in which it is essential to have all the libraries and board should be perfectly established on it to supervise the condition of street lights. [6]

ii.) Webserver

The GSM module (SIM800A) and its alterations are furnished and underpin PHP, JAVA, AJAX, etc. Manageable webservers are able to designed and utilized remotely. [6]

User can instantly communicated with the help of Client Server based mechanism using web based applications to supervise and monitor the street lights of any place from remote location.

The server will run a PHP web application which is going to maintain the street lights of city or rural area. Whenever street lights are turned on/off server is going to send a message to the controller to recognize the mandatory action. The controller is going receive the data and decode it for every individual street light healthy condition. [6]

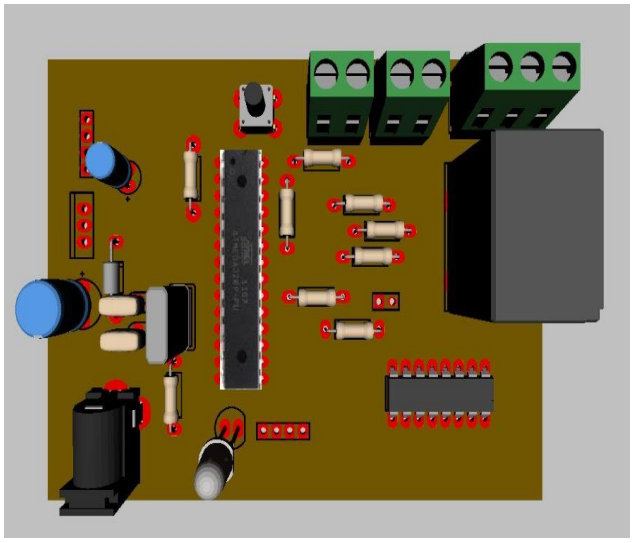


Figure 3: PCB Layout of Transmitter Circuit

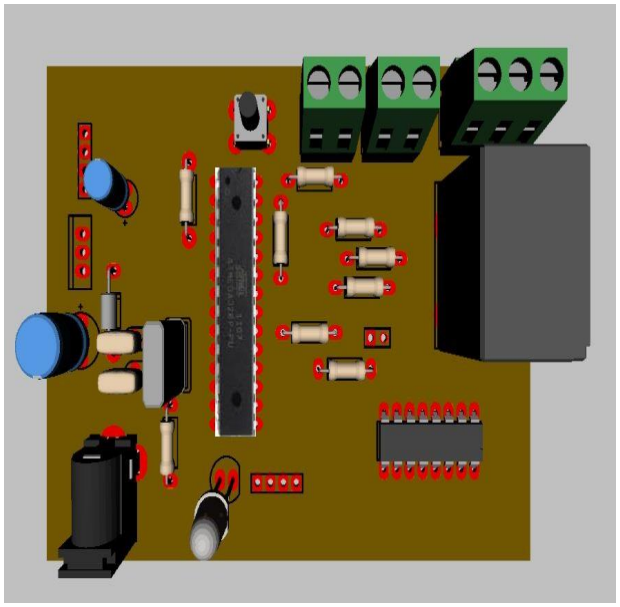


Figure 4: PCB Layout of Receiver Circuit

3. Proposed System

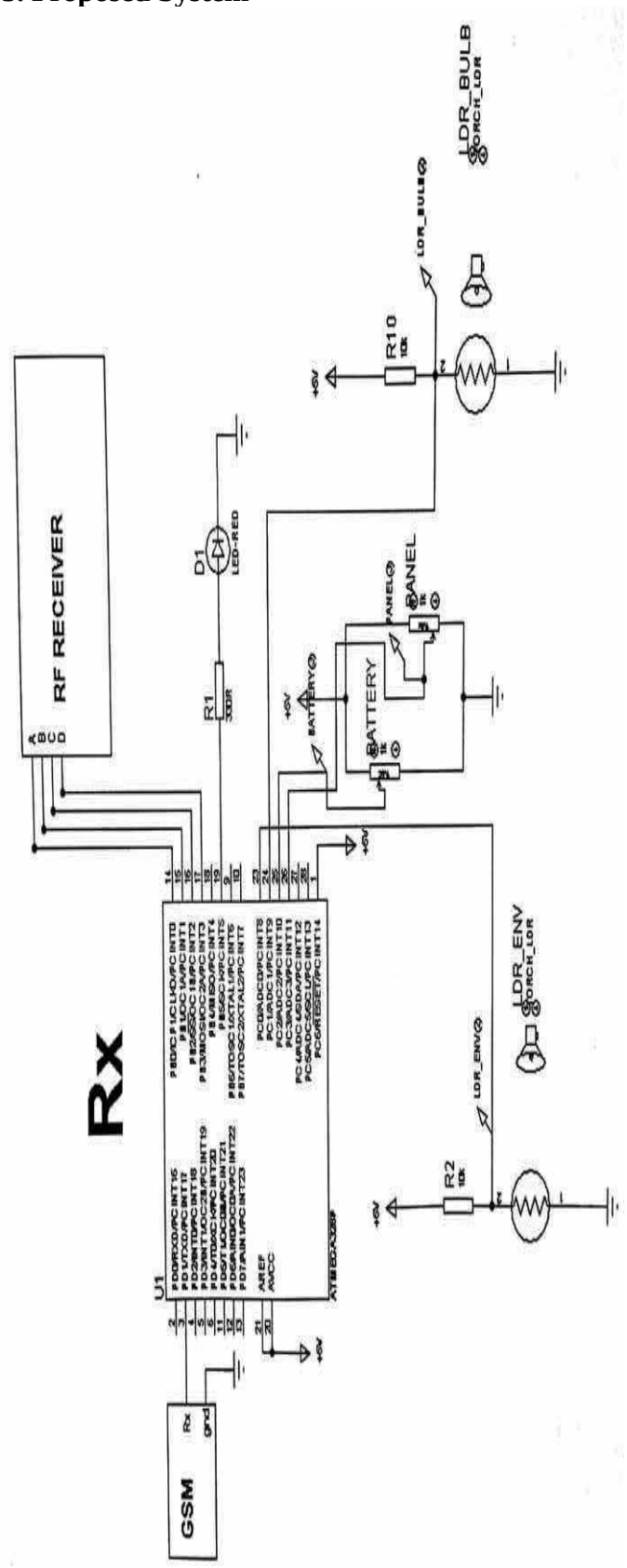


Figure 5: Receiver Circuit Design

The operation of the proposed system is able to do its assignments in a way which is not homogeneous to the prevailed systems with diversified features like automation in operation and user friendly interactions.

The proposed system is going to work with a street light circuit and it is monitored with the help of SIM800A module which is sequentially tracked by the mobile phone/laptop. This system can be comfortably executed with the individual street light controller and any Smartphone/ Laptop. [7]

The information is going to be collected from each street light whether it is on or off and the condition of the light like its working or not and the same is received with the help of GSM module.

The same circuit can be utilized to charge various electronic gadgets by using substitute system.

Pseudocode:

```
if(A==0 && B==0 && C==1 && D==0)//////////////////////night
  {
   if(LDR_env>800) //night
    {
     if(battery>panel)
       digitalWrite(LED,HIGH);
     if(battery<panel)
       digitalWrite(LED,LOW);
      Serial.println
("AT+SAPBR=3,1,\"Contype\",\"GPRS\"");
      delay(10000);
      Serial.println
("AT+SAPBR=3,1,\"APN\",\"www.airtelgprs.com\"");
      delay(10000);
      Serial.println ("AT+SAPBR=1,1");
      delay(10000);
      Serial.println ("AT+SAPBR=2,1");
      delay(10000);
      Serial.println("AT+HTTPINIT");
      delay(10000);
      Serial.println("AT+HTTPPARA=\"CID\",1");
      delay(10000);
      Serial.print("AT+HTTPPARA=\"URL\",");
      //delay(3000);

   if(battery>panel)
   {
    Seri-
al.print("http://cnir.in/iot/recieve.php?pid=00034&lat=Prima
ry Battery Discharging");
     if(LDR_bulb<800)
      Serial.print("&lng=Primary Lights On");
    if(LDR_bulb>800)
      Serial.print("&lng=Primary Lights Off");

      Serial.print("&device_id=Secondary Battery Discharg-
ing");
      Serial.println("&s1=Secondary Lights Off");
   }

   if(battery<panel)
   {
    Seri-
al.print("http://cnir.in/iot/recieve.php?pid=00034&lat=Prima
ry Battery Faulty");
     Serial.print("&lng=Primary Lights Off");

     Serial.print("&device_id=Secondary Battery Discharg-
ing");
     Serial.println("&s1=Secondary Lights Off");
   }

     delay(10000);
     Serial.println("AT+HTTPACTION=0");
     delay(10000);
     Serial.println("AT+HTTPTERM");
     delay(10000);
     Serial.println("AT+SAPBR=0,1");
     delay(120000);
   }
  }
```

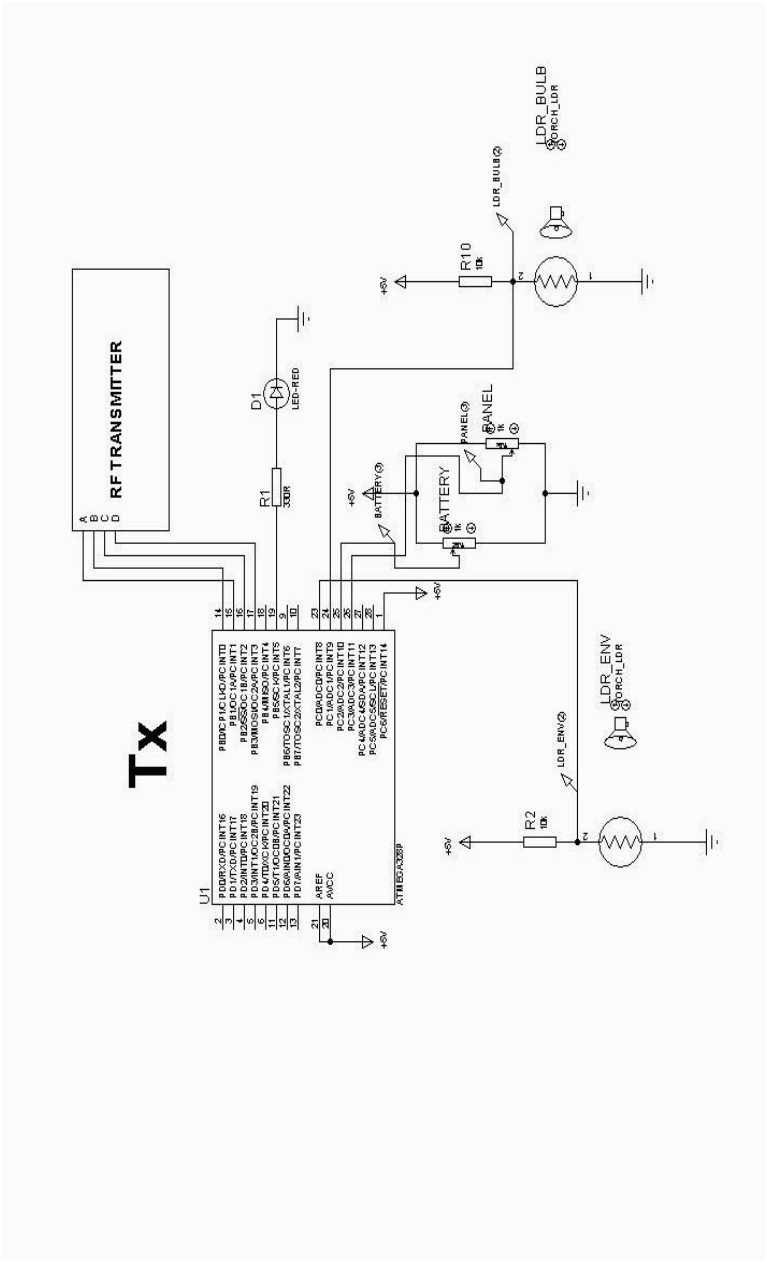


Figure 6: Transmitter Circuit Design

Data is conveyed from street light about their on/off conditions and heathy status to distinctive address within the system and connected to the web servers. [8]

In this process the street light are tested in diversified areas like healthy condition of illumination system and what is the present status of light whether it is turned on or off and any kind of fault occurred during the turning on process is determined. [8]

Pseudocode:

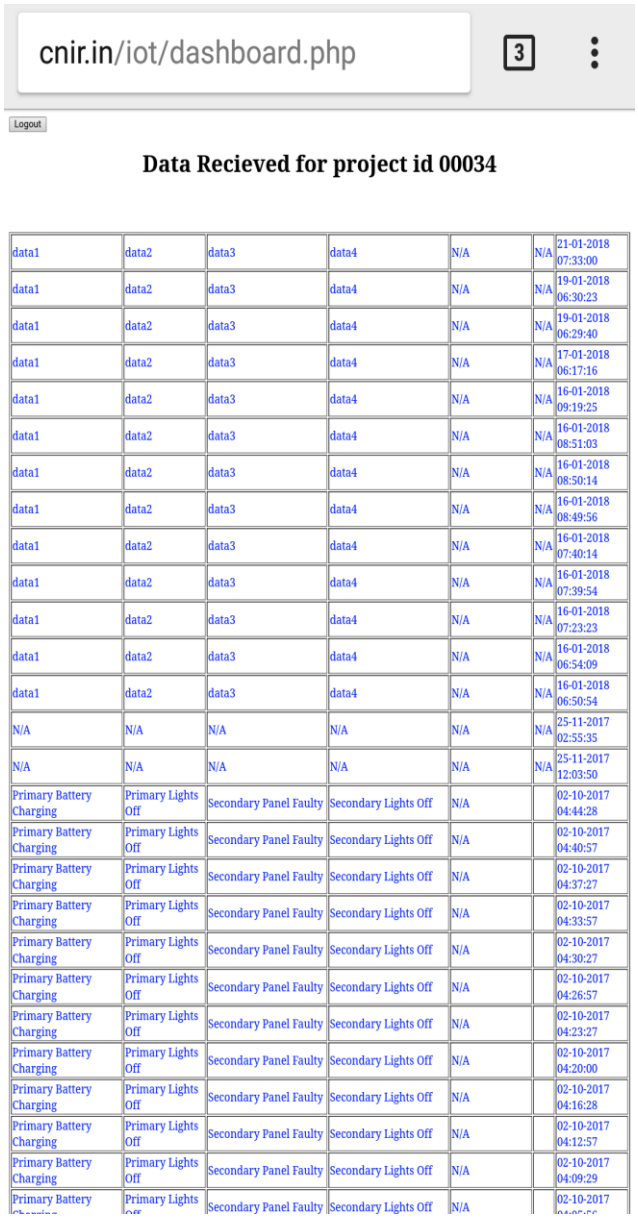
```
    if(LDR_env>800) //night
 {
  if(battery>panel)
    digitalWrite(LED,HIGH);
  if(battery<panel)
    digitalWrite(LED,LOW);

   if(battery>panel)
   {
    if(LDR_bulb<800)
    {
     digitalWrite(A,0);
     digitalWrite(B,0);
     digitalWrite(C,0);
     digitalWrite(D,1);
    }

    if(LDR_bulb>800)
    {
     digitalWrite(A,0);
     digitalWrite(B,0);
     digitalWrite(C,1);
     digitalWrite(D,0);
    }
   }

   if(battery<panel)
   {
    digitalWrite(A,0);
    digitalWrite(B,0);
    digitalWrite(C,1);
    digitalWrite(D,1);
   }
 }

 if(LDR_env<800) //daytime
 {
   digitalWrite(LED,LOW);

   if(panel>battery)
   {
    digitalWrite(A,0);
    digitalWrite(B,1);
    digitalWrite(C,0);
    digitalWrite(D,0);
   }

   if(panel<battery)
   {
    digitalWrite(A,0);
    digitalWrite(B,1);
    digitalWrite(C,0);
    digitalWrite(D,1);
   }
 }

}
```

4. Client Module:

In the proposed system client penetrates the username and password through which they can fortunately login to webpage. The client end is employed with PHP API which is having assorted functions like street light status, operation mode of load, fault indications and also date and time of operation is specified. [3]

Screen shot I – User Login Page

The client side script utilizes circumstances and indicates the following parameters.



data1	data2	data3	data4	N/A	N/A	21-01-2018 07:33:00
data1	data2	data3	data4	N/A	N/A	19-01-2018 06:30:23
data1	data2	data3	data4	N/A	N/A	19-01-2018 06:29:40
data1	data2	data3	data4	N/A	N/A	17-01-2018 06:17:16
data1	data2	data3	data4	N/A	N/A	16-01-2018 09:19:25
data1	data2	data3	data4	N/A	N/A	16-01-2018 08:51:03
data1	data2	data3	data4	N/A	N/A	16-01-2018 08:50:14
data1	data2	data3	data4	N/A	N/A	16-01-2018 08:49:56
data1	data2	data3	data4	N/A	N/A	16-01-2018 07:40:14
data1	data2	data3	data4	N/A	N/A	16-01-2018 07:39:54
data1	data2	data3	data4	N/A	N/A	16-01-2018 07:23:23
data1	data2	data3	data4	N/A	N/A	16-01-2018 06:54:09
data1	data2	data3	data4	N/A	N/A	16-01-2018 06:50:54
N/A	N/A	N/A	N/A	N/A	N/A	25-11-2017 02:55:35
N/A	N/A	N/A	N/A	N/A	N/A	25-11-2017 12:03:50
Primary Battery Charging	Primary Lights Off	Secondary Panel Faulty	Secondary Lights Off	N/A		02-10-2017 04:44:28
Primary Battery Charging	Primary Lights Off	Secondary Panel Faulty	Secondary Lights Off	N/A		02-10-2017 04:40:57
Primary Battery Charging	Primary Lights Off	Secondary Panel Faulty	Secondary Lights Off	N/A		02-10-2017 04:37:27
Primary Battery Charging	Primary Lights Off	Secondary Panel Faulty	Secondary Lights Off	N/A		02-10-2017 04:33:57
Primary Battery Charging	Primary Lights Off	Secondary Panel Faulty	Secondary Lights Off	N/A		02-10-2017 04:30:27
Primary Battery Charging	Primary Lights Off	Secondary Panel Faulty	Secondary Lights Off	N/A		02-10-2017 04:26:57
Primary Battery Charging	Primary Lights Off	Secondary Panel Faulty	Secondary Lights Off	N/A		02-10-2017 04:23:27
Primary Battery Charging	Primary Lights Off	Secondary Panel Faulty	Secondary Lights Off	N/A		02-10-2017 04:20:00
Primary Battery Charging	Primary Lights Off	Secondary Panel Faulty	Secondary Lights Off	N/A		02-10-2017 04:16:28
Primary Battery Charging	Primary Lights Off	Secondary Panel Faulty	Secondary Lights Off	N/A		02-10-2017 04:12:57
Primary Battery Charging	Primary Lights Off	Secondary Panel Faulty	Secondary Lights Off	N/A		02-10-2017 04:09:29
Primary Battery	Primary Lights	Secondary Panel Faulty	Secondary Lights Off	N/A		02-10-2017

Screen shot II – Profile Customization

- Street light condition is healthy (light is turned on or off condition and checking any fault occurrence)
- In case light is off check the conditions of load
- Checking the conditions of the light.

Checking the conditions is discretionary as a usual which can be predetermined. The maximum value can be assigned as Night condition and minimum value can be assigned as day condition and incase of any fault occurrence we can represent as faulty condition. The client is able to access the IoT based street light monitoring using GSM Module directly. [3]

5. Conclusion and Future Scope

The network is going to resolve the energy efficacy issues of traditional street light systems. The transmission speed is 99 to 100% depending upon deployment of sending and receiving units in the system. [1]

The proposed may appear to be exorbitant but can be compensated with the availability of power system and significantly less price for maintenance. There can be less light pollution and power utilization. Cost deduction can be done with the help Led technology thus which can lead to a perceptive management technology. The system can be flexible, elongated, and utterly adaptable to the user needs. [3]

The street light system competes at low power which can be acquired by GSM technology any one can receive the data from any point of the world.

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