VIT®

Vellore Institute of Technology

(Deemed to be University under section 3 of UGC Act, 1956)

STREET LIGHT
GLOW ON DETECTING VEHICLE MOVEMENT.

Team Members: -

17BCE0032 Diksha Singhania.

17BCI0099 Sandhya Ananthan.

Report Submitted for the

Final Project Review of: Street Light

Glow On Detecting Vehicle Movement.

Course Code: CSE2006-MICROPROCESSOR AND INTERFACING

SLOT: A1

Professor: Rajarajan G

AIM:

- Implement a working model which will be able to detect motion and switch on the LEDS accordingly.
- Help in reducing power consumption by our country
- Improve our economy indirectly.
- We can also use solar panels to recharge the leds, but in a country like ours which is still developing the installation of solar panels will be expensive hence we are proposing cost effective model.

ABSTRACT:

Currently, in the whole world, enormous electric energy is consumed by the street lights, which are automatically turn on when it becomes dark and automatically turn off when it becomes bright. This is the huge waste of energy in the whole world and should be changed. The main aim of the proposed model is that lights turn on when needed and light turn off when not needed. Moreover, this system behaves like usual street lights that turn on all night. The ideal behavior of the smart street light system is that no one finds turn-off of street lights at night. Whenever someone see street lights, they turn on and whenever no one see street lights, they turn off. The system consists of LED lights, motion sensors and Arduino uno Board. The lights turn on before pedestrians and vehicles come and turn off when there is no one. It will be difficult for pedestrians and drivers of vehicles to distinguish our lights and the conventional street lights because our street lights all turn on before they come.

INTRODUCTION:

Automation plays an increasingly important role in the world economy and in daily life. Automatic systems are being preferred over manual system. The research work shows automatic control of streetlights as a result of which power is saved to some extent. In the scope of industrialization, automation is a step beyond mechanization [1]. Whereas mechanization provided human operators with machinery to assist the users with muscular requirements of work, automation greatly decreases the need for human sensory and mental requirements as well. Basically, street lighting is one of the important parts. Therefore, the street lamps are relatively simple but with the development of urbanization, the number of streets increases rapidly with high traffic density. There are several factors need to be considered in order to design a good street lighting system such as night-time safety for community members and road

users, provide public lighting at cost effective, the reduction of crime and minimizing it is effect on the environment. At the beginning, street lamps were controlled by manual control where a control switch is set in each of the street lamps which is called the first generation of the original street light. After that, another method that has been used was optical control method done using high pressure sodium lamp in their system. Nowadays, it is seen that the method is widely used in the country. The method operates by set up an optical control circuit, change the resistance by using of light sensitive device to control street lamps light up automatically at dusk and turn off automatically after dawn in the morning. Due to the technological development nowadays, road lighting can be categorized according to the installation area and performance, for an example, lighting for traffic routes, lighting for subsidiary roads and lighting for urban center and public amenity areas. The WSN helps in improving the network sensing for street lighting. Meanwhile, street light system can be classified according to the type of lamps used such as incandescent light, mercury vapor light, metal halide light, high pressure sodium light, low pressure sodium light, fluorescent light, compact fluorescent light, induction light and LED light. Different type of light technology used in lighting design with their luminous efficiency, lamp service life and their considerations. The LED is considered a promising solution to modern street lighting system due to its behavior and advantages. A part from that, the advantages of LED are likely to replace the traditional street lamps such as the incandescent lamp, fluorescent lamp and High Pressure Sodium Lamp in future but LED technology is an extremely difficult process that requires a combination of advanced production lines, top quality materials and high-precision manufacturing process. Therefore, the research work highlights the energy efficient system of the street lights system using LED lamps with ULTRASONIC sensor interface for controlling and managing

LITERATURE SURVEY:

S.Suganya et al [2] have proposed about Street Light Glow on detecting vehicle movement using sensor isa system that utilizes the latest technology for sources of light as LED lamps. It is also used to control the switching of street light automatically according to the light intensity to develop flow based dynamic control statistics using infrared detection technology and maintain wireless communication among lamppost and control terminal using ZigBee Wireless protocol. It also combines various technologies: a timer, a statistics of traffic flow magnitude, photodiodes, LED, power transistors.

K.Santha et al [3] have surveyed on Street Lighting System Based on Vehicle Movements. The system operates in the automatic mode which regulates the streetlight according to brightness and dimness algorithm and light intensity. The control can be made according to the seasonal variation. It includes a time cut-out function and an automatic control pattern for conserving more electricity. The whole project was implemented using a PIC microcontroller.

Srikanth et al [4] proposed a ZigBee based Remote Control Automatic Street Light System. The system is designed with the help of ZigBee modules that helps in detecting the faulty lights and control the light. It also discusses about an intelligent system that takes automatic decisions for ON/OFF/DIMMING considering the vehicle movement or pedestrian and also the surrounding environment. ULTRASONIC motion sensor is used to detect movement of both living and non-living things.

M.Abhishek et al [5] haveimplemented design of traffic flow based street light control system with effective utilization of solar energy in the year 2015. They used the renewable source of energy i.e. the solar power for street lighting. They have also used 8052 series microcontroller and is developed by replacing the normal bulbs with the LEDs due to which the power consumption is reduced by 3 times. Sensors are placed on either side of the road which senses the vehicle movement and sends the commands to the microcontroller to switch ON and OFF the lights. Here all the street lights remain switched off and it glows only when it senses the vehicle movement. Hence, because of the microcontroller, even when its night the lights are switched off.

C.Bhuvaneshwari et al [6] have analyzed the street light with auto tracking system by which one can increase the conversion efficiency of the solar power generation. Here, the sun tracking sensor is the sensing device which senses the position of the sun time to time and gives the output to the amplifier based on light density of the sun. Sun tracking sensor is , amplifier unit is used to amplify the signals which converts low level signals to high level signals and the output is given to comparator. The LM324 IC is used as an amplifier. Comparator compares the signals and gives the command to AT89C51 microcontroller.

Steve Chadwick [7] reports on the two installation case studied in Scotland and Wales and explains the details and benefits of the technology. The system was called as MINOS that had a track record of over 100,000 units installed and working successfully.

From this literature survey, the methods each one has implemented and used is simple and easy to understand. These papers and journals has given many ideas to further implement a much efficient system and make things automated. The presentations are simple and clean with all the necessary information needed for a basic learner or reader.

EXISTING MODEL:

The existing model is the street lights which we see in everyday in our day today life. These street lights start working as soon an the sun sets and is on the entire night whether there is anyone around or not. The disadvantage of this system is that since the lights are on throughout the night, there is much consumption of electricity. Consumption of electricity costs us resources and money.The money and the resources which is being wasted on this system can be used somewhere where it is beneficial to the people or if not at least it will not deplete the earth.

Industry of street lighting systems are growing rapidly and going to complex with rapid growth of industry and cities. Automation, Power consumption and Cost Effectiveness are the important considerations in the present field of electronics and electrical related technologies. To control and maintain complex street lighting system more economically, various street light control systems are developed. These systems are developed to control and reduce energy consumption of a town's public lighting system using different technologies. The existing work is done using HID lamps. Currently, the HID is used for urban street light based on principle of gas discharge, thus the intensity is not controlled by any voltage reduction method as the discharge path is broken. HID lamps are a type of electrical gas discharge lamp which produces light by means of an electric arc between tungsten electrodes housed inside a translucent or transparent fused quartz or fused alumina arc tube. This tube is filled with both gas and metal salts. The gas facilitates the arc's initial strike. Once the arc is started, it heats and evaporates the metal salts forming plasma, which greatly increases the intensity of light produced by the arc and reduces its power consumption. High-intensity discharge lamps are a type of arc lamp.

Disadvantages of Existing System:

- HID lamps consume more power.
- The life time of the HID lamps is very less.
- It cannot be used in all outdoor applications.

- Brightness of the lights in the rear view mirrors which causes a problem for drivers in front of your vehicle.

Proposed System.

Since the HID lamps are not cost effective and not reliable, smart street light system has overcome by replacing the HID lamps with LED. Due to automation, power consumption and cost effectiveness in the present field of electronics and electrical related technologies, industry of street lighting systems are growing rapidly and going to complex with rapid growth of industry and cities. To control and maintain complex street lighting system more economically, various street light control systems are developed. These systems are developed to control and reduce energy consumption of a town's public lighting system using different technologies which uses ULTRASONIC motion sensors to detect the vehicle movement after which the street light begins to glow. As the vehicle moves, the street light that was glowing switches off and the following lights begins to glow.

a) **Arduino Uno :**
Arduino Uno specifications are ATmega328 microcontroller, operating voltage at 5v, input voltage 7 to 12v, input voltage limit up to 20v, digital I/O pins 14, analog pins 6, DC current 40mA, flash memory 32KB including 0.5KB used by boot loader. SRAM of 2KB, EEPROM of 1KB and clock speed of 16 MHz some of the Features of Arduino UNO are power: can be USB connection or external power supply, with 7 to 12 volts recommended. The Arduino UNO provides power pins for other devices, the variants are 5v 3.3v and vin IOREF pin for optional power. Arduino Uno is a 2KB of SRAM and 1KB of EEPROM (Electrically Erasable Programmable Read Only Memory). There are various input and output pins where 14 of them are digital pins with serial transfer and external interrupts and PWM (Pulse Width Modulation) pins and 6 analog pins. Arduino differs from all the preceding boards which does not use the FTDI USB-to-serial driver chip.

b) **Ultrasonic Sensors:**
Ultrasonic sensors are a type of acoustic sensor divided into three broad categories: transmitters, receivers and transceivers. Transmitters convert electrical signals into ultrasound, receivers convert ultrasound into electrical signals, and transceivers can both transmit and receive ultrasound. In a similar way to radar and sonar, ultrasonic transducers are

used in systems which evaluate targets by interpreting the reflected signals. For example, by measuring the time between sending a signal and receiving an echo the distance of an object can be calculated. Passive ultrasonic sensors are basically microphones that detect ultrasonic noise that is present under certain conditions. Ultrasonic probes and ultrasonic baths apply ultrasonic energy to agitate particles in a wide range of materials.

Proposed System Design Architecture:

Our model is a conventional method of reducing power consumption in street lights, which are one of the major power consuming public resource. In our model we aim to implement the use of Arduino board. Which is going to handle the control system of all street lights. We are going to connect this board with passive infrared sensors, which are going to detect movement on the road. We will detect the movement using this sensor in the first streetlight present in the street, which will inform all other street lights of this traveler, therefore all the other streetlights will be turned on 2secs after one another. It will remain switched on until the last street light in the street will also detect a movement, which will show that the traveler has passed through this street. We will have two infrasonic sensors implemented for each street, this way we can save money on implementing infrasonic sensors for each and every streetlight.

Components used

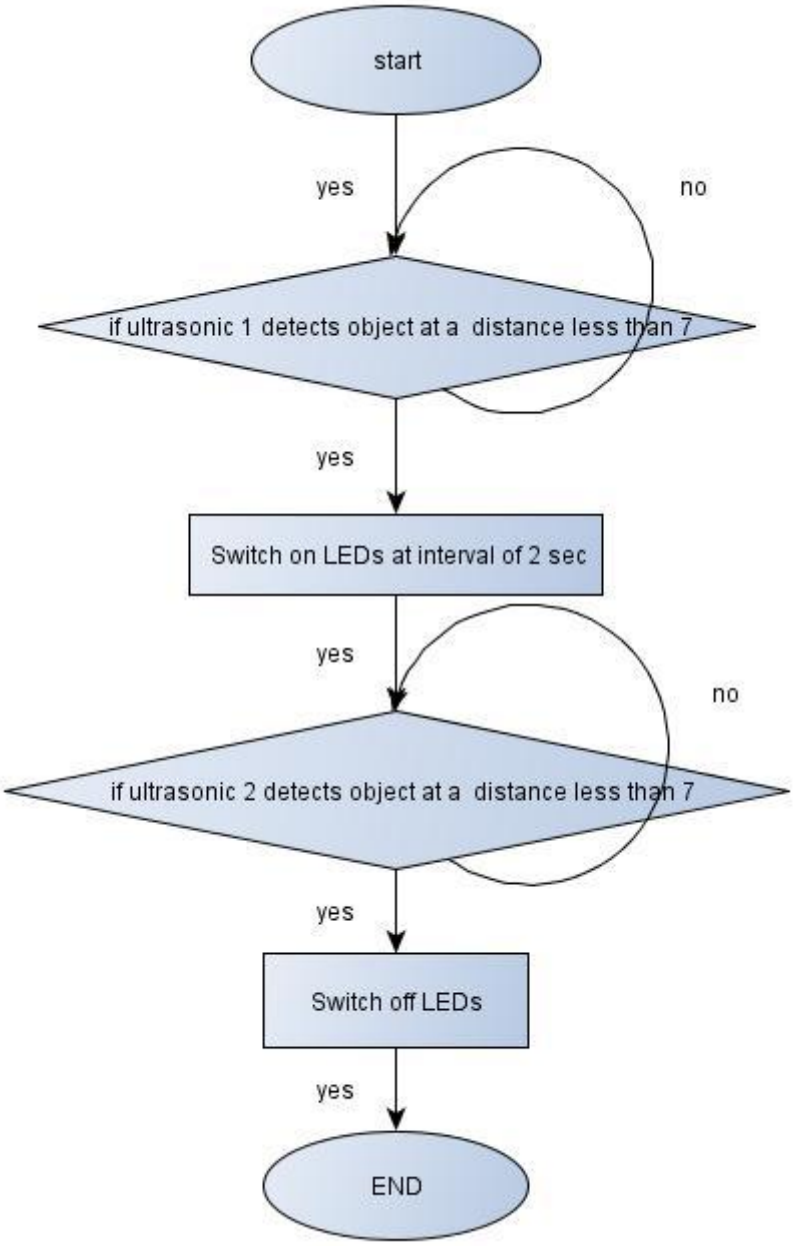
Hardware:

1. Ardunio uno Board
2. Ultrasonic sensors
3. LED’s
4. Wires, cables

Software:

1. Arduino IDE

Working Model:



In This working model , We have used Arduino uno, which has been interfaced with 2 ultrasonic sensors,

which we have connect trigger(1) with 5 of digital pin in Arduino board. In the same way, we connect all the other pins of our sensors to the board which will take values from the pins and provide the required information to the board. The

trigger pin is set as low, and then for a while set a high, if an object is present in front of the sensor, the ultrasonic waves will get reflected back to the echo pin, which will be high for a while, the duration in which the wave returns back to the sensor, is then converted into distance, which gives us our required value.

After Connecting the major component, which is the ultrasonic sensors, we then connect few LEDs which are working as our street lights, therefore in the code for this program, we will first take values from ultrasonic sensor (1) which is located in the start of the road, then we calculate the distance using d=t*s, which will give us the closeness of that object to the first sensor, here we set if the value of distance is less than 7, then the object has entered the road, then we will switch on the led's with a little duration. And finally when the object is detected by the second ultrasonic sensor, the lights will turn off. By this mechanism, we can monitor the number of vehicles entering a road, and conserve electricity.

Algorithm:

1. Define variables along with pin numbers (pin number connected in the board)

trigPin1 6, echoPin1 5, trigPin2 10, echoPin2 9

2. In Setup given rate as 9600 and set up trig as output and echo as input.

3. In loop get the distance of both sensors by taking formula d=s*t where t is the pin reading of echo.

4. Now, under a loop give if distance1<10, then turn on all LED's.

5. Similarly, if distance2<10, turn off all LED's.

Conclusion:

By using Smart Street light, one can save surplus amount of energy which is done by replacing sodium vapor lamps by LED and adding an additional feature for security purposes. It prevents unnecessary wastage of electricity, caused due to manual switching of streetlights when it's not required. It provides an efficient and smart automatic streetlight control system with the help of Ultransonic sensors. It can reduce the energy consumption and maintains the cost. The system is versatile, extendable and totally adjustable to user needs.

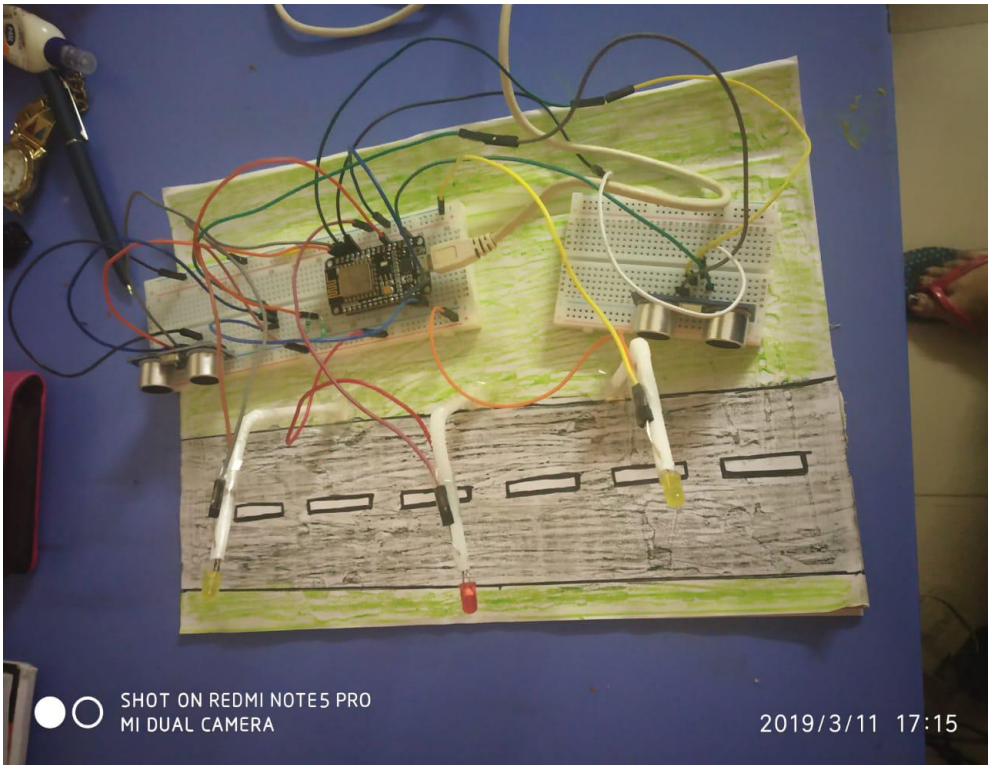
- The system is now used only for one way traffic in highways.
- Continuous use of ULTRASONIC sensors even in day time.
- Not switched on before the sunset

The Smart light system can be further extended to make the current system in two-way traffic, making the system more flexible in case of rainy days and introduction of ways to control the lights through GSM based service.

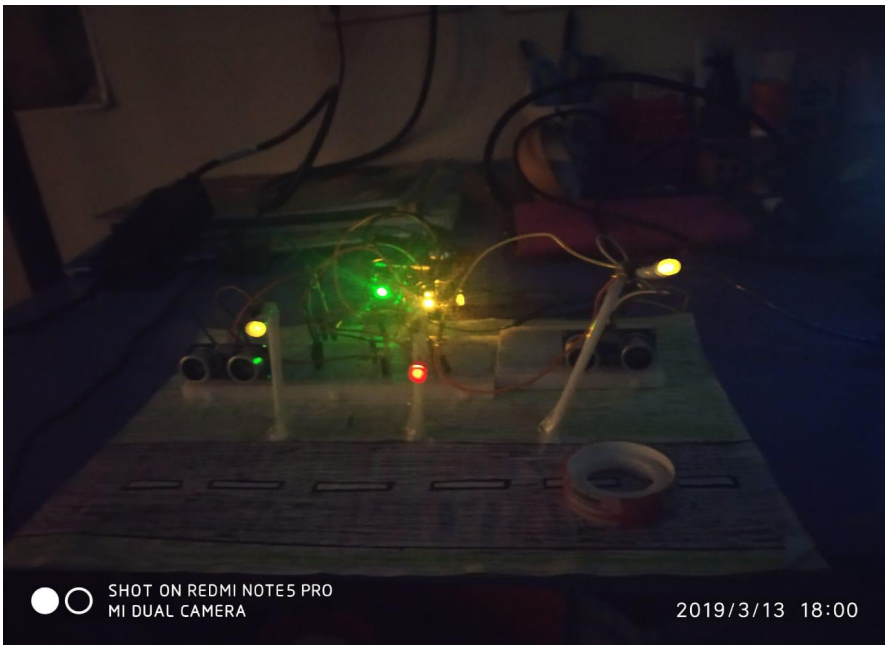
Result:

The project is designed for LED based street lights. A number of LED streetlights glow for a specific distance ahead, on sensing an approaching vehicle and then switches OFF once the vehicle passes by. Thus a lot of energy is saved in this process. Optionally, dimming feature can be used in this system while no vehicles are passing on the road.

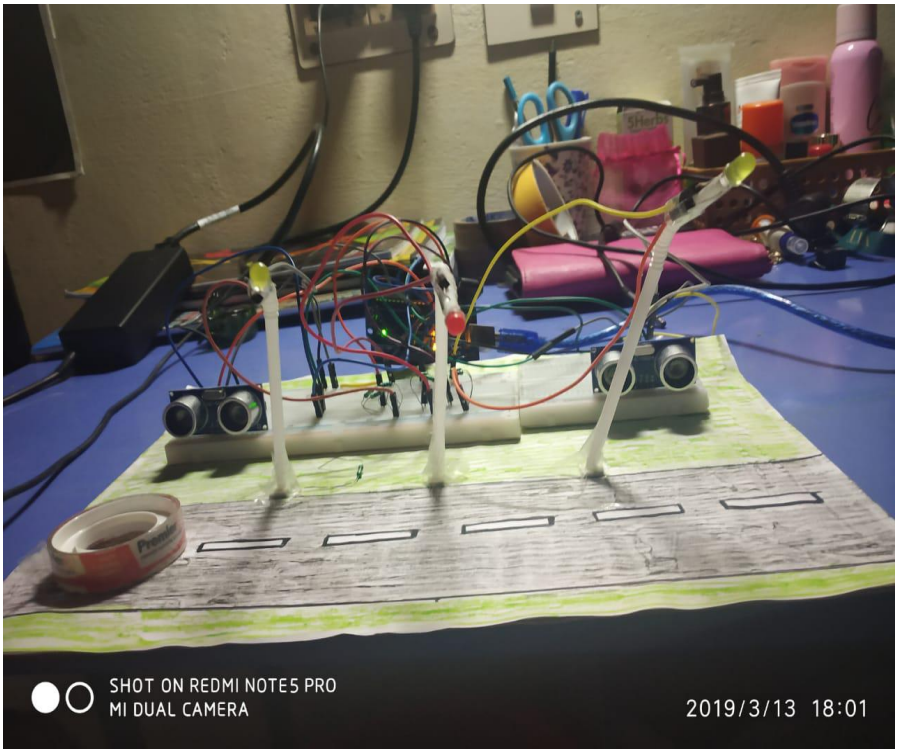
In this image, the setup is show, how trigger and echo of both sensors are connected to the port's, and the connection of LED's is also shown.



In this image, we see how the lights are turned on after an object is passed in front of the first sensor.



This image shows that when the object passes after the second sensor, the lights are turned off.



Code (Arduino uno):

```
#define trigPin1 6
#define echoPin1 5
#define trigPin2 10
#define echoPin2 9

long duration, distance1,distance2, RightSensor,LeftSensor;

void setup()
{
Serial.begin (9600);
pinMode(trigPin1, OUTPUT);
pinMode(echoPin1, INPUT);
pinMode(trigPin2, OUTPUT);
pinMode(echoPin2, INPUT);
}

void loop() {
SonarSensor(trigPin1, echoPin1);
RightSensor = distance1;
if(distance1<10)
{
  digitalWrite(7,HIGH);
  delay(10);
  digitalWrite(4,HIGH);
  delay(10);
```

```
  digitalWrite(3,HIGH);
}
SonarSensor(trigPin2, echoPin2);
LeftSensor = distance1;
if(distance1<10)
{
  digitalWrite(7,LOW);
  delay(10);
  digitalWrite(4,LOW);
  delay(10);
  digitalWrite(3,LOW);
}
Serial.print(LeftSensor);
Serial.print(" - ");
Serial.println(RightSensor);

}

void SonarSensor(int trigPin,int echoPin)
{
digitalWrite(trigPin, LOW);
delayMicroseconds(2);
digitalWrite(trigPin, HIGH);
delayMicroseconds(10);
digitalWrite(trigPin, LOW);
duration = pulseIn(echoPin, HIGH);
distance1 = (duration/2) / 29.1;
```

}

Reference:

[1]. http://opensourceecology.org/wiki/Automation

[2]. S. Suganya, R. Sinduja, T. Sowmiya& S. Senthilkumar, Street light glow on detecting vehicle movement using sensor

[3]. K.Santha Sheela,S.Padmadevi, Survey on Street Lighting System Based On Vehicle Movements

[4]. Srikanth M, Sudhakar K N,ZigBee Based Remote Control Automatic Street Light System

[5]. M.Abhishek, Syed ajram shah, K.Chetan, K,Arun Kumar, Design and implementation of traffic flow based street light control system with effective utilization of solar energy, International journal of Science Engineering and Advance Technology, IJSEAT, Vol 3, Issue 9, September -2015

[6]. C.Bhuvaneshwari, R.Rajeswari, C.Kalaiarasan, Analysis of Solar energy based street light with auto tracking system, International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering, Vol 2, Issue 7, July 2013

[7]. Steve Chadwick,"Street Light Monitoring – a Practical Solution magazine" November/December 2002

[8]. "Intelligent Street Lighting System Using Gsm" International Journal of Engineering Science Invention ISSN (Online): 2319 – 6734, ISSN (Print): 2319 – 6726Volume 2 Issue 3 March. 2013

[9]. "Wireless internet lighting control system",Budike, E.S. Lothar (Power web Technologies), US patent 7,167,777, Jan 23, 2007.

[10]. https://en.wikipedia.org/wiki/High-intensity_discharge_lamp

[11]. http://www.hobbytronics.co.uk/arduino-uno-r3

[12]. Tarun Agarwal. Retrieved from https://www.google.co.in/webhp?sourceid=chrome-instant&ion=1&espv=2&ie=UTF8#q=ir%20sensors

[13]. IOSR Journal of Mobile Computing & Application (IOSR-JMCA) e-ISSN: 2394-0050, P-ISSN: 2394-0042.Volume 3, Issue 2. (Mar. - Apr. 2016), PP 39-44

[14].Automatic Streetlights that Glow on Detecting Night and Object using Arduino Zain Mumtaz1 , Saleem Ullah1 , Zeeshan Ilyas1 , Shuo Liu2 , Naila Aslam1 , Jehangir Arshad Meo3 , Hamza Ahmad Madni2, 4*

[15].Smart street light system looking like usual street lights based on sensor networks (Invited Paper) Noriaki Yoshiura∗ , Yusaku Fujii† , Naoya Ohta‡ ∗ Department of Information and Computer Sciences, Saitama University.

****