Arduino Based Smart Street Light

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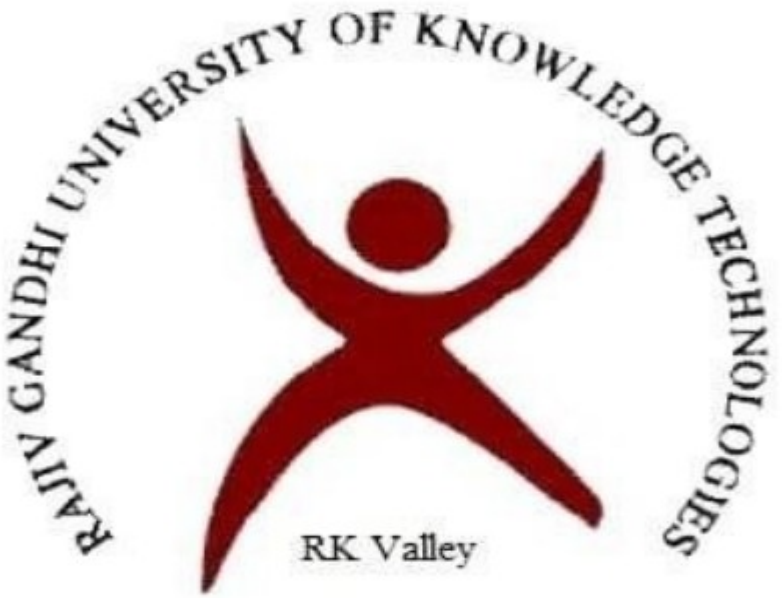
BACHELOR OF TECHNOLOGY



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CERTIFICATE

This is to certify that the mini project report entitled

“ Arduino Based Smart Street Light” *is a bonafide record submitted by* ***M.NIKHILESH REDDY*** *bearing Reg. No.* **R170925, M.VICTOR KRUPANAND** *bearing Reg. No.* **R170982, G.PAVAN KALYAN** *bearing Reg. No.* **R170912** *in partial fulfillment for the award of Degree of Bachelor of Technology in* ***Electronics and Communication Engineering*** *for the academic year* ***2021-2022.***

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INTERNAL EXAMINER **EXTERNAL EXAMINER**

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DECLARATION

We here by declare that the work presented in this project report entitled ‘ **Arduino Based Smart Street Light**’ submitted to the department of Electronics and Communication Engineering in Rajiv Gandhi University of Knowledge Technologies, IIIT RK Valley, Andhra Pradesh for the partial fulfillment of the requirement for the award of degree of BACHELOR OF TECHNOLOGY in ELECTRONICS AND COMMUNICATION ENGNIEERING is a record of our work carried out during the “ Third year ” under the guidance of SRI.M.ANITHA **M.Tech**, Asst. prof. in Department of ECE, in Rajiv Gandhi University of Knowledge Technologies, IIIT RK Valley, Andhra Pradesh.

The matter embodied in this work has not been submitted else where by anyone for the award of any other course of study.

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ABSTRACT

Our manuscript aims to develop a system which will lead toenergy conservation and by doing so, we would be able to lighten few more homes. The proposed work is accomplished by using Arduino microcontroller and sensors that will control the electricity based on night.The beauty of the proposed work is that the wastage of unused electricity can be reduced, lifetime of the streetlights gets enhance because the lights do not stay ON during the whole night, and also helps to increase safety measurements. We are confident that the proposed idea will be beneficial in the future applications of microcontrollers and sensors etc. By using the system energy consumption is reduced.We are confident that the proposed idea will be beneficial in the future applications of microcontrollers and sensors,etc

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CHAPTER 1

INTRODUCTION

Automation systems are being preferred over the manual mode because it reduces the use of energy to saves energy. These automation systems play an essential role in making our daily life more comfortable and facilitate users from ceiling fans to washing machines and in other applications . Among all exciting applications, street lights play a vital role in our environment and also plays a critical role in providing light for safety during night-time travel. In this scenario, when the street lights are in working functionality over the whole night that consumes a lot of energy and reduces the lifetime of the electrical equipment such as electric bulb etc. Especially in cities' streetlights, it is a severe power consuming factor and also the most significant energy expenses for a city. In this regard, an intelligent lighting control system can decrease street lighting costs up to 70% and increase the durability of the equipment. The traditional lighting system has been limited to two options ON and OFF only, and it is not efficient because this kind of operations meant power loss due to continuing working on maximum voltage. Hence, wastage of power from street lights is one of the noticeable power loss, but with the use of automation, it leads to many new methods of energy and money saving. In this regard, controlling lighting system using Light Dependent Resistor (LDR) , IR obstacle detector sensor and Arduino together is proposed in the past . In the meanwhile, the importance of smart light system has motivated a lot of studies and the series of research work has been done . In previous

works, the street light systems are based on LDR , and most of them are passive infrared receiver based systems that are controlled with timers and analog circuits. Sun tracking sensors are also utilized to power OFF the street lights by the detection of the sunlight luminance. Furthermore, street light control with the use of solar energy , and ZigBee based system to control street light have also been implemented. Distinguished from turning ON/OFF the electricity, another approach is introduced to dim the light in fewer traffic hours that might be useful to reduce the power consumption, but the electric bulbs are in continuous usage condition. To the best of our knowledge, a need is still existed to design a system that controls the dim light, connect the power ON/OFF with the vehicle's motion detection, calculate the total number of vehicles passed through the road, and control the entrance gate at night to reduce criminal activities.The most natural solution is to control the street lights according to the outside lighting condition. This is what our paper is aiming for in smart lighting system in which the street lights will be turned OFF when there are no motion detections or day-time, otherwise the lights will be remained Dim/ON. Our proposed design is aimed at efficiently replacing any light systems that are manually controlled, and this is accomplished with the properly arrangements of microcontroller Arduino Uno, IR obstacle avoidance sensor, LDR, and Resistors. In this scenario, when the intensity of sunlight impinges with LDR, street lights can be further controlled as per the desired requirement, automatically. Most importantly, a counter is set to count the number of vehicles/objects passing through the road, which will be displayed on the serial monitor of Arduino IDE . Moreover, the high-intensity

discharge street bulbs are replaced with LEDs to further reduce the power consumption. An automatic street light system does not help us in reducing the power consumption only, but also to reduce accidents, criminal activities and maintenance costs.

CHAPTER 2

REQUIREMENTS AND SPECIFICATIONS

This section gives a scope of hardware and software requirements that we will be using in this project along with specifictions to be required for the smooth functioning of software and hardware which will results in smooth performance.

2.1 Hardware Requirements

A project cannot be completed without the use of hardware , In this project we are using Arduino UNO board, LDR Sensor , Light bulb, Power Supply, Resistor, NPN Transistor,Jump Wires.

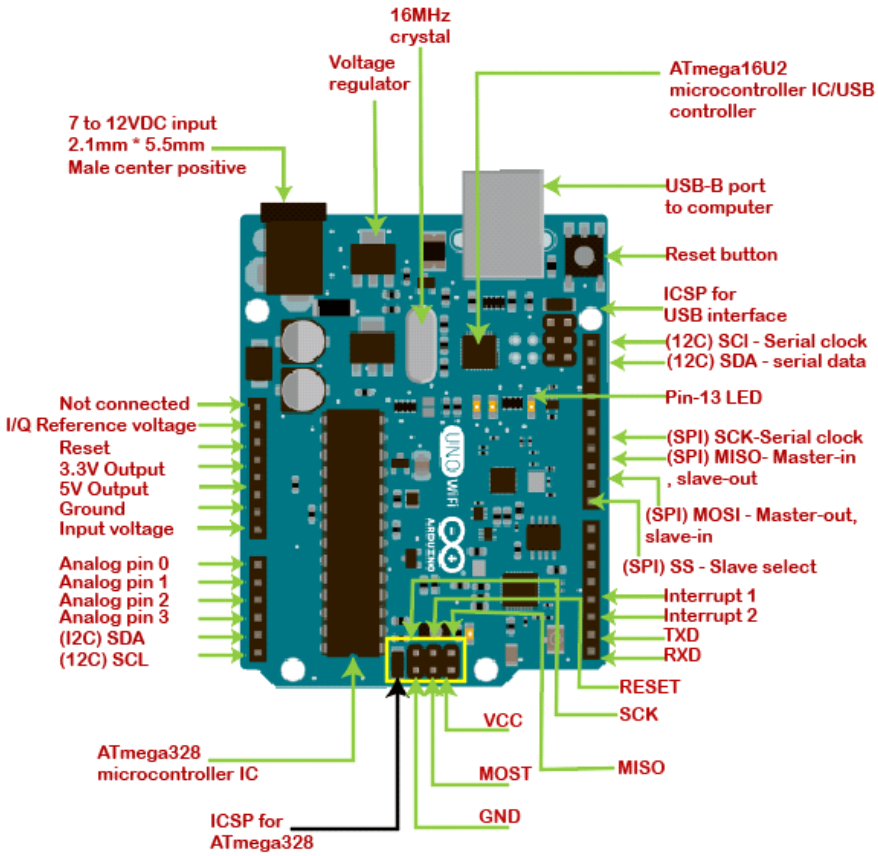
To access the software related to Arduino we need a Personnel Computer with the following specifications.

1. A Laptop with atleast 4 GB RAM and 100 GB Free Space.
2. Ubuntu Operating System or Windows Operating System.

2.1.1 Arduino UNO

Arduino was born at the Ivrea Interaction Design Institute as an easy tool for fast prototyping, aimed at students without a background in electronics and programming Arduino is an open-source electronics platform based on easy-to-use hardware and software. Arduino boards are able to read inputs - light on a sensor, a finger on a button, or a Twitter message - and turn it into an output – activating a motor, turning on an LED, publishing something online. You can tell your board what to do by sending a set of instructions to the microcontroller on the board. To do so you use the Arduino programming language (based on Wiring), and the Arduino Software (IDE), based on Process

Figure 2.1 : Ardunio UNO Pinout

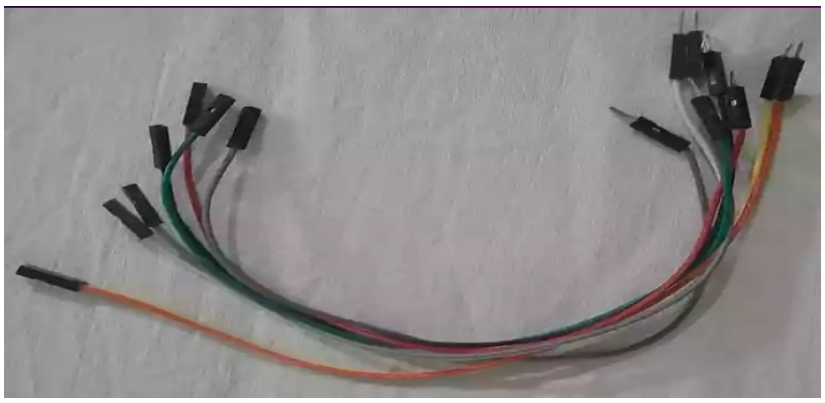


2.1.2 Resistor

Resistors are passive devices that restrict the flow of current or divide the voltage through the circuit. The input power passes through these resistors and then to the sensors to avoid damage.Resistors can also be used to provide a specific voltage for an active device such as a transistor.

2.1.3 JUMP WIRES

These are the main components that are used to establish the connections between different devices of the circuit.



2.1.4 POWER SUPPLY

DC Power supply is used for electricals components like the electrical bulb. Alternatively, Power supply modules can be used to connect electrical components. In this circuit, we will be using the DC power supply component in the simulation software.

2.1.5 LIGHT BULB

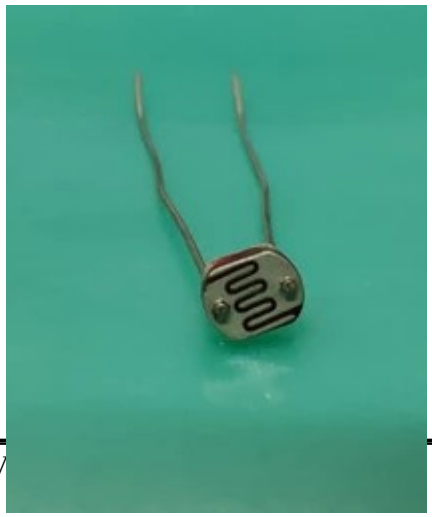
Electric bulbs, otherwise called incandescent bulbs are electrical components that emit light when a certain amount of power is given to them. Usually, bulbs are manufactured in a wide range of sizes based on the input power capacity. Ex. 1.5V, 13 Watts, etc

2.1.6 NPN Transistor

It is a low-power amplifying transistor. A common NPN Bipolar Junction transistor (BJT). This transistor is usually used for Switching purposes as we have used in our circuit.

2.1.7 LDR (Light-Dependent Resistor)

LDR is a Light Dependent Resistor whose resistance is dependent on the light impinging on it. The resistance offered by the sensor decreases with the increase in light strength and increases with the decrease in light strength. This device is used for detection of day-time and night-time because when sunlight falls on it, it will consider as day-time, and when there is no sunlight falls on it, it will be regarded as a night, as shown in Fig. 2b. These are very beneficial, especially in light/dark sensor circuits and help in automatically switching ON / OFF the street lights.



2.1.8 Tinkercad software

It is an online simulation software used for circuit design. It has all the electrical components required to built circuits and runs them.

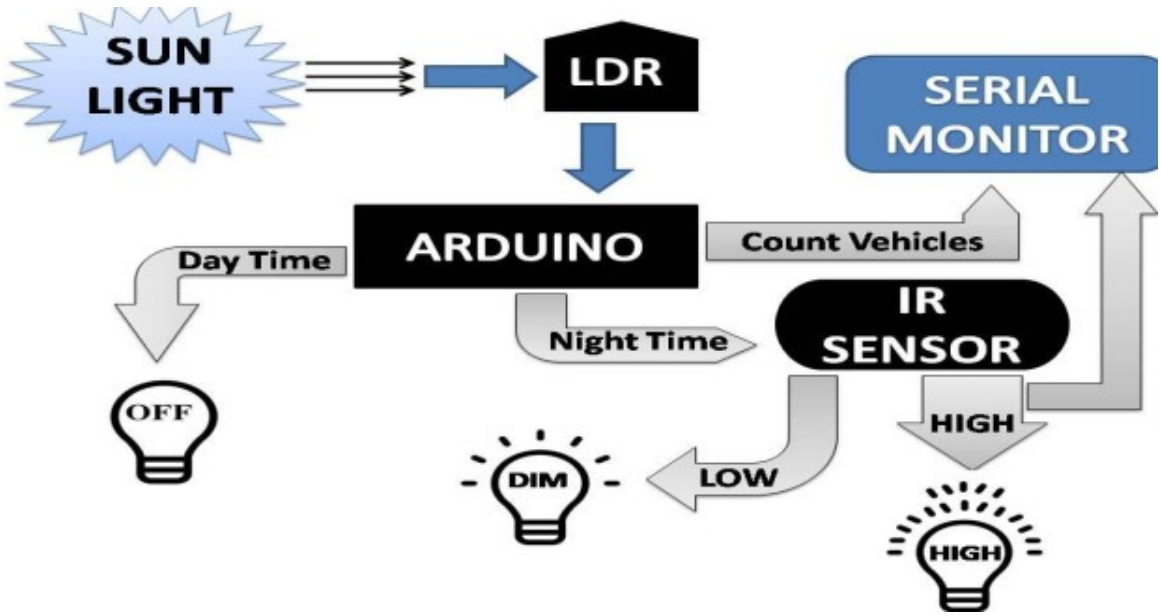
CHAPTER 3

DESIGN

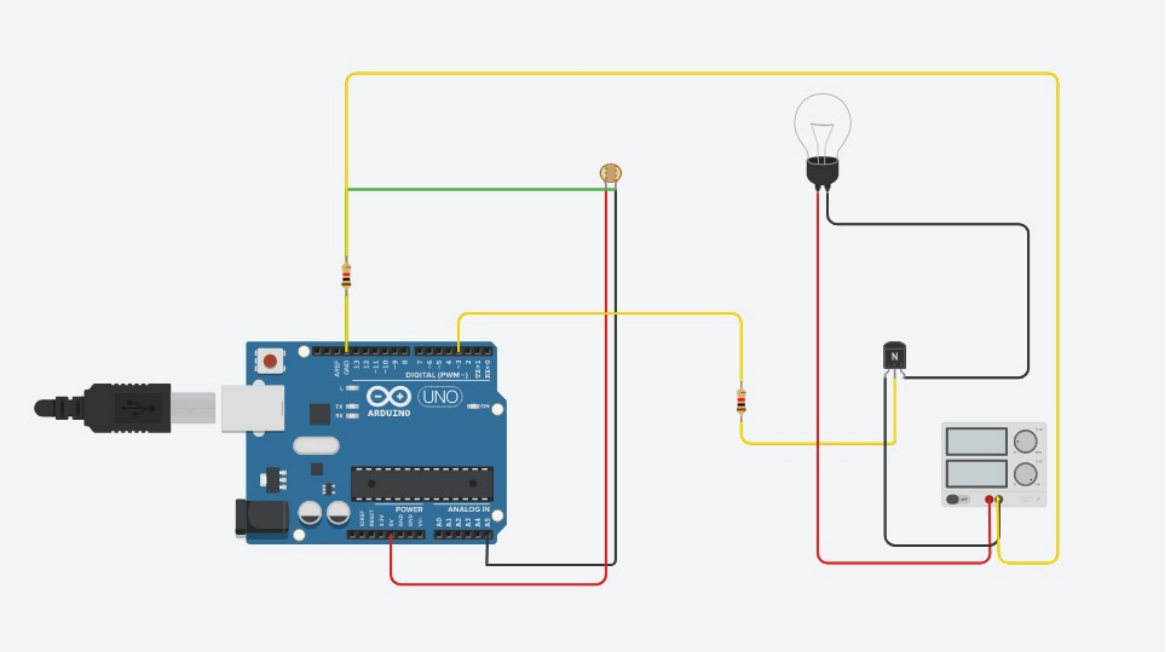
This section gives the brief idea of implementation of our project along with the block diagram and practical implementation design.

3.1 Block Diagram

A block diagram is a diagram of a system in which the principal parts or functions are represented by blocks connected by lines that show the relationships of the blocks



3.2 Practical Implementation Model



3.3 Working Principle

LDR is the photoresistor, a sensor that has semiconducting material on its surface. When light strikes on the surface of the LDR, the electrons present in the valence bond of the material are excited to

the conduction band. This in turn will generate a voltage that will be given as output based on the input light **intensity**.When the LDR gives output to the analog pin A5 of Arduino, the value is stored by the board itself. (It has a Flash memory). The transistor acts as a switch in this circuit. It will control the Light bulb based on the sensor output value. The collector is connected to the Ground. The base terminal of the Transistor is connected to the digital pin of Arduino through which the bulb will be controlled. That means, whenever there is a change done to the pin 3, there is a change in the status of the bulb as the emitter of the transistor goes further to connect to the second terminal of the light bulb.Hence to summarise the working, the LDR sensor receives input based on the input light intensity. Those voltage values are displayed on the power supply device panel. The transistor acts as a switch that is connected to the Arduino board through which it will control the bulb.

CHAPTER 4

CODING

This section gives the code that is to be used for the simulation of Arduino Based Smart Street Light which is interfaced with Arduino and Sensors.

```
int ldr=A5;

int ldr_value;

int light=3;

void setup()

{

pinMode(light, OUTPUT);
```

```
pinMode(ldr, INPUT);
}
void loop()
{
ldr_value=analogRead(ldr);
if (ldr_value>512)
digitalWrite(light, LOW);
else
digitalWrite(light, HIGH);
}
```

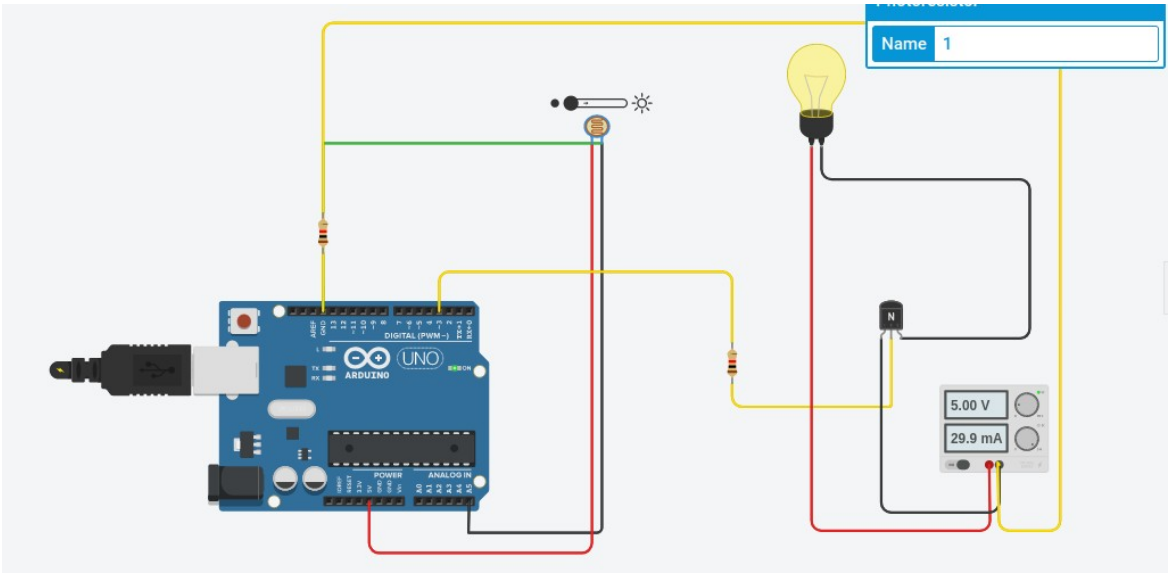
CHAPTER 5

TESTING

This is the section which gives the results of our code, which builds the communcation between device to device for the required operations to be performed our project has Two modes of operation based on the light intensity.

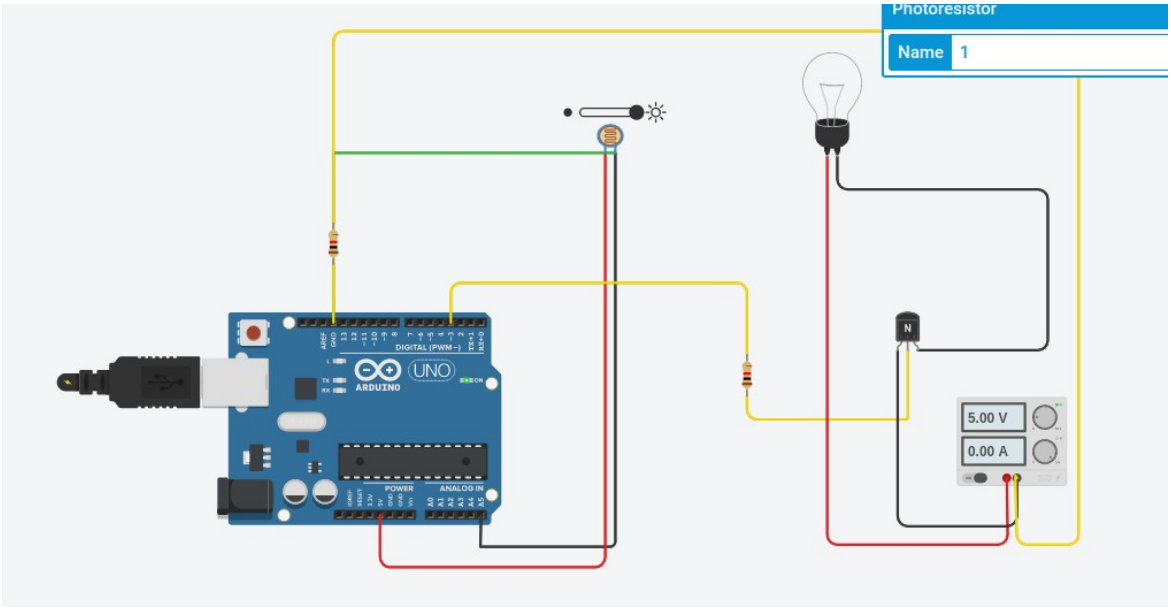
5.1 First Mode of Operation:

As we know that Based upon the intensity of the sunlight the blub glows Brighter and Dim.In this case the light intensity is less and the blub glows brighter.



5.2 Second Mode of Operation:

As we know that Based upon the intensity of the sunlight the blub glows Brighter and Dim.In this case the light intensity is more and the blub gets off.



CHAPTER 6

ADVANTAGES AND DISADVANTAGES

6.1 Advantages:

● Maintenance cost reduction

● Reduction in co2 emission

● Reduction of the light pollution

● Wirelesscommunication

● Energy saving

● Reduction of the man power

● Over heating and risk of accidients is also minnimized

6.2 Disadvantages:

● Intial investment is higher compared to the conventional street lights Risk of the theft is higher as the equipment costs are comparatively higher

● Flexibility is high

● High sensitivity

CHAPTER 7

APPLICATIONS

● This system can be easily implemented in smart cities,home automation, agriculture field monitoring, timely automated lights, parking lights of hospitals, malls, airport, universities and industries etc.

- To be able to desigh the device that add safety in the dark areas
- To be able to design the efficient street lights

CHAPTER 8

CONCLUSION

The proposed streetlight automation system is a cost effective and the safest way to reduce power consumption. It helps us to get rid of today's world problems of manual switching and most importantly, primary cost and maintenance can be decreased easily. The LED consumes less energy with cool-white light emission and has a better life than highenergy consuming lamps.Moving to the new & renewable energy sources, this system can be upgraded by replacing conventional LED modules with the solar-based LED modules. With these efficient reasons, this presented work has more advantages which can overcome the present limitations. Keep in mind that these long-term benefits; the starting cost would never be a problem because the return time of investment is very less. This system can be easily implemented in street lights, smart cities, home automation, agriculture field monitoring, timely automated lights, parking lights of hospitals,malls, airport, universities and industries etc.

CHAPTER 9

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