A Mini-Project Report

on

SMART STREET LIGHT USING IOT

Submitted in partial fulfillment of the requirements

for the award of degree of

BACHELOR OF TECHNOLOGY

in

Information Technology

by

V. Sai Akshita (19WH1A1212)

Athiya Fathima (19WH1A1232)

Priyanka Kolli (19WH1A1236)

M. Preethi (19WH1A1259)

Under the esteemed guidance of

Mr. R. Arun Kumar

Assistant Professor

Department of Information Technology

BVRIT HYDERABAD College of Engineering for Women

Rajiv Gandhi Nagar, Nizampet Road, Bachupally, Hyderabad – 500090

(Affiliated to Jawaharlal Nehru Technological University Hyderabad)

(NAAC 'A' Grade & NBA Accredited- ECE, EEE, CSE IT)

January, 2023

DECLARATION

We hereby declare that the work presented in this project entitled " **SMART STREET LIGHT USING IOT** "submitted towards completion of the project in IV year I sem of B.Tech IT at "BVRIT HYDERABAD College of Engineering for Women", Hyderabad is an authentic record of our original work carried out under the esteemed guidance of **Mr. R. Arun Kumar, Assistant Professor**, Department of IT.

V. Sai Akshita (19WH1A1212)

Athiya Fathima (19WH1A1232)

Priyanka Kolli (19WH1A1236)

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CERTIFICATE

This is to certify that the mini-project report on **"SMART STREET LIGHT USING IOT "** is a bonafide work carried out by **Ms. V. Sai Akshita (19WH1A1212), Athiya Fathima (19WH1A1232), Priyanka Kolli (19WH1A1236), M. Preethi (19WH1A1259)** in the partial fulfillment for the award of B.tech degree in **Information Techonology, BVRIT HYDERABAD College of Engineering for Women, Bachupally, Hyderabad** affiliated to the Jawaharlal Nehru Technological University Hyderabad under my guidance and supervision.The results embodied in the mini-project work have not been submitted to any other university or institute for the award of any degree or diploma.

Internal Guide
Mr. R. Arun Kumar
Assistant Professor
Department of IT

Head of the Department
Dr. ArunaRao S L
Professor & HoD
Department of IT

External Examiner

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V. Sai Akshita (19WH1A1212)

Athiya Fathima (19WH1A1232)

Priyanka Kolli (19WH1A1236)

M. Preethi (19WH1A1259)

ABSTRACT

On a global scale, lakhs of rupees are being spent each day on the streetlights to provide the required electricity supply. The maintenance and replacement costs of conventional incandescent bulbs are immense. All of these contribute to a greater demand for electricity production which results in more carbon dioxide emissions from powerhouses. So, along with unnecessary light pollution, this practice causes damage to our planet too. Smart Street light system is an automated system which automates the streetlights. The main aim of Smart Street light system is to reduce the power consumption when there are no vehicle movements on the road. The Smart Street lights will glow with high intensity when there are vehicles on the road otherwise the lights will remain dim throughout the night. With advancement of technology, things are becoming simpler and easier for everyone in the world today. Automation is the use of control systems and information technologies to reduce the need for human work in the production of goods and services. In the scope of industrialization, mechanization provides human operators with machinery to assist the users with the muscular requirements of work, whereas automation greatly decreases the need for human sensory and mental requirements as well. These days automatic systems are being preferred over manual system. This system shows automatic control of streetlights as a result power is saved to some extent. The Smart Street light system provides a solution for energy saving which is achieved by sensing an approaching vehicle using the Infrared sensor and then switching ON a block of streetlights ahead of the vehicle with high intensity. As the vehicle passes by, the trailing lights turn dim automatically. Thus, we save a lot of energy and henceforth money.

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1. INTRODUCTION

Urban areas in the entire world are dealing with increasing energy consumption and carbon emissions, a known contributor to climate change. Due to inadequate dimming control and low efficiency, current street lighting is wasteful in terms of energy spending, accounting for a major part of governmental electricity costs. Therefore, it has become desirable and of great importance to design a new smart lighting system that is more efficient and environmentally friendly.

The main aim of a new smart street lighting system is to control energy efficient LED street lights to turn on only when needed and to remain in a dim state otherwise. The system integrates technologies such as: Infrared Sensor sensor, wireless network and dimmable LEDs.

The feasibility study done by the team details the requirements and constraints considered in the design of the system, as well as a technical overview of the solution. Additionally, the successful implementation of a prototype further supports a possible large-scale development of the project. Finally, it aims to present an overview of a profitable and green solution to the energy consumption problem imposed by street lighting.

Smart Street light is an automated system which automates the street. The Smart Street light is to reduce the power consumption when there are no vehicle movements on the road. The Smart street light will glow with high intensity when there are vehicles on the road otherwise the lights will remain dim. The Smart street light provides a solution for energy saving which is achieved by sensing an approaching vehicle using the IR sensors.

Automation plays very important role in the world economy and in daily life. Automatic systems are being preferred over any kind of manual system. It highlights the energy efficient system of the street lights system using LED lamps with IR sensor interface for controlling and managing. A LDR Sensor, IR Sensors, Arduino Uno, LED , Resistors are core requirements.

1.1 Objective

The existing lighting control system was developed uniquely for the target center at the time of construction and is a one-of-a-kind system. Our country is suffering from power crisis for a long time. Although some times because of our ignorance, we see street lights are on in the day. So, we always suffer from this electricity crisis. By using automation to our street lights controlling system, we can not only save our energy but also save human labor. Here we will show how we can make a controlling system easily by using LDR and Relay, microcontroller and small amount of power supply. The present system is like, the street lights will be switched on in the evening before the sun sets and they are switched off the next day morning after there is sufficient light on the roads. As a result, the electricity waste occurs greatly all over the country. But the actual timings for these street lights to be switched on are when there is absolute darkness.

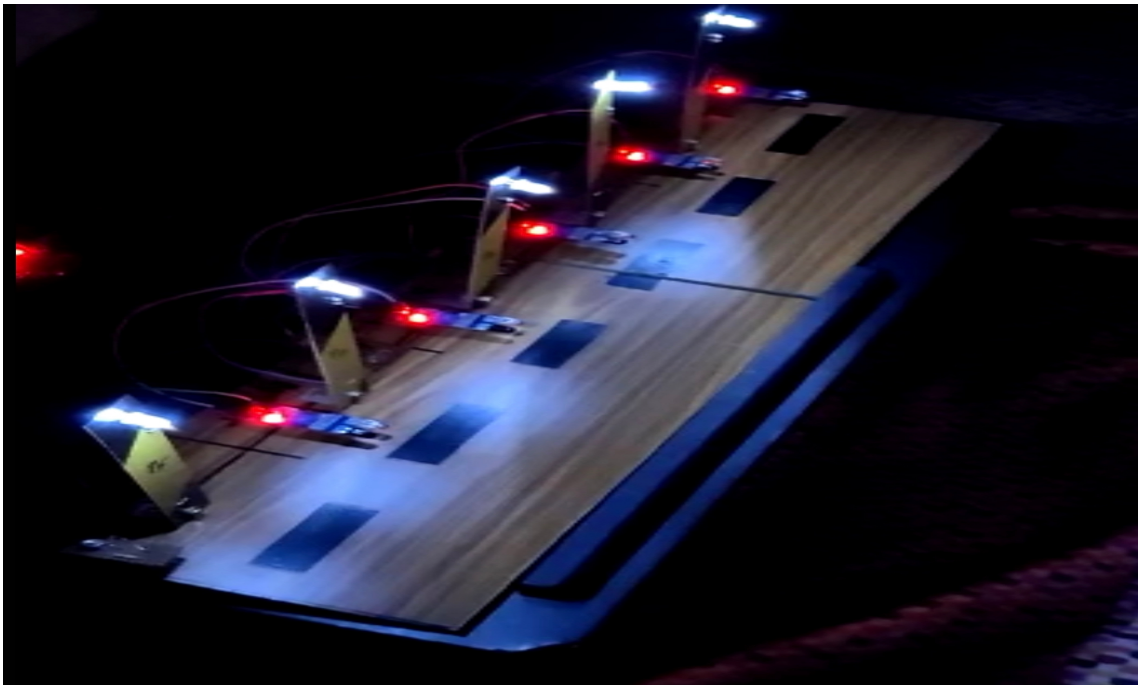

Figure 1.1: Smart Street Light Control Using LDR and IR Sensor

1.2 Problem Definition

This project gives the best solution for electrical power wastage. Also, the manual operation of the lighting system is completely eliminated. In our project we are using LDR, which varies according to the amount of light falling on its surface, this give an indication for us whether it is a day/night time. Bridge type full wave rectifier is used to rectify the ac output of secondary of 230/12V step down transformer. The programming language used for developing the software to the microcontroller is Embedded/Assembly. The KEIL cross compiler is used to edit, compile and debug this program. Here in our application, we are using AT89C51 microcontroller which is Flash Programmable IC. We believe that our idea provides better than the existing system. In the present project street lights are taken into consideration where the above discussed factors are rectified in them.

The current street lighting policy requires all lights to be fully operational during the entire night, due to security reasons and inadequate dimming technology. This leads to unnecessary energy use, lowers the lamps' life and causes significant light pollution. Considering the above problems of conventional lighting methods, it has become increasingly important to develop a radically new system that is both environmentally friendly and cost effective.

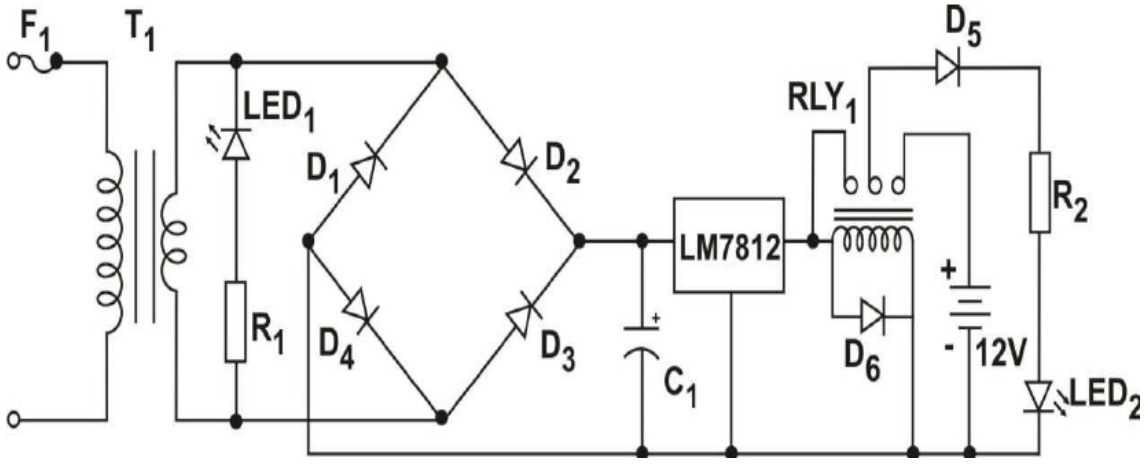

Figure 1.2: Power Section Circuit Diagram

1.3 Aim of the Project

We have placed IR sensors in both sides of the road, which can be controlled by Micro controller (AT89C51). The IR ‘s will be activated only on the night time. If any obstacle crosses the IR, automatically particular light will be ON, for few seconds.7805 three terminal voltage regulators is used for voltage regulation. Bridge type full wave rectifier is used to rectify the ac output of secondary of 230/12V step down transformer. The programming language used for developing the software to the microcontroller is Embedded/Assembly. The KEIL cross compiler is used to edit, compile and debug this program. We believe that our idea provides better than the existing system. In the present project street lights are taken into consideration where the above discussed factors are rectified in them. There have been many advancements taking place in the semiconductor industry leading to more and more advancements in wireless technology. The main aim of the project is to save the power; by using effectively we can save more power, as we know that there is shortage of power nowadays in everywhere mostly in villages Nowadays, human has become too busy and he is unable to find time even to switch the lights wherever not necessary. This can be seen more effectively in the case of street lights.

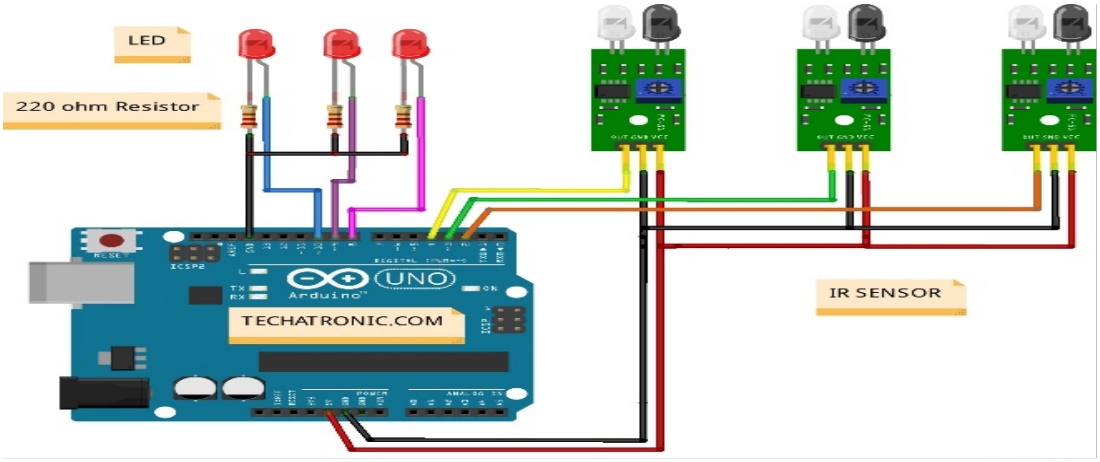

Figure 1.3: General Circuit Diagram of IR Sensor

The present system is like, the street lights will be switched on in the evening before the sun sets and they are switched off the next day morning after there is sufficient light on the roads. But the actual timings for these street lights to be switched on are when there is absolute darkness. This type of regulation is ideal for having a simple variable bench power supply. Actually, this is quite important because one of the first projects a hobbyist should undertake is the construction of a variable regulated power supply. While a dedicated supply is quite handy e.g., 5V or 12V, it's much handier to have a variable supply on hand, especially for testing. Most digital logic circuits and processors need a 5-volt power supply.

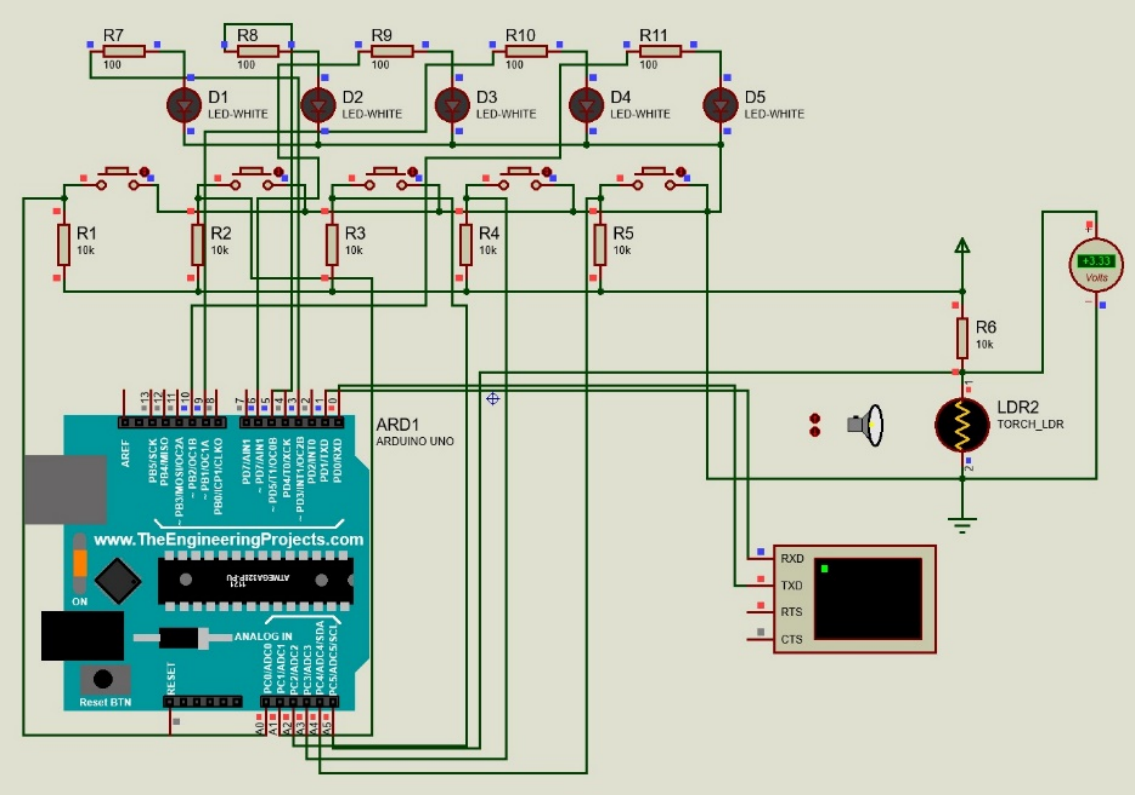

Figure 1.4: Proposed System Overlay Circuit with Simulation Test Run on Proteus

2. LITEATURE SURVEY

The following shows a survey done for Automatic Street light and its energy saving process. Based on the vehicle movement during late hours to consume the excessive wastage of energy on the environment. We also calculated the total energy consumption before usage of our proposed model and after implementation of circuit model with various detailed study with the recent research papers.

[1] Jay Singh, Shiva Pujan Jaiswal, Monika Jain, Research Gate "Automation In Street Lights Using IR Sensors and LDR", IEEE Transactions on recent development in engineering and technology 2020-2021

Street lights are the major requirement in today's life of transportation for safety purposes and avoiding accidents during night. Despite that in today's busy life no one cares about to switch off/on the lights when not required. In this paper i will give you the solution to eliminate the manpower and to reduce the power consumption at the street. Automatic street light system is one of the best techniques which is to be used nowadays as it provides intelligent street lightning mechanism. It provides light automatically during night by the help of motion detection techniques without any human interference. The main objectives of using this type of street lights are; Conservation of energy for future generation as it reduces power consumption, reducing human efforts, improves the system in our daily life. In the present days automated systems have fewer manual operations, high flexibility and accurate. The basic components required in making of motion Detector Street lights are; LDR, LEDs, IR sensors, Microcontroller. During day time there is no requirement of street lights so the LDR keeps the street lights off until the light level is low or the frequency of light is low the resistance of the LDR is high.

This prevents current flowing to the base of the transistors. Thus, the street lights do not glow. But as soon as the light falling on the LDR has high frequency or have high intensity incident light then the street lights will start glow. Power LEDs lights are used because it saves energy, has high energy efficiency. IR sensors (infrared sensors) is an electronic instrument which senses the movement of the object by emitting infrared radiations. IR sensors are used in Night Vision Devices, Hyperspectral

Imaging, Meteorology, Gas Detectors, Rail Safety, Petroleum exploration. An Embedded System is a combination of computer hardware and software, and perhaps additional mechanical or other parts, designed to perform a specific function. An embedded system is a microcontroller-based, software driven, reliable, real-time control system, autonomous, or human or network interactive, operating on diverse physical variables and in diverse environments and sold into a competitive and cost-conscious market. Microcontroller is a compact microcomputer designed to given the operation of embedded systems in motor vehicles, robots, office machines, complex medical devices, mobile radio transceivers, vending machines, home appliances, photocopiers, scanners, fax machines and printers.

[2] Samson Yusuf Dauda, Nmezi S, Loko, IJARD "Design and Construction of an automatic streetlight controller using microcontroller and LDR", IEEE Transactions on Academic Research and Development 2020

Security of our environment which includes protection of life and property is one of the major priorities of every nation. A street lighting is any electrical lighting that is fixed outside house for the illumination of the environment or a raised source of light on the edge of a road or walkway, which is turned ON at a certain time every night. Street lighting is very important as it aids in illumination of our streets and serve for beautification or the environment at nighttime. According to, streetlights increased the aesthetic beauty of an environment as well as increase security, but the sorry state of our streetlights in Nigeria due to lack of proper maintenance has become a thing of concern. Failure and irregularities in power supply hinders the continuous illumination of our streets due to manual operation of the streetlights results in increasing crime on our streets and support for evil activities There are three main uses of streetlight, each requiring different types of lights and placement, they are beacon light, road way light and security light. Streetlight is also applicable in industries, homes, universities, farms, convention grounds and other public places. The streetlight ensures safe, fast and efficient movement of people and goods from one place to another. Street lighting is a particularly critical concern for public authorities in developing countries such as Nigeria because of its strategic

importance for economic and social stability due to reduced crime rates, accidents and other evil activities that takes place at dark hours. Inefficient lighting wastes significant financial resources every year, and poor lighting creates unsafe conditions. In a properly lit society, manual control street lighting systems consume quite a large sum of the city ‘s power supply, which is obviously due to its constant operation during the night, and more so some of these streetlights shine into the day because of its manual nature. Manual control is prone to errors and leads to energy wastages and manually dimming during midnight is impracticable. Also, dynamically tracking the light level is manually impracticable.

[3] Jagannath Dixit, Devesh Katiyar, Gaurav Goel, IJCRT “Automatic Street light Controller System Using LDR and PIR Sensor”, IEEE Transactions on Science and Research 2021

Generally, we can see street lights are ON even after sunrise and no presence of human thus by having an automatic street light control system, which turns ON and Off-street lights when ambient light falls below a specific intensity, for this, we can use LDR sensor. In this system, we are also using a PIR motion sensor which detects the motion of the object such as human and animal passing through it, using this motion of object LEDs are turned ON. Most of the time we see street lights are ON even after sunrise and no presence of any person who needs light thus by having an automatic street light control system which turns ON and Off-street lights when it detects a person and also when ambient light falls below a specific intensity. The manpower required for controlling the light cuts a huge cost, so using this system we can also reduce the cost of manpower and reduce unnecessary power consumption. LDR sensor keeps the street light OFF in day time. When the light intensity is low then the LDR is stared working and the light is switched on. The main aims of this project are to implement an auto-intensity control of LED-based on LDR and PIR motion sensor. PIR motion sensor detects the human presence and turns ON/OFF LED light. LDR and PIR motion sensor interface with a microcontroller, as the surrounding light decreases LDR sensor turn on the LED light and also when PIR sensor detects motion it turns ON lights.

[4] Nidhi Agrawal, Saurabh Patil, Laxmikant Tekam, IJARSCT "Smart Street Light Using Intensity Controller", IEEE Transactions on Communication and Technology 2022

Nowadays, the concept of a Smart City is one of the main future targets for a better environment. The convectional street light system consumes more energy because they turn on when it becomes dark and turned off when it becomes bright. it is important to manage this waste more efficiently to create a better world. This project is inspired by the most common question, 'what can be done to reduce this huge wastage of energy?' There are some attempts, in which the energy waste of the street lights is reduced. A sensor light, lights. If the person crosses the street from point A, this moment will be detected by the sensor and lights turn on at points 1 and 2 when the person moves forward for position E, the moment is detected by points 3 and 5 and it turn lights on and lights at point 1 and 2 will be off. So, this will help to reduce energy consumption during the night. which is controlled on and lights at point 1 and 2 will be off. So, this will do by the brightness sensor and the motion sensor. It only turns on for a while when the motion is detected in front of the light and it is dark. However, it usually is too late to turn the light on when a person or a car comes in front of it. The light should turn on before a person or a car comes. LED lights are insufficient to reduce power consumption so we introduce a new smart street light system. The main aim of this project is to reduce the cost of power consumption.

[5] Sindhu A M, Jerin George, Sumit Roy, Chandra J, IJARSCT "Smart Street Light Using IR Sensors", IEEE Transactions on Mobile Computing and Applications 2022

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 IR sensor interface for controlling and managing.

2.1 Major Issues

Industry of street lighting systems are growing rapidly 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.

2.2 Disadvantages of Existing System

1. HID lamps consume more power.

2. The life time of the HID lamps is very less.

3. It cannot be used in all outdoor applications.

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

2.3 Design Specifications

Our proposed design aims to reduce the carbon footprint and the overall costs of street lighting by integrating dimmable light-emitting diodes (LEDs) and wireless technology. The principle of operation is to efficiently control the intensity of the streetlights to respond to the needs of road users. The following is a list of requirements our system aims to fulfill such to solve the problems that the current lighting system presents:

1. Motion Detection: A motion detection sensor will ensure that the lights only brighten when motion is detected.

2. Wireless Communication: The network will enable the lights to transmit and receive data between each other. This ensures that when motion is detected near one light, the adjacent lights will turn on, therefore providing enough light for pedestrians or cars.

3. Microcontroller: The microcontroller will act as the processing unit.It must process the data received from the sensor.This output controls the intensity of the light according to the results of data processing.It must be able to receive and send control signals through the network.

4. Dimming: This involves adjusting the lighting levels of LEDs such that lower lighting levels are used when there are no pedestrian or cars on the streets.

5. Control: Intelligent algorithms will be used to smartly control the lights to quickly respond to the needs of road users.

3. SYSTEM ANALYSIS AND DESIGN

Street lights are an essential part of all cities and the highways, that's helpful to prevent accidents and unwanted thefts or robbery. Thousands of Street lights are installed beside the highways and the main roads. But the main problem is these street lights consume about 25-30 of the total energy spent in the city.

3.1 Proposed System

In this project, our main aim is to develop a "Smart Street light system" that will reduce electric power consumption. The normal street lights always glow with high intensity, who consumes high electricity. But in the case of a smart street lights system, it will glow with high intensity if there are vehicles or human movement on the road otherwise the lights will remain dim. Another advantage of this system is, street lights will automatically turn on in the evening, and turn on automatically at day time (presence of sunlight). By using this system, we can save enough amount of electricity and off-course money, this saved electricity can be used to lighten few more homes in the rural areas.

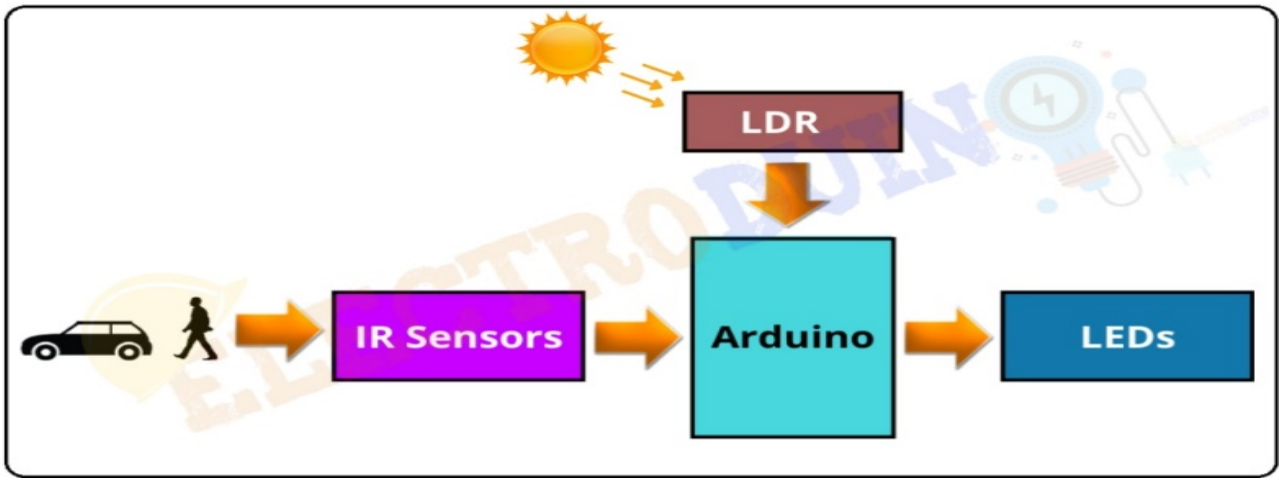

Figure 3.1: Block Diagram

3.2 Architecture Design

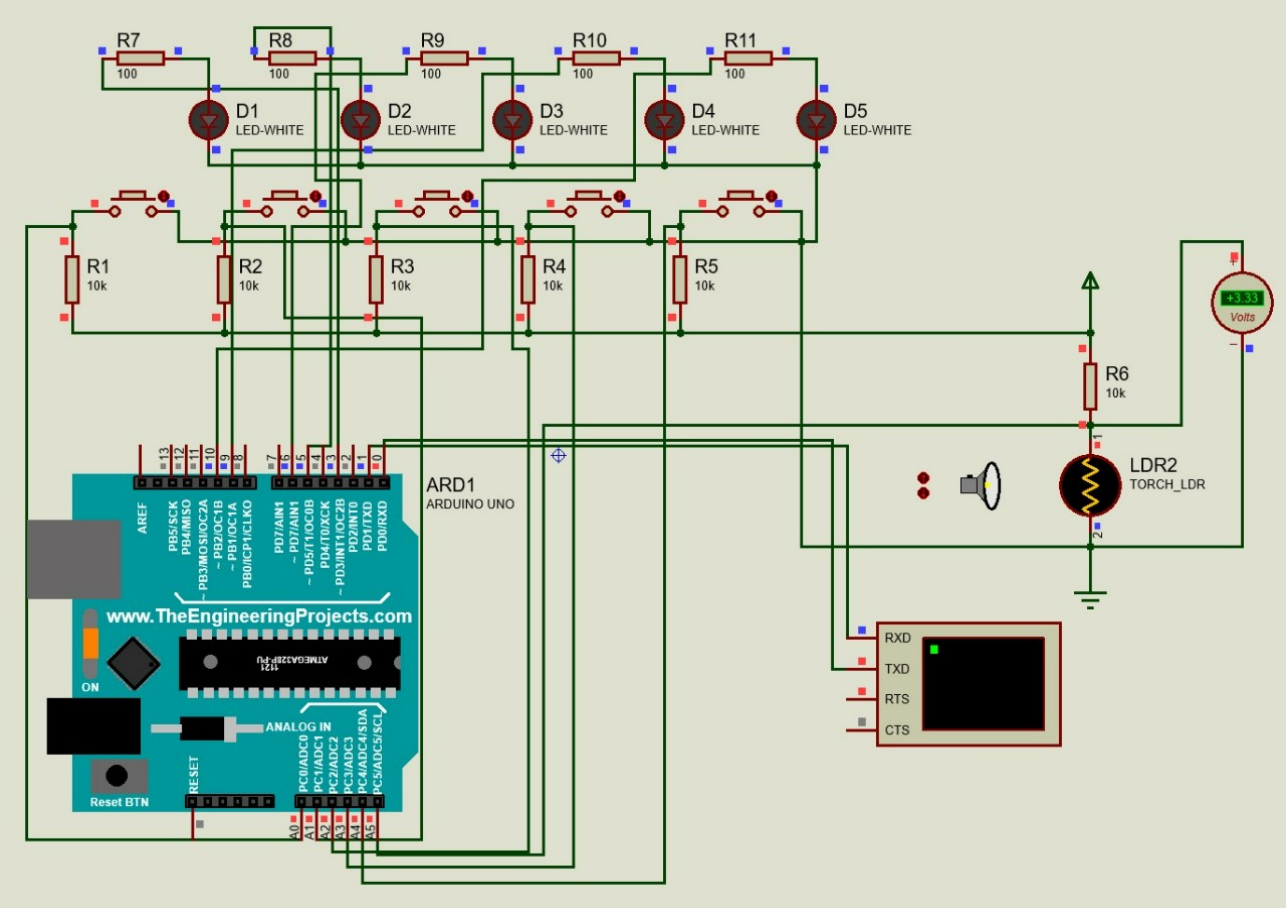

Figure 3.2: Architecture Design

This system is very easy to implement, the key components of this project are the LDR, IR Sensor, Arduino Board, and LED. The Arduino board is the brain of this project, which controls the whole system. The IR sensor work as the eye of this project that detects the presence of vehicles or human on the road, and LDR sense the presence or absence of sunlight, and LEDs represent the street lights.

In the daytime, the system detects the sunlight by the LDR and it will be turned OFF the street lights (LED). When the system detects dark (after evening), then it will turn on the street lights (LED). After turn on the streetlight, if the system doesn't detect any vehicles or human movement on the road by the IR Sensor, then it will glow the lights with low intensity. When the system detects vehicles or human movement by the IR Sensor, then it will glow the street lights with high intensity.

An LDR is connected to the analog pin of the Arduino. It controls the LEDs by detecting the presence or absence of sunlight. When sufficient sunlight is present in the surroundings, then the LDR offers high resistance and acts as an insulator. In this case, the Arduino read high analog output values from the LDR and automatically turn off all LEDs (streetlights). During the absence of sunlight, the LDR detects dark and offers Low resistance, and acts as a conductor. In this case, the Arduino read Low analog input values from the LDR and automatically turn on the LEDs (streetlights). At the same time, the IR sensor also starting its operations and start detecting any vehicles or people moving on the road.

In this project, we are using 4 IR sensors that are connected to the digital pins of the Arduino. We also use 5 LEDs that represent the streetlights, each LED connected to the PWM pins of the Arduino. Each IR sensor controls 2 LEDs. When any of the IR sensors sense the position of the vehicle or human, its output goes LOW (0). Then the Arduino read Low output value from that sensor and increase the light intensity of two LEDs by using Pulse Width Modulation (PWM) technique. When the IR sensors don't detect any vehicle or human position, its output goes High (1). Then the Arduino read High output value from that sensor. Now the Arduino decreases the light intensity of the LEDs by using Pulse Width Modulation (PWM) technique.

3.3 Circuit Functions

the circuit diagram of the Smart streetlight. It works in accordance with the varying sunlight. Whenever there is sufficient sunlight in surroundings, LDR exhibits high resistance and acts as

an insulator, while in darkness this LDR behaves as low resistance path and allows the flows of electricity, this LDR's operates with the help of IR sensors, these sensors are activated under low illumination conditions and these are controlled by an AT89C51 micro controller, every basic electronic circuit will operate under regulated 5v DC. When any object comes in the range of IR sensors, as IR LED emits the radiations and reflected back to IR photodiode by the object. Hence, object is detected.The heart of Arduino circuit is the low power, high performance Arduino micro controller is programmed by embedded assembly programming language for implementing these tasks; this program is stored and operated by means of storage device EPROM. The intensity of LED's is remained at low initially (when no object is detected, at no natural light condition) by Arduino using Pulse Width Modulation (PWM) technique where analog signal is converted to digital signal, ON-OFF process of LEDs take place so rapidly in such a way, the LEDs seem to glow dimly when seen by naked eye. Hence, intensity of LEDs are controlled by varying duty cycle.The project is successfully implemented in many areas based on the experimental verification proving that it can save the electrical power to greater extent removing the manual work completely; the system became the origin for upcoming advanced intelligent systems in saving both human and electrical power.

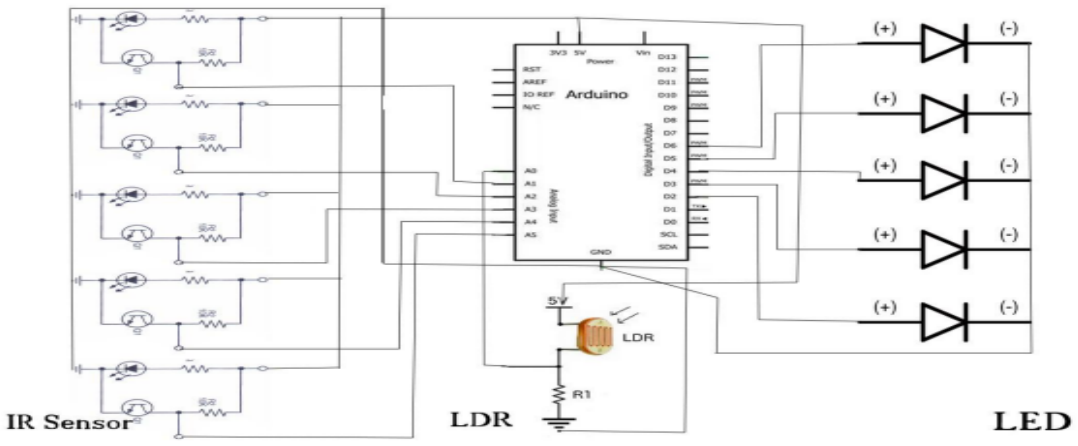

Figure 3.3: Circuit Diagram

3.4 Activity Diagram

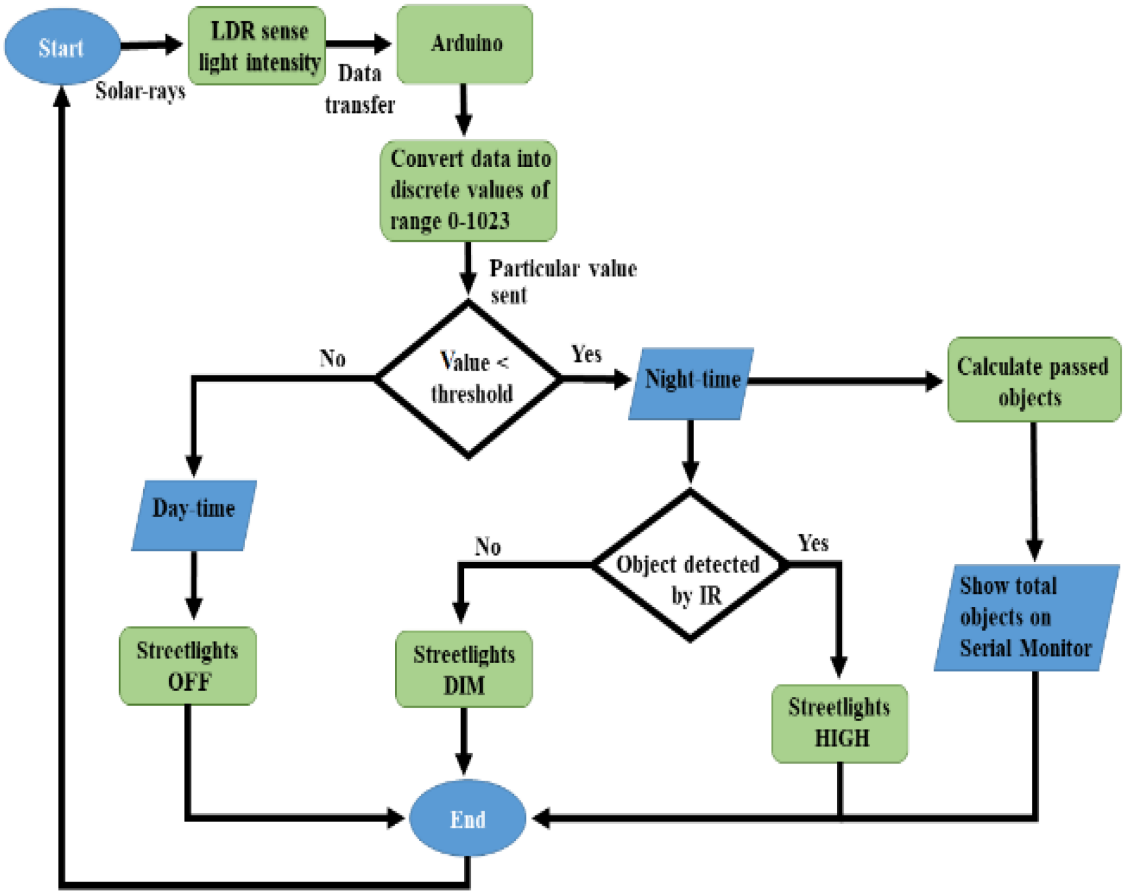

Figure 3.4: Activity Diagram

In the beginning, the LDR sensor will sense the light intensity in the atmosphere at that time, and it will consequently transfer the data to Arduino,After receiving the data, Arduino will convert it into different discrete values from 0 to 1023 (in which 0 represents maximum darkness, and 1023 represents maximum brightness), and then it will adjust the output voltage accordingly from 0 to 2.5 V/5 V (DIM/HIGH) depending upon the received value (0–1023) by comparing it with the

threshold value. Whereas, the threshold value can be randomly chosen by the user and in this case, the threshold value is adjusted to 10. So, the output will be 2.5 V in the complete darkness (night time), if the received value is less than the threshold value. As a result, DIM LEDs will glow that is the half of maximum brightness, and when there is completely shine (daytime), thereceived value will be higher than the threshold value, and the output voltage would be 0V, resultingthe LEDs to be completely switched OFF.

Initially, the IR obstacle avoidance sensor will be LOW. So, when there is no object in front of the sensor, the IR transmitter does continuously transmit the IR light. Whenever a car or any other object blocks any of the IR obstacle avoidance sensors, then the emitted rays will reflect the IR receiver after hitting the object, then microcontroller will sense it as a motion. In simple words, when an object passed in front of the first IR obstacle avoidance sensor, the corresponding LEDs will be turned from DIM to HIGH (5 V) by the microcontroller. As the object moves forward and blocks the next IR obstacle avoidance sensor, the next three LEDs will be turned to HIGH from DIM, and the LEDs from the previous set switched to DIM from HIGH. The process continues this way for the entire IR obstacle avoidance sensors and LEDs.

4. IMPLEMENTATION

4.1 Modules

4.1.1. Light Detection Module: The light-dependent resistor is also known as a photo resistor or photocell. It is a light-controlled variable resistor. In photo resistor resistance decreases when light intensity increased and resistance increases with light intensity decreased. So that we can say that the resistance of the photo resistor is maximum at low light and minimum as light increases. LDR is mainly used for the detection of day and night. It can turn ON/OFF street light according to the change in light intensity or day/night time.

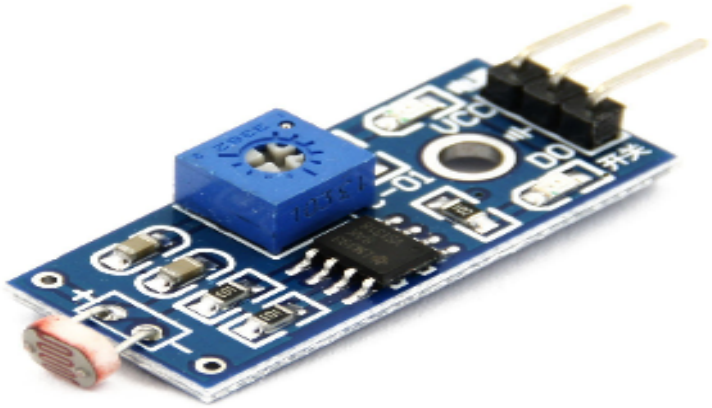

Figure 4.1.1: LDR Sensor

4.1.2 Object Detection Module: IR sensor is an electronic device, that emits the light in order to sense some object of the surroundings. An IR sensor can measure the heat of an object as well as detects the motion. Usually, in the infrared spectrum, all the objects radiate some form of thermal radiation. These types of radiations are invisible to our eyes, but infrared sensor can detect these radiations. The emitter is simply an IR LED (Light Emitting Diode) and the detector is simply an IR photodiode. Photodiode is sensitive to IR light of the same wavelength which is emitted by the IR

LED.When IR light falls on the photodiode, the resistances and the output voltages will change in proportion to the magnitude of the IR light received. There are five basic elements used in a typical infrared detection system: an infrared source, a transmission medium, optical component, infrared detectors or receivers and signal processing. Infrared lasers and Infrared LEDs of specific wavelength used as infrared sources. The three main types of media used for infrared transmission are vacuum, atmosphere and optical fibers. Optical components are used to focus the infrared radiation or to limit the spectral response

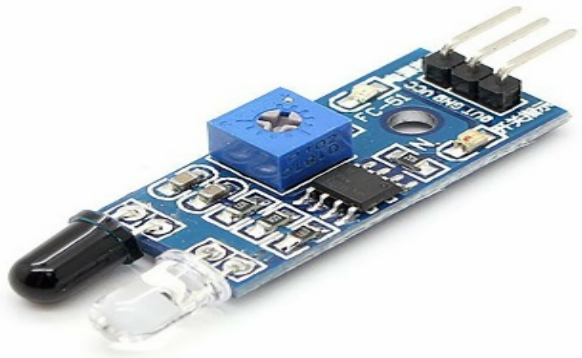

Figure 4.1.2: IR Sensor

4.1.3 Power and Cost Saving Module: In our proposed model we can analyze the cost of electricity based on Indian parameters, so let's take a scenario where if the daytime is 12 hours and the hundred lights are operating under 220 volts, and therefore the power of the light is sixty watts. The road distance considers 1 kilometer, the unit is calculated below. Unit = P*T/1000 60*12/1000 0.72 Unit per day per lamp Let's take the average cost of electricity per unit in India is 5.43 rupees than the total cost per month = 0.72*5.43*30 = 117.28 rupees per month per light. The total amount for all light in 1 kilometer is = 117.28*100 = 11728 rupees. So, using the Automatic Street light system we can

automatically on/OFF light according to day and night time by measuring the light intensity using an LDR sensor and also by detecting human presence we can also turn ON/OFF light. It can save a huge amount of our money as well as reduce electricity consumption. Here we can only calculate for only 1 kilometer but in the real road are hundreds and thousands kilometer long and several street lights are more. So that we can say that the automatic street light system is capable of saving electricity.

Liquid Crystal Display (LCDs) provide a cost-effective way to put a text output unit for a microcontroller. As we have seen in the previous tutorial, LEDs or 7 Segments do not have the flexibility to display informative messages. This display has 2 lines and can display 16 characters on each line. Nonetheless, when it is interfaced with the microcontroller, we can scroll the messages with software to display information which is more than 16 characters in length.

Figure 4.1.3: LCD Display

The functioning of above whole modules are controlled by Arduino and suppling the voltage to them.Arduino is an open-source microcontroller board that has an ATmega32 series controller and an IDE (Integrated Development Environment) used for writing and uploading codes to the board.

Arduino operating voltage is 5 volts and input voltage 7 to 20 volts. It has Universal Serial Bus (USB) for loading and power from a personal computer. We can also give electric power to the microcontroller by 9v battery, USB cable A to B, and another power source such as power bank, etc. A microcontroller is the brain of the project which controls all the components connected to it. It takes the input signal from the sensor and takes action according to the code uploaded in ATmega32. Arduino IDE support programming language such as C and C++. The microcontroller has 14 digital input/output pins out of these 14 pins six pins are capable of PWM output, six analog input/output pins from A0 to A5, 16 MHz ceramic resonators, USB connection jack, external power supply jack for 9v, and In-Circuit Serial Programmer (ICSP) header. It also has 32 kb flash memory where 0.5 kb used by the boot loader. The microcontroller takes the input from the LDR sensor and PIR motion sensor, processes the sensor data, and gives the output to LEDs.

Figure 4.1.4: AVR Atmega328P

A voltage sensor is a sensor used to calculate and monitor the amount of voltage in an object. Voltage sensors can determine the AC voltage or DC voltage level. The input of this sensor is the voltage, whereas the output is the switches, analog voltage signal, a current signal, or an audible signal.

Sensors are devices that can sense or identify and react to certain types of electrical or optical signals. The implementation of a voltage sensor and current sensor techniques have become an excellent choice for the conventional current and voltage measurement methods.

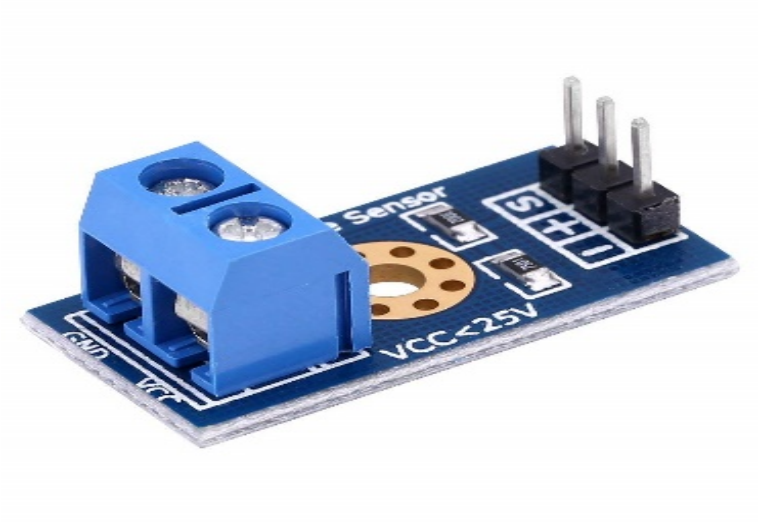

Figure 4.1.5: Voltage Sensor

4.2 Results

4.2.1 Code For Working of Modules

```
define LDR 19
define LED1 3
define LED2 5
define LED3 6
define LED4 9
define LED5 10
define S1 14
define S2 15
define S3 16
define S4 17
define S5 18
int Light = 0;
int S1O = 0;
int S2O = 0;
int S3O = 0;
int S4O = 0;
int S5O = 0;
void setup()
pinMode(LDR, INPUT);
pinMode(LED1, OUTPUT);
pinMode(LED2, OUTPUT);
pinMode(LED3, OUTPUT);
pinMode(LED4, OUTPUT);
pinMode(LED5, OUTPUT);
Serial.begin(9600);
```

```
void loop()
Light = analogRead(LDR);
S1O = analogRead(S1);
S2O = analogRead(S2);
S3O = analogRead(S3);
S4O = analogRead(S4);
S5O = analogRead(S5);
Serial.print(Ïntensity Level: ”);
Serial.println(Light);
if(Light «= 450)
digitalWrite(LED1, LOW);
digitalWrite(LED2, LOW);
digitalWrite(LED3, LOW);
digitalWrite(LED4, LOW);
digitalWrite(LED5, LOW);
else if(S1O « 100)
digitalWrite(LED1, HIGH);
else if(S2O « 100)
digitalWrite(LED2, HIGH);
else if(S3O « 100)
digitalWrite(LED3, HIGH);
else if(S4O « 100)
digitalWrite(LED4, HIGH);
else if(S5O « 100)
digitalWrite(LED5, HIGH);
else
analogWrite(LED1, 75);
```

analogWrite(LED2, 75);

analogWrite(LED3, 75);

analogWrite(LED4, 75);

analogWrite(LED5, 75);

4.2.1 Result

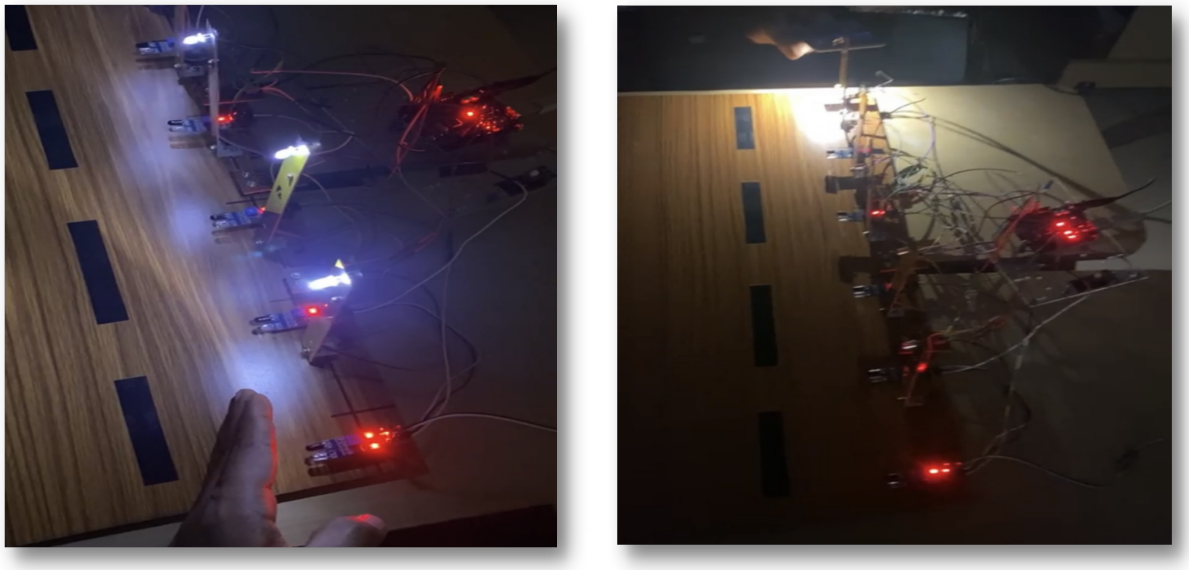

Figure 4.2.1: Object Detection and Light Detection

4.2.2 Code For Reducing Cost

define LDR 19

define LED1 3

define LED2 5

define LED3 6

define LED4 9

define LED5 10

```
define S1 14
define S2 15
define S3 16
define S4 17
define S5 18
int Light = 0;
int S1O = 0;
int S2O = 0;
int S3O = 0;
int S4O = 0;
int S5O = 0;
void setup()
pinMode(LDR, INPUT);
pinMode(LED1, OUTPUT);
pinMode(LED2, OUTPUT);
pinMode(LED3, OUTPUT);
pinMode(LED4, OUTPUT);
pinMode(LED5, OUTPUT);
Serial.begin(9600);
void loop()
Light = analogRead(LDR);
S1O = analogRead(S1);
S2O = analogRead(S2);
S3O = analogRead(S3);
S4O = analogRead(S4);
S5O = analogRead(S5);
Serial.print(Ïntensity Level: ”);
```

```
Serial.println(Light);
Serial.println(”Total Energy Saved / day - 1 Unit”);
Serial.println(Regular LED Lamp Load - 20 Watt”);
Serial.println(”Power Saving Mode - 2 Watt”);
Serial.println(”Total savings Per Month aproximately - 1000/- ”);
Serial.println();
Serial.println();
delay(250);
if(Light «= 450)
digitalWrite(LED1, LOW);
digitalWrite(LED2, LOW);
digitalWrite(LED3, LOW);
digitalWrite(LED4, LOW);
digitalWrite(LED5, LOW);
else if(S1O « 100)
digitalWrite(LED1, HIGH);
else if(S2O « 100)
digitalWrite(LED2, HIGH);
else if(S3O « 100)
digitalWrite(LED3, HIGH);
else if(S4O « 100)
digitalWrite(LED4, HIGH);
else if(S5O « 100)
digitalWrite(LED5, HIGH);
else
analogWrite(LED1, 75);
analogWrite(LED2, 75);
```

analogWrite(LED3, 75);

analogWrite(LED4, 75);

analogWrite(LED5, 75);

4.2.2 Result

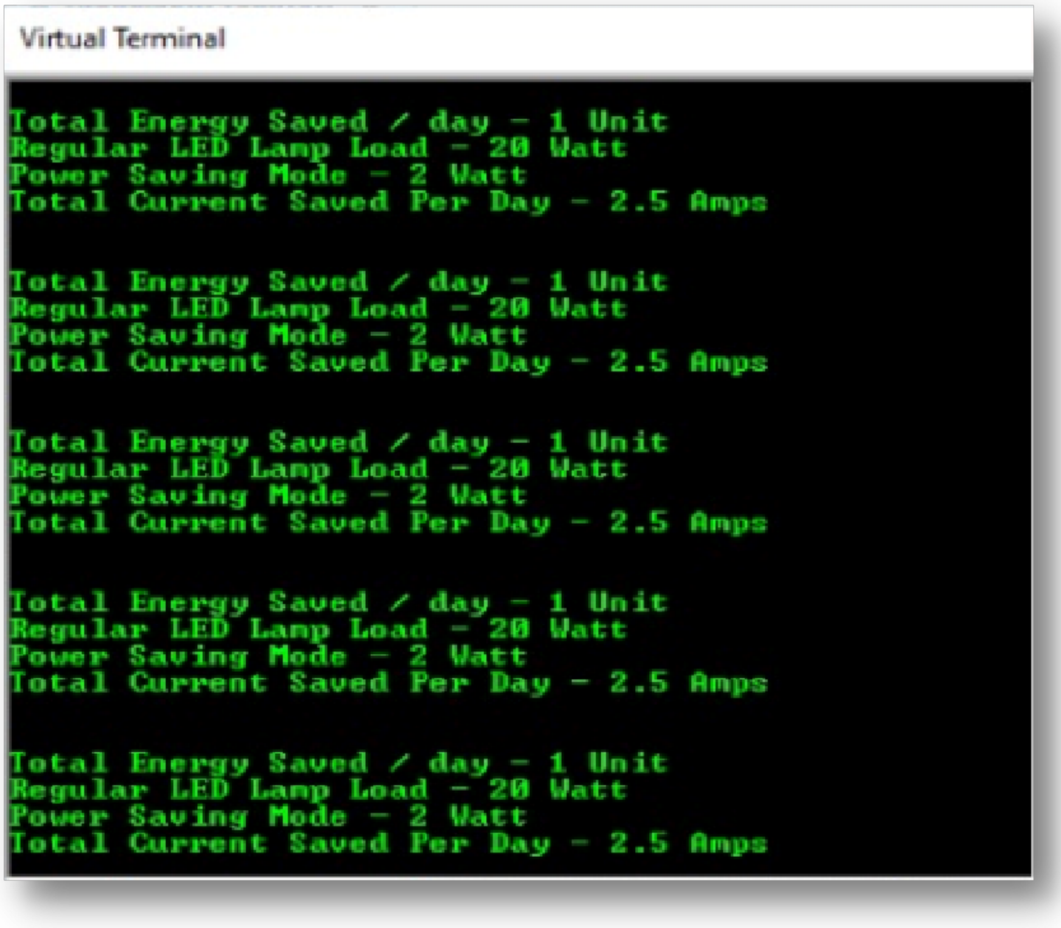

Figure 4.2.2: Power Saving

5. CONCLUSION AND FUTURE SCOPE

In this automatic street light system, we can try to reduce manual work to ON and OFF switches. The system itself detects whether there is a need for light or not. When darkness rises to a certain value and a person is detected. The proposed streetlight automation system is 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. It reduces the unnecessary use of electricity. It provides an efficient and smart automatic streetlight control system with the help of LDR and IR sensors. It can reduce energy consumption and maintains the cost. This system is very versatile, extendable, and adjustable to user needs. We do not have to manually turn on and off these street lights as they turn on and off all by themselves according to the intensity of the surrounding's light. The main purpose of this project is to prevent the loss of electricity unnecessarily during the daytime and in absence of any person to make the system more efficient than before. This system can be easily implemented in street lights, smart cities, home automation, agriculture field monitoring, forest animal monitoring, parking areas, and other public and private's places.

The system is now used only for One way traffic in highways.Continuous uses of LDR and IR 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 twoway traffic, making the system more flexible in case of rainy days and introduction of ways to control the lights through GSM based service.

6. REFERENCES

1. Sindhu A M, Jerin George, Sumit Roy, Chandra J, IJARSCT “Smart Street Light Using IR Sensors”, IEEE Transactions on Mobile Computing and Applications 2022.

2. Nidhi Agrawal, Saurabh Patil, Laxmikant Tekam, IJARSCT “Smart Street Light Using Intensity Controller”, IEEE Transactions on Communication and Technology 2022.

3. Jagannath Dixit, Devesh Katiyar, Gaurav Goel, IJCRT “Automatic Street light Controller System Using LDR and PIR Sensor”, IEEE Transactions on Science and Research 2021.

4. Samson Yusuf Dauda, Nmezi S, Loko, IJARD “Design and Construction of an automatic streetlight controller using microcontroller and LDR”, IEEE Transactions on Academic Research and Development 2020

5. Jay Singh, Shiva Pujan Jaiswal, Monika Jain, Research Gate “Automation In Street Lights Using IR Sensors and LDR”, IEEE Transactions on recent development in engineering and technology 2020

6. Dr. A. Senthil Kumar , K. Vignesh, “ Adaptive Lighting in Street Lights ”, International Journal of Engineering Research Technology (IJERT) ISSN: 2278-0181 Published by, www.ijert.org ECLECTIC - 2020 Conference Proceedings.

7. Chaitanya K , Shweta D, “ Arduino Based street light system” , February 2019 — IJIRT — Volume 5 Issue 9 — ISSN: 2349-6002.

8. Y M Jagadeesha , S Ak Ilesha , S Karthika , Prasantha, “Intelligent Street Lights “, December 2019, Procedia Technology, 21:547 551,DOI:10. 1016/i.protcy.2018.10.050