VISVESVARAYA TECHNOLOGICAL UNIVERSITY

Jnana Sangama, Belagavi – 590014.

A Internship Report

On

"Intelligent Street Lighting System"

Submitted in partial fulfillment of the requirement for the award of degree of

BACHELOR OF ENGINEERING

By

Ajay K	**(1AP21CS004)**
Mallikarjun S	**(1AP21CS026)**
Thejas M	**(1AP21CS049)**

Under the guidance of:
Akhil Sai

2024 – 2025

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

A P S COLLEGE OF ENGINEERING

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Evaluation Sheet

Title of the Project: Intelligent Street Lighting System

Name of the Students : Ajay K
Mallikarjun S
Thejas M

External Supervisor:

_____

Internal Supervisor:

_____

_____

Date:

Place:

Project Completion Certificate

I, **Ajay K** (1AP21CS004), hereby declare that the material presented in the Project Report titled **"Intelligent Street Lighting System"** represents original work carried out by me in the **Department of Computer Science** at the **APS college of Engineering, Bangalore** during the tenure **2 October, 2024 – 12, December, 2024**.

With My signature, I certify that:

- I have not manipulated any of the data or results.
- I have not committed any plagiarism of intellectual property and have clearly indicated and referenced the contributions of others.
- I have explicitly acknowledged all collaborative research and discussions.
- I understand that any false claim will result in severe disciplinary action.
- I understand that the work may be screened for any form of academic misconduct.

Date: **Student Signature**:

In my capacity as the supervisor of the above-mentioned work, I certify that the work presented in this report was carried out under my supervision and is worthy of consideration for the requirements of the B.Tech. Internship Work.

Advisor's Name: **Sameerana C P** **Guide Name: Akhil Sai**

Advisor's Signature **Guide Signature**

Project Completion Certificate

I, **Mallikarjun S** (1AP21CS026), hereby declare that the material presented in the Project Report titled **"Intelligent Street Lighting System"** represents original work carried out by me in the **Department of Computer Science** at the **APS college of Engineering, Bangalore** during the tenure **2 October, 2024 – 12, December, 2024**.

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Advisor's Name: **Sameeranna C P** **Guide Name: Akhil Sai**

Advisor's Signature **Guide Signature**

Project Completion Certificate

I, **Thejas M**(1AP21CS049), hereby declare that the material presented in the Project Report titled **" Intelligent Street Lighting System"** represents original work carried out by me in the **Department of Computer Science and Engineering** at the **APS college of Engineering, Bangalore** during the tenure **2 October, 2024 – 12, December, 2024**.

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Advisor's Name : **Sameerana C P** **Guide Name: Akhil Sai**

Advisor's Signature **Guide Signature**

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ABSTRACT

The Weather Monitoring and Reporting System that is based on the Internet of Things (IoT) is used to provide real-time updates on weather conditions such as temperature, humidity, moisture, and rain levels. For instance, if scientists or nature analysts need to monitor changes in a specific environment like a volcano or a rainforest, they may face limitations with an SMS based weather monitoring system that only sends messages to a few recipients, and the time required for sending messages increases with the number of mobile numbers. In such cases, individuals would need to visit specific sites to access information on the weather conditions, which is visible to everyone.

Due to drastic changes in climate, weather forecasts are becoming increasingly unpredictable. As a result, Weather Reporting Systems are being primarily used for real-time monitoring of continuously changing weather and climatic conditions in controlled areas like homes, industries, and agriculture. The IoT platform, ThingSpeak, is utilized for displaying weather parameters and information globally. This information is also displayed on an OLED using two-way microcontroller communication via Wi-Fi hotspots. Reports on weather conditions for particular places that are based on satellite systems may not provide exact weather conditions, which can be problematic when accurate weather reports are needed in real-time. In the Weather Reporting System, all weather parameters sensors are controlled by an ESP32 microcontroller acting as the server that sends all the data collected by sensors to the ThingSpeak database, which is visible worldwide and displayed on the OLED using a Wemos DI mini as the client microcontroller. The collected data is then compared to weather forecast data and statistics generated by forecast stations. To simplify data analysis, all collected data is saved in Google Sheets format using the IFTT tool. This system monitors changes in weather conditions occurring in the environment and provides users with the quickest way to access information

Chapter 1

ABSTRACT

Conventional street lighting systems in areas with a low frequency of passersby are online most of the night without purpose. The consequence is that a large amount of power is wasted meaninglessly. With the broad availability of flexible-lighting technology like light-emitting diode lamps and everywhere available wireless internet connection, fast reacting, reliably operating, and power-conserving street lighting systems become reality. The purpose of this work is to describe the Intelligent Street Lighting (ISL) system, a first approach to accomplish the demand for flexible public lighting systems.

The project is about a real time adaptive street lighting scheme, detecting the presence of vehicles and dynamically adjusts the brightness of lights to the optimal level. The main aim of smart street lighting system is reducing the power usage when no vehicle movements are being detected on the road and to turn ON the smart street light only when car approaches. When a vehicle comes, then the next pair of three lights glows while the vehicle keep moving ahead, the coming pair of the lights glows and the pair before, comes back to the initial level after a certain time interval. With this, the energy efficiency is being improved of street lights and its usefulness. The streetlights are assumed to start their operation at sunset and finish at sunrise the next day. We have also proposed a new adaptive smart street lighting algorithm which will illustrate how the system is going to operate according to seasonal changes, and what would be the corresponding operational hours of the smart streetlights to keep them on without causing any delays and problems for the vehicles. Our proposed model uses Infrared (IR) sensor and LED lights. As LEDs are more efficient and have longer lifespan, lights on the streets of our country are being substituted by LED street lights, which helps to solve the problem of power wastage. The other reason for using LED in our project is that its intensity can be varied as per the time and traffic on road. The successful implementation of a prototype further will be helping in large-scale development of the project. The project presents alternative to a profitable and nature friendly solution to the excessive energy wastage problem with the current street light systems and is one of the effective scheme for electricity saving

Chapter 2

INTRODUCTION

Due to the increase of environmental concerns, lighting control systems will play an important role in the reduction of energy consumption of the lighting without impeding comfort goals. As mentioned the energy is the single most important parameter to consider when assessing the impacts of technical systems on the environment. Energy related emissions are responsible for approximately 80% of air emissions and central to the most serious global environmental impacts and hazards, including climate change, acid deposition, smog and particulates. Lighting is often the largest electrical load in offices, but the cost of lighting energy consumption is low when compared to the personnel costs. Thus its energy saving potential is often neglected. According to study global grid based electricity consumption for lighting was about 2650 TW in 2005, which was an equivalent of 19% of total global electricity consumption. European office buildings dedicate about 50% of their electricity for lighting, whereas the share of electricity for lighting is around 20-30% in hospitals, 15% in factories, 10-15% in schools and 10% in residential buildings. .Intelligent lighting control and energy management system is a perfect solution for energy saving, especially in public lighting management. It realizes remote on/off and dimming of lights, which can save energy by 40%, save lights maintenance costs by 50%, and prolong lamp life by 25%. The system application in streetlight control for each lamp will reduce in streetlight electricity and maintenance cost, and increase availability of street light

2.1 Objectives

The objective for this project is to design a smart lighting system which targets the energy saving and autonomous operation on economical affordable for the streets. Build an energy saving smart lighting system with integrated sensors and controllers. Design a smart lighting system with modular approach design, which makes the system scalability and expandability. Design a smart lighting system which compatibility and scalability with other commercial product and automation system, which might include more than lighting systems.

2.2 Problem Statement

Traditional street lighting systems operate inefficiently, consuming excessive energy by running at full brightness regardless of traffic conditions, weather, or time of day. They often lack real-time monitoring, resulting in delayed maintenance, increased operational costs, and safety risks in poorly lit areas.

Chapter 3

APPLICATIONS

1. **Traffic Monitoring and Management**
    - Monitoring vehicular and pedestrian traffic patterns to optimize light distribution and improve road safety.
    - Assisting in traffic flow analysis by integrating with sensors and cameras.
2. **Public Safety Enhancement**
    - Providing brighter illumination in areas with high pedestrian activity or potential security risks.
    - Detecting unusual activities (e.g., loitering or accidents) and alerting authorities.
3. **Environmental Sustainability**
    - Reducing carbon footprints by minimizing energy usage and incorporating renewable energy sources like solar power.
    - Supporting cities in achieving their sustainability goals and green initiatives.
4. **Remote Monitoring and Maintenance**
    - Real-time detection of malfunctions or outages to improve maintenance efficiency and reduce downtime.
    - Predictive maintenance using sensor data to avoid unexpected failures.
5. **Emergency Response Support**
    - Automatically increasing brightness in emergency zones to assist responders and ensure public safety.
    - Enhancing visibility in evacuation routes during natural disasters or crises.
6. **Cost Optimization**

- Lowering operational and maintenance costs through energy savings and automated monitoring systems.
- Extending the lifespan of lighting components by reducing unnecessary usage.

7. Integration with Renewable Energy

- Deploying solar-powered streetlights to reduce reliance on the grid and ensure uninterrupted operation in off-grid locations.
- Storing excess energy in batteries for night time use or power backup.

8. Aesthetic and Tourism Support

- Creating visually appealing light designs for parks, landmarks, and other public spaces.

Chapter 4

COMPONENTS

4.1 Raspberry pi 4 Model B

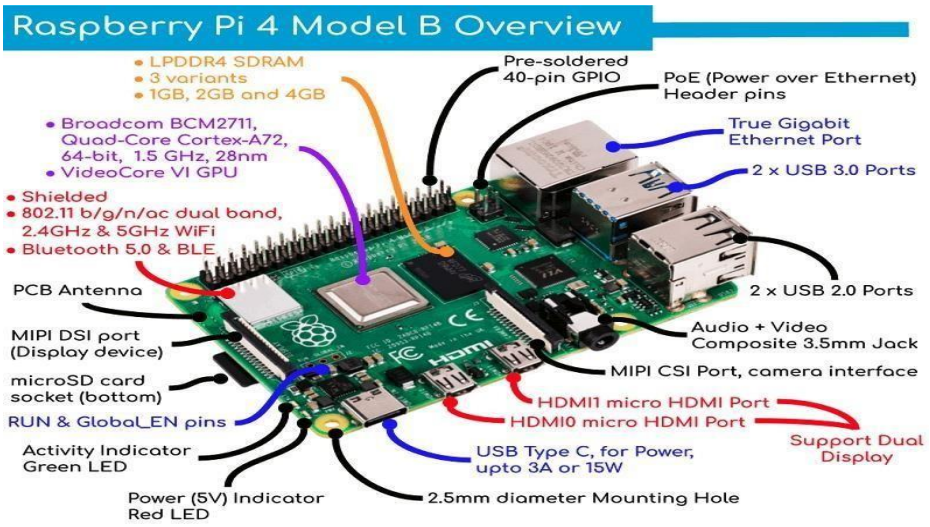


Figure 4.1: Raspberry pi 4 Model B.

The Raspberry Pi 4 Model B is a powerful single-board computer designed for a variety of applications, from education to industrial automation. It features a quad-core ARM Cortex-A72 processor, up to 8GB of RAM, dual micro-HDMI ports supporting 4K output, and USB 3.0 connectivity. Its GPIO pins enable easy interfacing with sensors, motors, and other peripherals, making it ideal for hardware projects. Built-in Wi-Fi, Bluetooth, and Ethernet provide versatile networking options. The Pi 4 is a versatile platform for learning, prototyping, and deploying IoT and embedded systems solutions.

4.2 HC-SR04 Ultrasonic sensor

Figure 4.3: HC-SR04 Ultrasonic sensor

This sensor uses sonar and capable to determine the distance of object, which is not easily affected by sunlight. It is also packaged with a transmitter and a receiver.

Light sensor

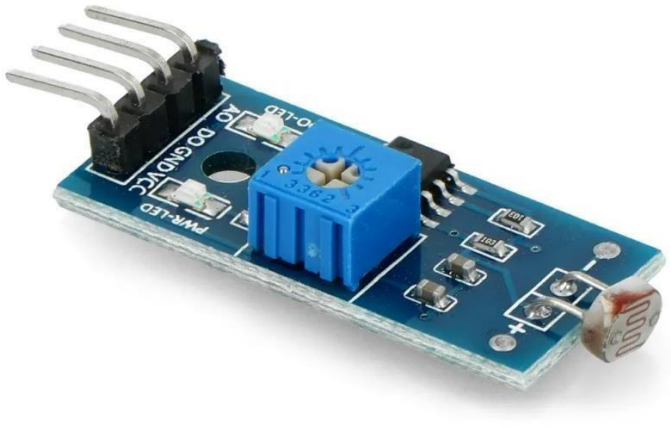


Figure 4.4: Light sensor

Light sensor module function in this work is to detect day and night. This sensor is capable to detect the brightness of environment because there is a Light-dependent Resistor (LDR) provided in the module.

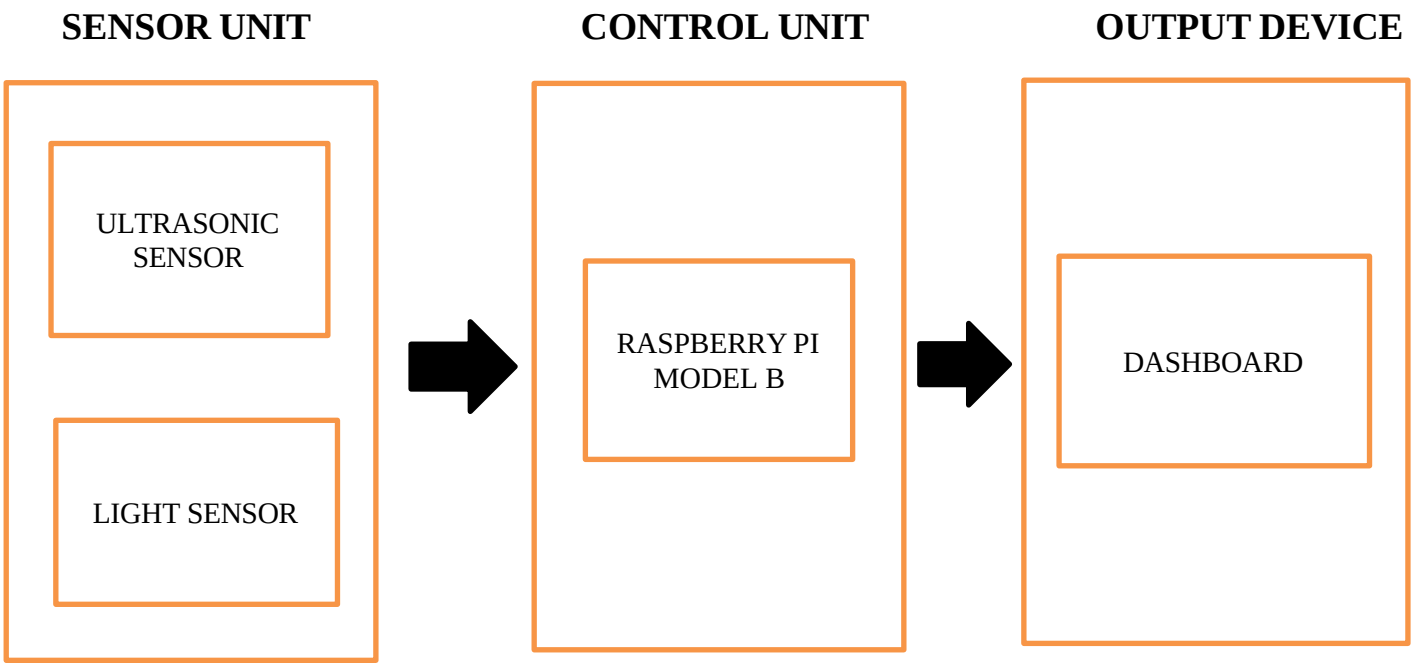
4.3 Wi-Fi Adapter

Figure 4.5: Wi-fi adapter

It is a WLAN USB dongle. The function of this adapter is to connect Raspberry Pi with Wide Local Area Network (WLAN).

Chapter 5

FLOWCHART



Chapter 6

CONCLUSION AND FUTURE WORK

The aim was to control the intensity of the road light framework between various time intervals with regular change, identify the movement out and about and increment the power of the lights when there is car moving and lessen the intensity once the movement has finished. By the utilization of Smart Street Light, additional portion of vivacity can be spared which is ended by superseding sodium vapour lights by LED. It counteracts the wastage of power brought about by manual exchanging of streetlights. It furnishes with a productive and programmed shrewd streetlight control basis with the support of IR sensors. It can control the vitality utilization and keep up the expense. This savvy framework is profoundly adaptable and unconditionally flexible to client needs. This undertaking of Smart Street Light System is an effortful, functional, eco accommodating and the most secure approach to spare vitality. It spares the vitality effectively by supplanting the traditional knobs by LEDs and via programmed darkening of LEDs as and when require. Primary downsides of this framework are the underlying establishment cost and support. Be that as it may, the costly scale usage of this proposed framework will definitely lessen the general expense up as it were. This undertaking has an extension in various different applications like: giving lighting in transport safe house and parking garages. The proposed framework is suitable for road lighting uncommonly in remote urban and rustic territories where the traffic is low on occasion.

In coming future fixing of security cameras will be central feature for the system we proposed. The job of the cameras would be to automatically capture the image of an object in motion across the streetlight and save it in its memory which can be used as a reference in future to ensure the safety at nights. This system can also be customized by upgrading ordinary LED lights to the solar LED lights which are new & renewable energy sources we could serve the same purpose of automatically controlling the street lights much more effectively in both aspects of cost and manpower. The system now is only to be used for one-way traffic on highways. The system has bright feature in two way traffic environment which enables the system more efficient.

CHAPTER 7

PSEDOCODE