International Journal of Multidisciplinary Engineering in Current Research - IJMEC
Volume 8, Issue 12, December-2023, http://ijmec.com/, ISSN: 2456-4265

MOBILE PHONE CONTROLLED STREET LIGHT CONTROL SYSTEM WITH AUTOMATIC DAY/NIGHT SWITCH OVER

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Abstract: The Mobile Phone Controlled Street Light Control System with Automatic Day/Night Switchover represents an innovative approach to urban lighting management. Leveraging automatic light sensing technology, the system ensures energy-efficient operation by autonomously activating street lights at night and deactivating them during daylight hours. This functionality is complemented by a user- friendly mobile application, allowing remote control and monitoring of individual lights. With real- time status updates and adjustable brightness levels, the system provides administrators and users with a flexible and efficient tool for optimizing urban lighting. The integration of IoT facilitates seamless communication, enhancing overall sustainability and contributing to a more intelligent and responsive

I. INTRODUCTION

The project titled "Mobile Phone Controlled Street Light Control System with Automatic Day/Night Switch Over" aims to address a number of issues related to conventional street lighting systems. Because conventional systems frequently follow preset schedules, they consume excessive amounts of energy because street lights are left on during the day. In addition to causing wasteful spending, this lack of adaptation exacerbates environmental issues.

Additionally, managers face logistical difficulties due to the manual nature of monitoring and operating street lighting. By requiring physical interaction for maintenance, adjustments, or problem solving, traditional methods increase operational complexity and cause delays. The idea acknowledges the need for a more responsive and intelligent urban lighting infrastructure that can change with the seasons and the demands of the lighting environment. The main issue is the energy consumption and operational management inefficiencies of the current street lighting systems. By implementing a smart street lighting system with automatic day/night switching depending on ambient light levels, the project seeks to eliminate this inefficiency. By guaranteeing that lights are only turned on when necessary, this not only maximizes energy efficiency but also improves the general sustainability of urban lighting.

The initiative also intends to introduce mobile phone control to streamline street light management. A user-friendly smartphone application takes the role of the conventional manual method, enabling administrators and users to remotely monitor and operate individual street lights.This capability comes in handy in situations like emergency, maintenance, or adjusting to varied urban landscape areas' unique lighting needs.The project aims to develop a comprehensive solution that not only tackles the inefficiencies of current street lighting systems but also advances a more sustainable, adaptable, and user focused urban lighting infrastructure by incorporating these features and utilizing cutting-edge technologies like the Internet of Things.

The primary objective of the "Mobile Phone Controlled Street Light Control System with Automatic Day/Night Switch Over" project is to design and implement a smart and energy-efficient solution for urban street lighting. The project aims to overcome the limitations of traditional street lighting systems by introducing an automatic day/night switchover mechanism based on ambient light levels. This feature is designed to optimize energy consumption, ensuring that street lights are active only when required, thereby reducing unnecessary power usage during daylight hours. Another key objective is to enhance the operational management of street lights by incorporating mobile phone control. Through a user-friendly mobile application, administrators and users can remotely monitor, control, and adjust individual street lights, providing a more responsive and flexible approach to urban lighting management. The integration of IoT technologies is a crucial aspect, enabling seamless communication between the mobile application and the street lights, contributing to real-time monitoring, data collection, and analysis. Overall, the project aims to create a comprehensive and sustainable urban lighting solution that improves energy efficiency, reduces operational complexities, and enhances user accessibility.

II. LITERATURE SURVEY

A thorough investigation of smart street lighting systems is revealed by the literature review conducted for the "Mobile Phone Controlled Street Light Control System with Automatic Day/Night Switchover" project. Creating automatic day/night switchover mechanisms has been the subject of numerous studies; these studies frequently make use of ambient light sensors based on photovoltaic cells or sophisticated light-sensitive technologies. The focus lies in attaining precise and agile switching to maximize energy conservation while guaranteeing security and visibility in metropolitan settings.

The integration of mobile phones as control interfaces for street lighting has gained significant attention. Mobile applications designed for street light control offer features such as real-time monitoring, remote on/off functionality, and adaptive lighting schemes. The literature underscores the importance of user-friendly interfaces and robust communication protocols to seamlessly integrate mobile phone control into urban lighting systems.

IoT technologies play a pivotal role in smart urban lighting, as evidenced in the literature. Researchers explore the integration of sensors, communication modules, and data analytics to create intelligent systems capable of real-time adjustments based on environmental conditions. Considerations for the reliability, scalability, and security of IoT implementations are critical aspects addressed in the surveyed literature.

Energy efficiency is a prominent theme, with studies conducting in-depth analyses of the balance between energy savings and the consumption associated with implementing IoT devices and sensors. Sustainable urban development and the environmental impact of intelligent lighting solutions are key considerations, reflecting a growing awareness of the need for eco-friendly urban infrastructure.

The literature survey also includes comprehensive cost-benefit analyses of smart street lighting systems.

Researchers explore factors such as initial setup costs, maintenance expenses, and the long-term economic and environmental benefits.

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Finally, the literature survey encompasses a diverse range of case studies and practical implementations of mobile-controlled street lighting systems globally. These real-world examples provide valuable insights into challenges faced, lessons learned, and the overall impact on urban environments, contributing to the theoretical foundation and practical considerations for the development of the proposed project.

Existing System

The current street lighting system mostly uses conventional methods, such as photocell-based and fixed schedule systems. When street lights are on fixed schedules, they follow set timing patterns regardless of the amount of ambient light. Energy inefficiencies may arise from this static approach since lights may be left on during the day when there are adequate external light sources. Even though photocell-based systems are more adaptable to changes in the environment, they are still not sophisticated enough to efficiently optimize energy consumption.

Street lights in fixed schedule systems follow a set schedule, which is a traditional method. Even in situations where external illumination is sufficient, street lights are needlessly turned on due to this strict schedule that does not take into consideration variations in natural light levels. As a result, there may be a rise in the amount of energy used.Photocell-based systems incorporate light sensors to detect ambient light levels and trigger street lights accordingly. While an improvement over fixed schedules, these systems may not offer the precision needed to adapt dynamically to changing light conditions. Additionally, photocell-based approaches may lack the flexibility and remote management capabilities required for efficient urban lighting control.

III. ANALYSIS

In the realm of urban infrastructure enhancement, I have spearheaded the development of a groundbreaking project—a Mobile Phone Controlled Street Light Control System with Automatic Day/Night Switch Over. This innovative system combines cutting-edge technologies to revolutionize the management of street lighting. Much like the voice-based prescription generator, this street light control system boasts a modular structure that not only simplifies comprehension but also enhances adaptability. The project's core functionality relies on ambient light detection, intelligently activating or deactivating street lights based on natural light conditions. By incorporating mobile phone control and leveraging Internet of Things (IoT) technologies, users and administrators gain the ability to remotely monitor and adjust street lights through a dedicated mobile application. This connectivity ensures real-time data collection and analysis for efficient urban lighting management. The project's foundation is laid upon essential Python packages, and the code is meticulously crafted within the Visual Studio Code Integrated Development Environment (IDE). With a commitment to simplicity, adaptability, and sustainability, this Mobile Phone Controlled Street Light Control System stands poised to transform the landscape of urban lighting infrastructure.

CONTENT DIAGRAM OF PROJECT

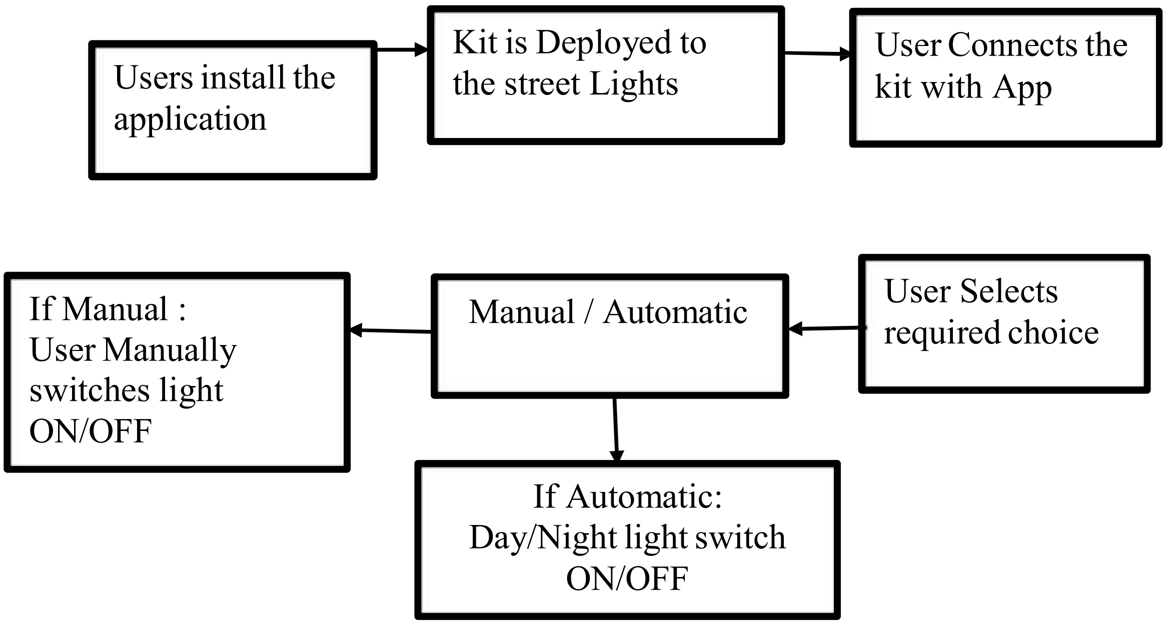


Fig 3.4.1 Content Diagram

IV. DESIGN

The design of a Mobile Phone Controlled Street Light Control System with Automatic Day/Night Switchover entails a comprehensive approach integrating several crucial components. At its core lies a user-friendly mobile application compatible with both Android and iOS platforms, facilitating remote access to street light controls. This system incorporates light sensors to enable automatic activation and deactivation of street lights based on ambient light levels. A centralized control hub serves as the command center, communicating with individual street light units equipped with control modules that receive and execute instructions. Data collection from sensors embedded in street lights enables the system to analyze lighting patterns, power usage, and environmental factors, optimizing schedules and identifying potential malfunctions.

Machine learning models predict lighting needs, detect anomalies, and adapt to historical usage patterns. User engagement is encouraged through the app, allowing feedback and issue reporting, which contributes to system responsiveness and adaptation. Energy conservation features, such as dimming capabilities during low-traffic hours, are integrated, while robust security protocols safeguard against unauthorized access and ensure data integrity. Remote monitoring and maintenance capabilities allow for proactive troubleshooting and quick responses to system irregularities. The system is designed for scalability and compatibility with diverse street light models and city infrastructure, ensuring adaptability and future enhancements.

Designed with scalability in mind, the system is engineered to seamlessly integrate with various street light models and urban infrastructures, enabling cities to expand and evolve their lighting networks while maintaining interoperability and adaptability to future technological advancements. This holistic approach positions the Mobile Phone Controlled Street Light Control System as a robust, adaptive, and user- centric solution catering to the evolving needs of modern urban lighting management.

DFD OR UML DIAGRAMS USE CASE DIAGRAM

A use case diagram represents the interactions between users (actors) and the system. For a Mobile Phone Controlled Street Light Control System With Automatic Day/Night Switchover

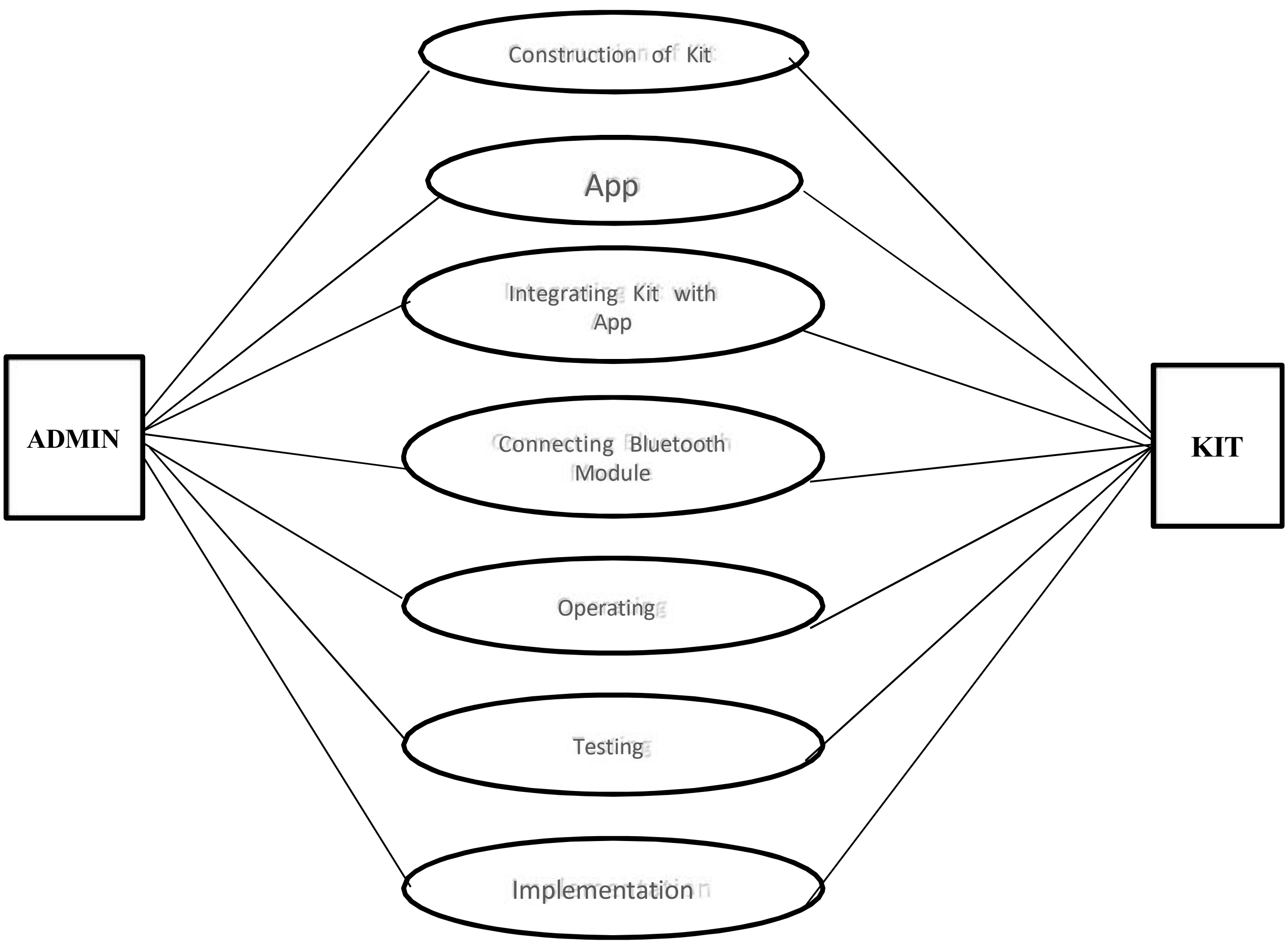


Fig 4.2.1 Use Case Diagram

International Journal of Multidisciplinary Engineering in Current Research - IJMEC
Volume 8, Issue 12, December-2023, http://ijmec.com/, ISSN: 2456-4265

CLASS DIAGRAM

DEPLOYMENT DIAGRAM

A deployment diagram in UML showcases the physical deployment of artifacts on nodes (hardware or software elements).

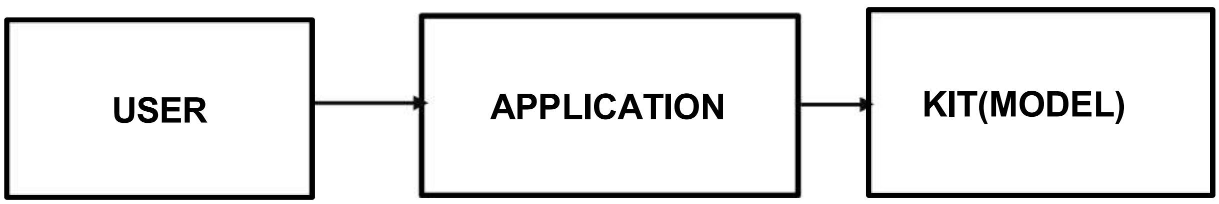


Fig 4.2.3 Deployment Diagram

SEQUENCE DIAGRAM

A sequence diagram in UML illustrates the interactions between different components or objects in a particular sequence.

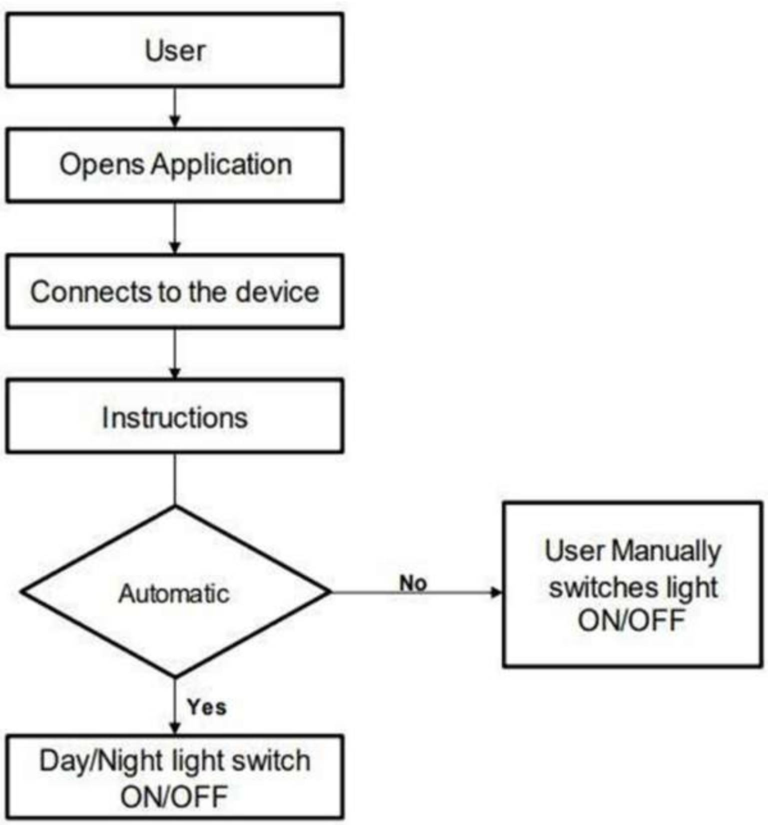
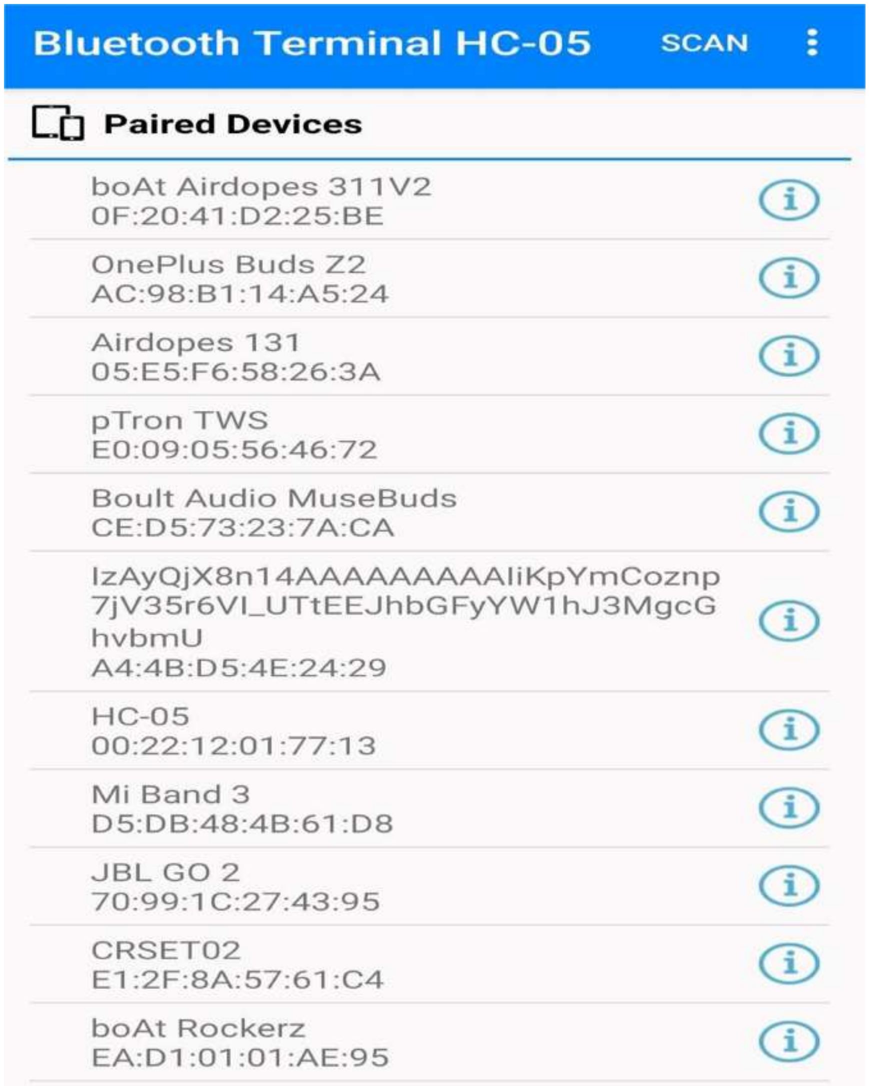


Fig 4.2.4 Sequence Diagram

MODULE DESIGN AND ORGANISATION

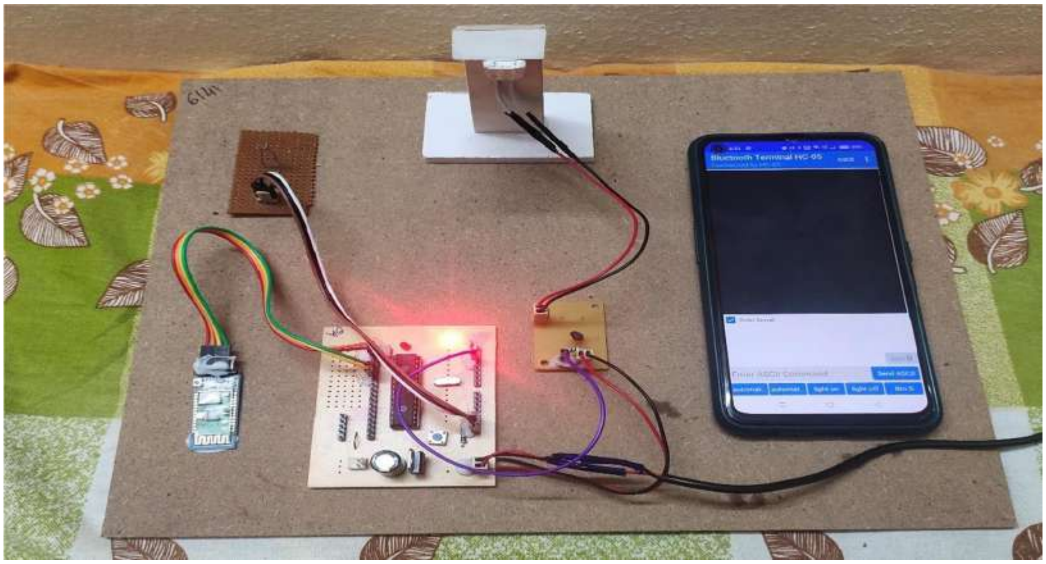
The Mobile Phone Controlled Street Light Control System with Automatic Day/Night Switchover is meant to provide smooth operation, expandability, and efficient administration of street lighting infrastructure. This is accomplished via the modular design and organization of the system. A comprehensive solution is provided by the design of the system, which is comprised of a number of modules, each of which performs a certain function and operates in coordination with the others.The user interface is provided by the Control Interface Module, which is also the component of the mobile application that can be accessed on mobile devices designed for Android and iOS. A user-friendly interface is provided by this module, which enables remote access to and administration of street lighting. It makes it possible to perform a wide range of functions, such as turning the lights on and off, modifying the brightness levels, and arranging the patterns of lighting. The primary link that users have with the system's backend is provided by this component inside the system.The Automation Module, which is situated at the middle of the system, is equipped with light sensors that have been strategically strategically placed across the urban area. These sensors are able to detect the levels of light in the surrounding area and then trigger the automatic activation or deactivation of the street lights. This ensures that the area is illuminated in the manner that is most appropriate for the conditions of the environment. For the purpose of increasing energy conservation while simultaneously boosting safety and visibility, this module is responsible for coordinating the automatic shift between day and night.In its role as the central hub, the Central Control Module is responsible for monitoring the information that is sent between the mobile application and the various street light units each individually. The system is responsible for receiving orders from the Control Interface Module and then distributing those commands to the street light units that are specifically designed to have Control Units installed. In accordance with the directives issued by the central hub, the Control Units, which are included into each and every street light, are responsible for carrying out orders by adjusting the intensity of the light as well as its duration.When it comes to collecting, processing, and analyzing data obtained from sensors that are built into street lights, the Data Analysis and Optimization Module is an especially important component. Lighting patterns, energy use, and environmental variables are all gathered via the collection of data.

V. RESULTS & OUTPUT SCREENS



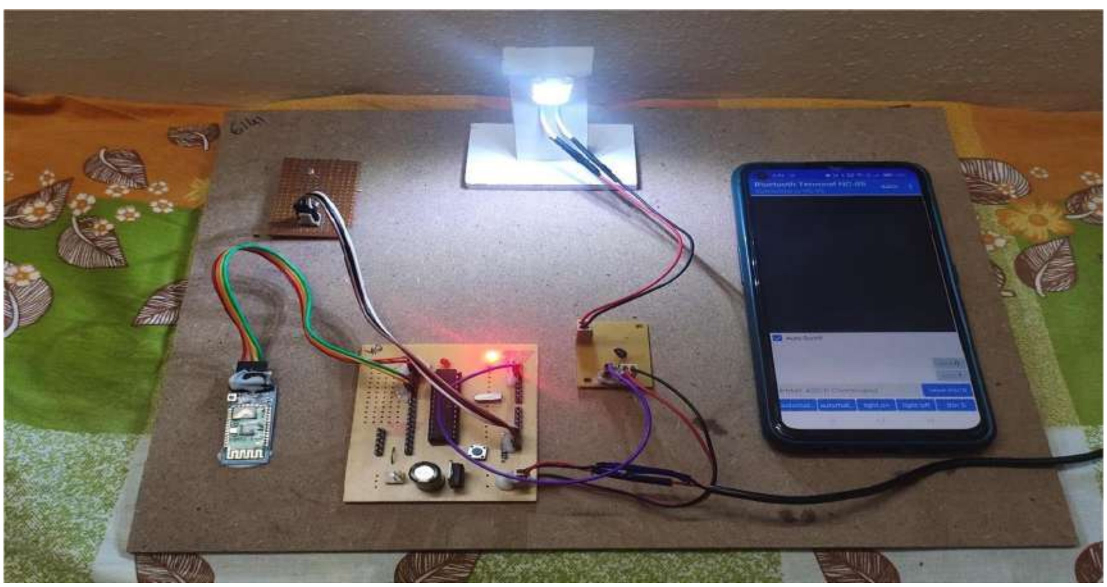
Screen 5.4.1 Application Dashboard

In the above picture it specifies the dashboard off the application and the paired devices of it



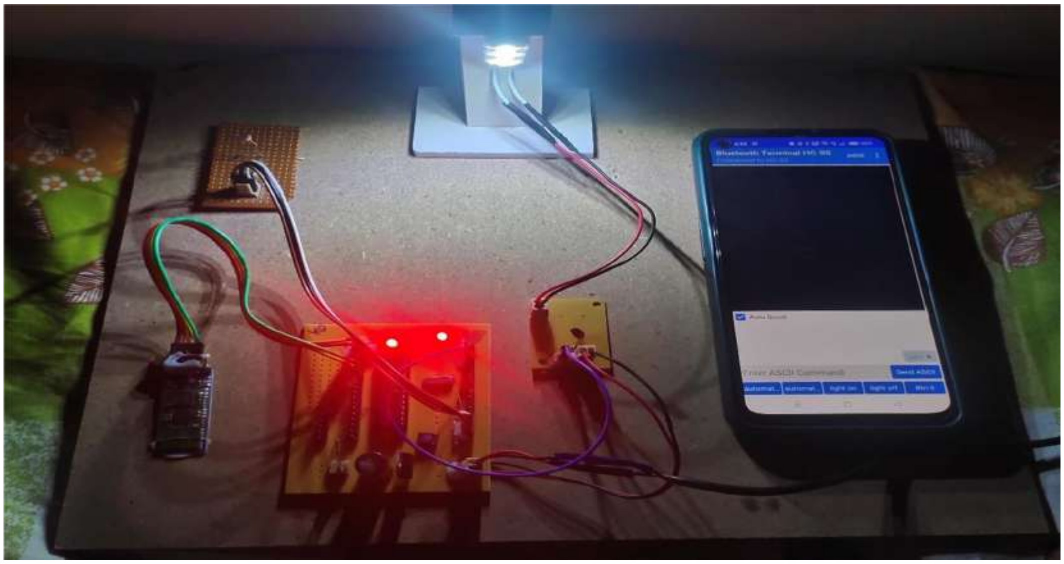
Screen 5.4.2 Manual Mode: OFF

The above figure when the user it connected to the HC-05 device and selected as manual mode off



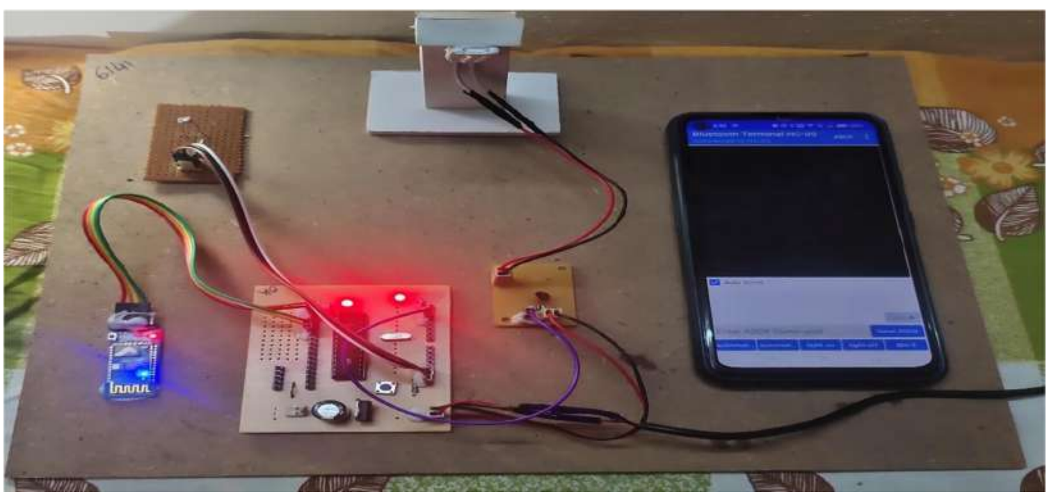
Screen 5.4.3 Manual Mode: ON

The above figure when the user it connected to the HC-05 device and selected as manual mode off



Screen 5.4.4 Automatic Mode: ON

The above figure when the user it connected to the HC-05 device and selected as Automatic mode and the kit is under the dark area where the light is required the kit gets sensed automatically and on the light.



Screen 5.4.5 Automatic Mode: OFF

The above figure when the user it connected to the HC-05 device and selected as Automatic mode and the kit is under the presence of light and no additional light is required, so the kit gets turned off

Result Analysis

This chapter provides information about the website's implementation phase. This section provides a succinct overview of the key features that were used to develop the URL checking application. It is made up of numerous source codes that were used to create this website. Additionally provides the results of each area, which clarifies the various possibilities available to correctly finish project.

CONCLUSION

The integration of hardware components within the system has been meticulously executed to ensure optimal functionality and synergy among each module. Each hardware module's inclusion has been methodically justified, strategically positioned to contribute to the system's seamless operation and overall efficiency. From the Control Interface Module embedded in the mobile application to the Automation Module housing light sensors and the Central Control Module coordinating communication, every component serves a distinct yet interconnected purpose, fostering the system's robustness.

Future Scope

Introducing a GSM (Global System for Mobile Communications) module serves as a significant enhancement to address a critical drawback in the system—the lack of real- time status updates for the person operating the appliances. This additional component enables seamless communication between the system and the user, providing vital information about the appliances' current status, even remotely.

The integration of the GSM module revolutionizes the user experience by offering an effective means of receiving appliance status updates in real time. Through this module, users gain the capability to remotely monitor the operational status of the appliances connected to the system. This includes receiving notifications about whether the street lights are on or off, their current brightness levels, any malfunctions, or other critical operational details.

REFERENCES:

The sites which were used while doing this project:

1. www.wikipedia.com
2. www.allaboutcircuits.com
3. www.microchip.com
4. www.howstuffworks.com

Books referred:

1. Raj kamal –Microcontrollers Architecture, Programming, Interfacing and System Design.
2. Mazidi and Mazidi –Embedded Systems.
3. PCB Design Tutorial –David.L.Jones.
4. PIC Microcontroller Manual – Microchip..
5. Embedded C –Michael.J.Pont.