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SMART STREET LIGHT SYSTEM WITH LDR AND IR SENSORS FOR ENERGY-EFFICIENT ILLUMINATION

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Abstract

This project presents the design and implementation of a Smart Street Light System that incorporates LightDependent Resistors (LDR) and Infrared (IR) sensors to optimize energy usage and enhance public safety. Theprimary objective of this system is to intelligently manage street lighting by adjusting the brightness of LED lightsaccording to the surrounding environmental conditions and the presence of objects or movement in the vicinity. During daylight hours, the LDR detects sufficient ambient light and automatically turns off the street lights,conserving energy. At night, when the ambient light levels drop, the lights are turned on but at a dimmed intensity.The IR sensors further refine this by detecting movement, such as pedestrians or vehicles, and increasing thebrightness of the lights as needed. This ensures that the lights provide adequate illumination only when necessary,reducing unnecessary power consumption.

The Smart Street Light System is not only cost-effective but also environmentally friendly, significantly reducing energy consumption and maintenance costs while lowering carbon emissions. Additionally, the system enhances public safety by ensuring that streets are well-lit only when required, thereby reducing the likelihood of accidentsor criminal activities in poorly lit areas.

This project aligns with smart city initiatives, providing a scalable and efficient solution for urban infrastructure. By integrating advanced sensor technology with traditional street lighting, the system offers a practical approach to modernizing urban environments, contributing to the development of intelligent, sustainable cities. The successful implementation of this project demonstrates the potential of smart technologies to improve energy management and public safety on a broader scale, setting a precedent for future innovations in intelligent infrastructure.

Introduction

The implementation of smart technologies in urban infrastructure has become increasingly essential for enhancing sustainability and efficiency. This project presents a novel approach to street lighting by integrating Light Dependent Resistors (LDRs) and Infrared (IR) sensors to create an intelligent lighting system. The primary objective is to reduce energy consumption while maintaining optimal illumination levels based on ambient light conditions and the presence of objects. The project works Upon detecting darkness and the presence of objects, the MCU processes the sensor inputs and dynamically adjusts the brightness of the LED lights to provide adequate illumination. This ensures energy efficiency by dimming or turning off the lights when not required, thereby reducing unnecessary power consumption Key features of the system include real-time responsiveness to environmental changes, automatic adjustment of lighting intensity, and the ability to conserve energy without compromising safety and visibility

Literature Review:

Solar Based Charging Station for E-Vehicle

The concept of smart street lighting systems has gained significant attention in recent years due to their potential to enhance energy efficiency, reduce costs, and improve public safety. Several studies have proposed various approaches to smart street lighting systems using advanced technologies such as the IoT, artificial intelligence (AI), and sensor networks Smart street lighting systems have gained significant attention in recent years due to their potential to enhance energy efficiency, reduce costs, and improve public safety. Several studies have proposed various approaches to smart street lighting systems using advanced technologies such as power electronics, wireless sensor networks, and the IoT The system was able to adjust the brightness of the street lights based on the ambient light level, as well as detect and report any faults in the system. Another study by A. Imran et al. (2019) proposed a smart street lighting system that utilized a combination of IoT, cloud computing, and big data analytics It is stated that the current traditional street lighting systems are inefficient, as they operate on fixed schedules and are not adaptive to real-time changes in traffic or weather conditions. The literature survey highlights that smart street lighting systems can improve energy efficiency, reduce maintenance costs, and enhance public safety They discuss various approaches, such as using sensors and wireless communication technologies to monitor and control the street lighting system. They also highlight some of the challenges associated with implementing such systems, including the need for reliable and secure communication protocols and the high cost of installation and maintenance They discuss various approaches, such as using sensors, wireless communication, and machine learning algorithms, to monitor and control the street lighting system. They also highlight some of the challenges associated with implementing such systems, including the need for reliable and secure communication protocols and the high cost of installation and maintenance The literature survey in this article discusses various studies related to smart street lighting systems and their applications. It includes

research on different sensor technologies used in smart street lighting systems, such as IR sensors, PIR sensors, and ultrasonic sensors. The survey also examines different control strategies for these systems, including manual control, time-based control, and adaptive control. Additionally, the literature survey discusses the benefits of smart street lighting systems, such as energy savings, improved safety, and reduced maintenance costs. The survey also explores the 5 challenges associated with implementing these systems, including the initial cost of installation and the need for technical expertise to maintain and operate the system The survey examines different sensor technologies used in smart street lighting systems, including IR sensors, PIR sensors, and ultrasonic sensors. Additionally, the literature survey discusses the benefits of smart street lighting systems, such as energy savings, improved safety, and reduced maintenance costs. The survey also explores the challenges associated with implementing these systems, such as the need for technical expertise and the initial cost of installation. Furthermore, the literature survey highlights the importance of using Lab

Proposed System

The smart street light system dynamically adjusts the brightness of LED lights based on ambient light levels and detected presence of objects, significantly reducing energy consumption by only illuminating when necessary.

- The implementation of energy-efficient LED lights and intelligent control mechanisms reduces operational costs over time, providing long-term cost savings despite initial investment in smart technology.

- By optimizing energy usage and reducing carbon footprint, the smart street light system promotes environmental sustainability and aligns with green initiatives aimed at mitigating climate change
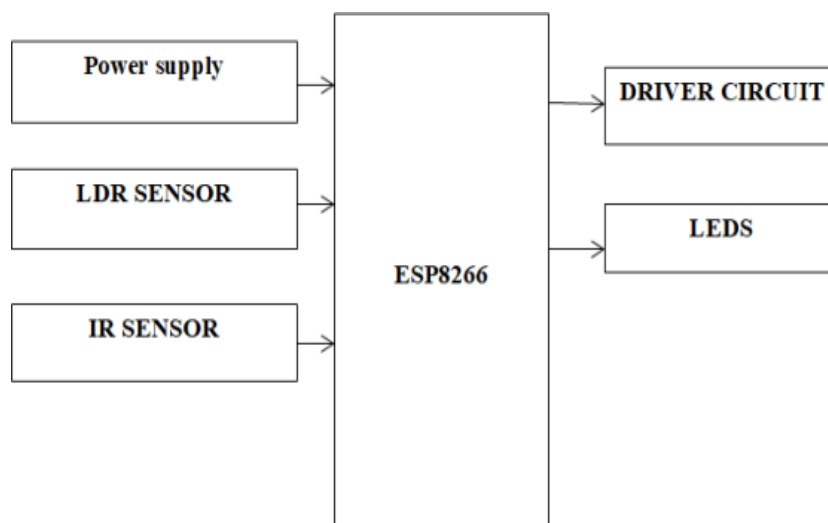
Block Diagram

FIG 1- BLOCK DIAGRAM

Hardware Components:

Power Supply:

The power supply section provides a constant +5V to power the components. An IC, the LM7805, is used to ensure a stable +5V output. The input AC voltage, typically 220V, is first fed into a transformer that steps it down to the required level for DC output. A diode rectifier then performs full-wave rectification, converting the AC into DC, which is initially filtered by a simple capacitor to smooth out the voltage. However, this DC voltage still contains some ripple or fluctuations. To eliminate these ripples and maintain a steady DC output, even if the input voltage varies or the load changes, a voltage regulator circuit is used. This regulation is typically achieved with a popular voltage regulator IC.
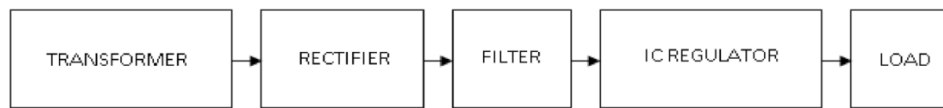
```
TRANSFORMER → RECTIFIER → FILTER → IC REGULATOR → LOAD
```

Fig 2-Block diagram of power supply

Esp3Module:

The ESP32 module is a cost-effective, energy-efficient system-on-chip (SoC) microcontroller developed by Espressif Systems. It integrates both Wi-Fi and Bluetooth connectivity, making it ideal for applications such as Internet of Things (IoT) devices, wearable technology, and embedded systems. Featuring dual-core processors with speeds of up to 240 MHz, the ESP32 also includes a variety of built-in peripherals, such as touch sensors, analog-to-digital converters, and pulse-width modulation (PWM) controllers. Additionally, it supports multiple communication protocols, including Wi-Fi, Bluetooth, and Ethernet.

Fig3: Esp32 Module

IR SENSOR:

that is invisible

like

reflects

detector   captures   reflected

proportional to

the reflection.

IR sensors are widely used in various applications, including motion detection, temperature measurement, and proximity sensing. They play a crucial role in security systems for detecting intruders, in temperature monitoring devices for room or object temperature measurement, and in robotics for obstacle detection. Infrared radiation itself has a longer wavelength than visible light but is shorter than microwaves. All objects with a temperature above absolute zero, including humans, animals, and inanimate objects like walls and floors, emit infrared radiation, making IR sensors highly versatile in numerous technological applications.
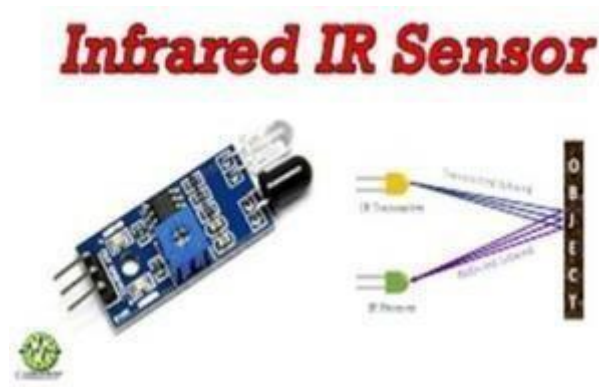
Fig 4-IR sensor

LDR Sensor:

Light Dependent Resistors (LDRs) are highly useful components, particularly in light and dark sensor circuits. Under normal conditions, an LDR has a very high resistance, sometimes reaching up to 1,000,000 ohms. However, when exposed to light, its resistance decreases significantly.

In low-light conditions, the LDR's high resistance prevents current from reaching the base of the transistors, keeping the LED off. Conversely, when light falls on the LDR, its resistance drops, allowing current to flow into the base of the first transistor and then the second. This triggers the LED to illuminate, making LDRs ideal for applications like automatic lighting systems and ambient light detection.

Fig 5: LDR sensor

ULN2003:

The ULN2003A is an integrated circuit developed by Texas Instruments, featuring an array of seven NPN Darlington transistors. Each transistor can handle up to 500 mA and 50 V output. The IC includes common-cathode flyback diodes, making it well-suited for switching inductive loads such as servomotors. It is available in various package types, including PDIP, SOIC, SOP, and TSSOP.

Other variants in the same family include the ULN2002A, ULN2004A, ULQ2003A, and ULQ2004A, each designed for different logic input levels. Additionally, similar ICs such as the ULN2001A (with four inputs) and the ULN2801A to ULN2805A series differ primarily in their logic input compatibility (TTL, CMOS, PMOS) and the number of inputs and outputs (ranging from 4 to 8).

Darlington Transistor

A Darlington transistor, also known as a Darlington pair, is a configuration where two bipolar transistors are directly coupled in DC. This setup allows the current amplified by the first transistor to be further amplified by the second, resulting in a total current gain equal to the product of the individual gains of both transistors. This makes Darlington transistors highly effective for applications requiring significant current amplification.
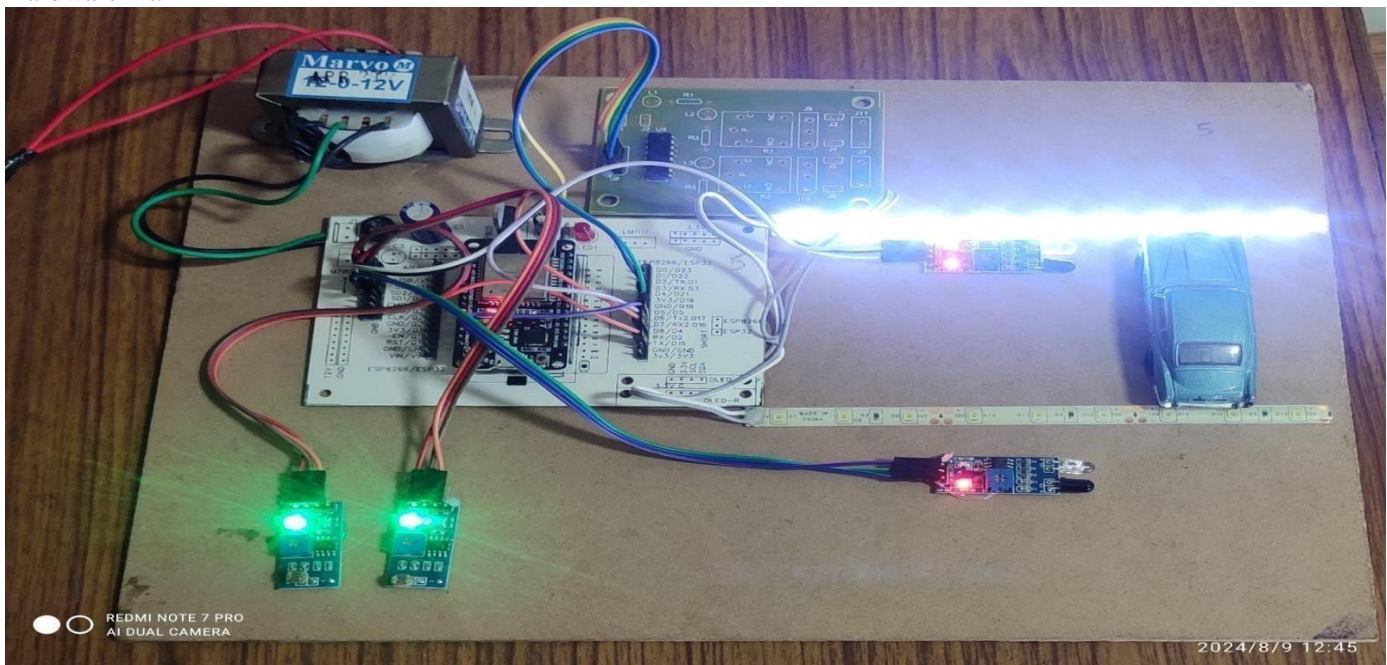
Hardware kit:

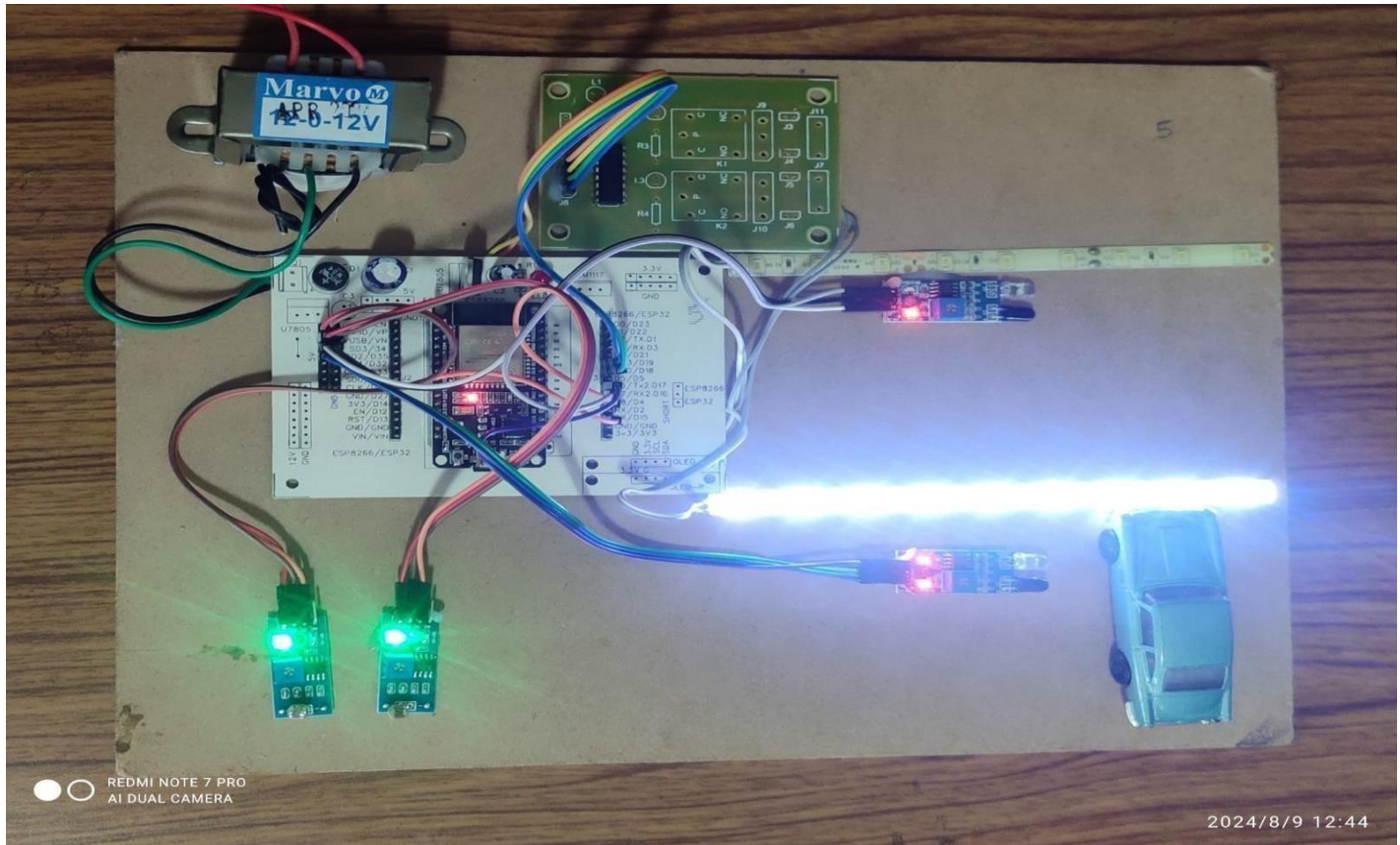Fig 7: WHEN THE OBJECT IS SENSED BY THE SENSOR DURING NIGHT TIME

Fig 8: THE 1 STREET LIGHT TURNS OFF WHEN THE OBJECT MOVES FURTHER SO ENERGY IS CONSERVED

Result:

Implementing a smart street light system using LDR and IR sensors delivers several key benefits:

1. Energy Efficiency

- Significant reduction in power consumption by ensuring lights operate only when needed.
- Measurable decrease in electricity costs, typically ranging from 30% to 60%, depending on location and prior lighting practices.

2. Enhanced Safety & Security

- Improved visibility in low-light conditions, reducing the risk of accidents for pedestrians and vehicles.
- Increased security by ensuring well-lit public spaces, deterring criminal activities, and enabling integration with surveillance systems.

3. Cost Savings

- Lower operational costs due to optimized energy usage.
- Reduced maintenance expenses through real-time monitoring and proactive maintenance alerts, preventing sudden failures.

4. Automation & Smart Integration

- Strengthens urban infrastructure by incorporating smart technology for efficient city management.
- Supports smart city initiatives by collecting valuable data for future urban planning and resource optimization.

Conclusion:

The smart street light project utilizing LDR and IR sensors presents a practical and effective solution for modernizing urban lighting systems. The key conclusions from its implementation and analysis include:

1. Efficiency

- Optimizes street lighting by adjusting based on real-time ambient light and movement.
- Reduces the need for manual operation, enhancing automation and operational efficiency.

2. Cost-Effectiveness

- Achieves significant cost savings through lower energy consumption and reduced maintenance efforts.
- The initial investment is offset by long-term reductions in operational expenses.

3. Environmental Benefits

- Contributes to sustainable urban development by minimizing energy waste and light pollution.
- Supports global energy conservation and climate change mitigation efforts.

4. Improved Quality of Life

- Enhances public safety and security by ensuring well-lit streets and public spaces.
- Increases community satisfaction with a more reliable and adaptive lighting system.

5. Scalability & Future Integration

- Offers a scalable solution that can be expanded to additional urban areas.
- Lays the foundation for integration with other smart city technologies, fostering a more connected and intelligent urban environment.

In summary, the smart street light project using LDR and IR sensors successfully merges technological innovation with practical benefits, leading to a more efficient, secure, and sustainable urban lighting infrastructure.

Reference:

[1] S. Kadirova, T. Nenov and D. Kajtsanov, "IoT Based Automatic Electronic System for Monitoring and Control of Street Lighting," 2020 IEEE 26th International Symposium for Design and Technology in Electronic Packaging (SIITME), 2020, pp. 122-126, doi: 10.1109/SIITME50350.2020.9292246

[2]. P. P. F. Dheena, G. S. Raj, G. Dutt and S. V. Jinny, "IOT based smart street light management system," 2017 IEEE International Conference on Circuits and Systems (ICCS), 2017, pp. 368-371, doi: 10.1109/ICCS1.2017.8326023

[3] S. M. Sorif, D. Saha and P. Dutta, "Smart Street Light Management System with Automatic Brightness Adjustment Using Bolt IoT Platform," 2021 IEEE International IOT, Electronics and Mechatronics (IEMTRONICS), 2021, pp1-6,doi: 10.1109/IEMTRONICS52119.2021.9422668

[4] M. C. V. S. Mary, G. P. Devaraj, T. A. Theepak, D. J. Pushparaj and J. M. Esther, "Intelligent Energy Efficient Street Light Controlling System based on IoT for Smart City," 2018 IEEE International Conference on Smart Systems and Inventive Technology (ICSSIT), 2018, pp. 551-554, doi: 10.1109/ICSSIT.2018.8748324.

[5] N. Gopinath, D. Ezhilarasi, S. Kiruthika and S. Hemavathi, "Self-Activating Street Lights Using Sensors and Arduino," 2021 IEEE 4th International Conference on Computing and CommunicationsTechnologies(ICCCT),2021,pp.469-472,doi10.1109/ICCCT53315.2021.9711871

[6] Anandakumar, H., & Umamaheswari, K. (2017). Supervised machine learning techniques in cognitive radio networks during cooperative spectrum handovers. Cluster Computing, 20(2),1505-1515.

[7] S, D., & H, A. (2019). AODV Route Discovery and Route Maintenance in MANETs. 2019 5th International Conference on Advanced Computing & Communication Systems (ICACCS). doi:10.1109/icaccs.2019.8728456

[8] H. Anandakumar and K. Umamaheswari, An Efficient Optimized Handover in CognitiveRadio Networks using Cooperative Spectrum Sensing, Intelligent Automation & Soft Computing, pp. 1– 8, Sep. 2017. doi:10.1080/10798587.2017.1364931

[10] Suganya, M., & Ananda kumar, H. (2013, December). Handover based spectrum allocationin cognitive radio networks. In 2013 International Conference on Green Computing, Communication and Conservation of Energy (ICGCE) (pp. 215-219