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Automatic Street Light

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Abstract - Street lighting is an essential public utility that ensures safety and visibility during night hours. However, conventional street lighting systems operate manually or remain switched ON even during daylight, leading to unnecessary power consumption. This mini project presents the design and implementation of an Automatic Street Light System that operates based on ambient light conditions. The system uses a Light Dependent Resistor (LDR) to sense the intensity of sunlight. When daylight is present, the resistance of the LDR is low and the street lights remain OFF. As darkness falls, the LDR resistance increases, triggering the control circuit to autornatically switch ON the street lights. This automatic operation eliminates the need for manual control.

Keywords - Gesture LDR , LED, Resistor, Jumper wires, Power supply, Battery.

I. Introduction

The street lighting is one of the largest energy expenses for a city. An intelligent street lighting system can cut municipal street lighting cots as much as 50%-70%. The present system is like the 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 outside [1]. But the actual timing for these lights to be switched on are when there is absolute darkness. With this, the power will be wasted up to some extent. In sunny and rainy days, ON and OFF time differ discernibly which is one of the significant hindrances of the present street lights systems.

II. Literature Review

Automatic street light control systems have been widely studied and developed to improve energy efficiency, reduce human intervention, and enhance public safety. Several researchers have proposed different approaches, ranging from simple sensor-based systems to advanced lot and intelligent control techniques. The following literature survey highlights key works in this area, their methodologies, and findings. Biradar and Patil developed an automatic street light system using a Light Dependent Resistor (LDR) and basic analog circuitry. Their system automatically switches street lights ON at night and OFF during the day based on ambient light intensity. This work demonstrated the fundamental feasibility of sensor-based automatic lighting and reported significant energy savings compared to manually controlled systems.

However, the design lacked adaptive control for varying environmental conditions, such as cloudy days or shadows. Rahman and colleagues proposed an automatic street light system using an Arduino microcontroller with LDR sensors. In addition to ON/OFF control, their system implemented dimming control using PWM (Pulse Width Modulation) based on the intensity of darkness.

III. System Architecture & Methodology

TheThe system architecture of an automatic street light consists of a power supply unit, a light sensing element such as an LDR (Light Dependent Resistor), a control unit (transistor or microcontroller), a switching device like a relay module, and the lighting source such as an LED lamp. The power supply provides the required electrical energy to the entire circuit. The LDR is used to sense the intensity of ambient light and convert it into an electrical signal by changing its resistance according to light conditions. This signal is then sent to the control unit, which processes the input and decides whether the street light should be turned ON or OFF. The relay or switching device acts as an interface between the low-power control circuit and the high-power street lamp, ensuring safe and efficient operation.

The methodology of the automatic street light system is based on continuous monitoring of surrounding light intensity. During daytime, when sunlight is sufficient, the LDR offers low resistance, and the control unit keeps the relay in the OFF state, thereby turning the street light OFF. During nighttime or low-light conditions, the resistance of the LDR increases, triggering the control unit to activate the relay and switch the street light ON. This process occurs automatically without human intervention. The system operates continuously, providing energy-efficient lighting, reducing power consumption, minimizing manual effort, and enhancing safety in public areas.

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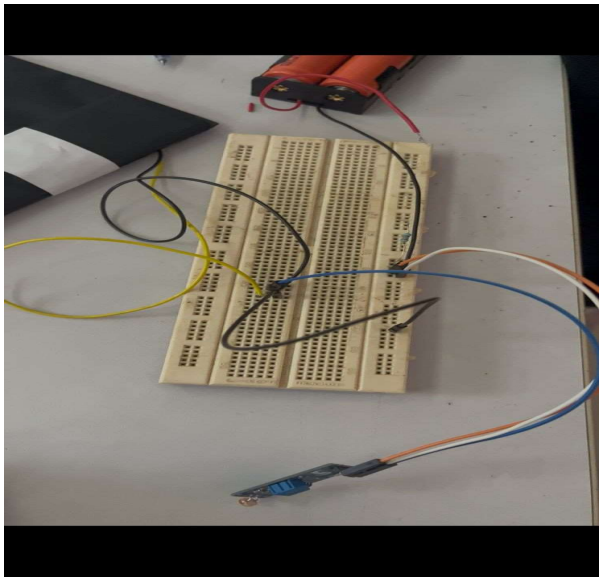

Fig. 1

Fig.1 Overall system architecture of the Automatic street light

A. Hardware Setup

The The hardware setup of an automatic street light system consists of a power supply unit, light sensing unit, control unit, driver circuit, and the street lamp (load).First, the power supply unit converts 230V AC mains into low-voltage DC (5V or 12V) using a transformer, rectifier, filter capacitor, and voltage regulator. This regulated DC supply powers the sensor and control circuit.The Light Dependent Resistor (LDR) is used as the sensing element. It is connected in a voltage divider configuration with a resistor or potentiometer. The LDR changes its resistance according to the intensity of sunlight — low resistance during daytime and high resistance at night.The output from the LDR is given to a transistor (such as BC547) or a microcontroller, which acts as a control unit.The transistor works as a switch and amplifies the signal received from the LDR. The light sensing unit uses a Light Dependent Resistor (LDR), which changes its resistance according to the intensity of sunlight. The LDR is connected in a voltage divider configuration with a resistor or potentiometer to detect day and night conditions. This hardware setup ensures automatic operation, energy saving, reduced manpower, and efficient street lighting management.

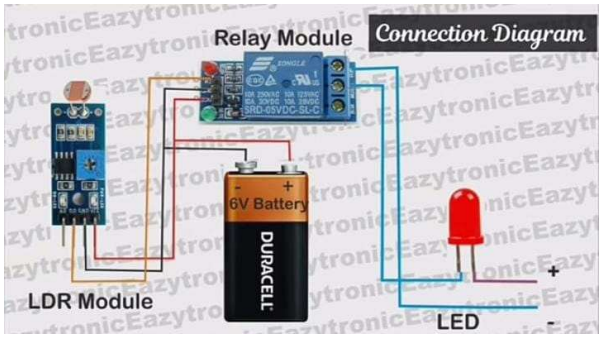

Fig. 2

Fig.2 Hardware implementation of the system using LDR module, LED and battery power supply.

B. Sensing and Controlling

The Sensing is the process of detecting environmental conditions (mainly light intensity) to decide whether the street light should be ON or OFF.

•The system uses a Light Dependent Resistor (LDR) as the main sensor.

•The resistance of the LDR changes with light intensity:Low resistance in daylight High resistance in darkness.The LDR is connected in a voltage divider circuit with a resistor.The output voltage from this arrangement changes according to the surrounding light.

C. Automatic operation

The automatic operation of an automatic street light system is based on sensing the surrounding light intensity and controlling the street lamp without human intervention. The system mainly uses a Light Dependent Resistor (LDR), a control unit (such as a transistor or microcontroller), a relay module, and an LED street lamp.

D. Power Supply

The power supply of an automatic street light system is used to convert the high 230V AC mains supply into a low, stable DC voltage required for operating electronic components such as the LDR, transistor, relay, or microcontroller. It mainly consists of a step-down transformer, bridge rectifier, filter capacitor, and voltage regulator. The transformer reduces the 230V AC to a lower AC voltage (usually 12V AC). The bridge rectifier then converts this AC voltage into pulsating DC.

IV. Result

The The automatic street light mini project was successfully designed and tested. The system worked according to the light intensity of the surroundings. During daytime, when sufficient light was present, the LDR detected high light intensity and kept the street light in the OFF condition. During nighttime or low-light conditions, the LDR sensed darkness and automatically switched the street light ON through the transistor and relay circuit.

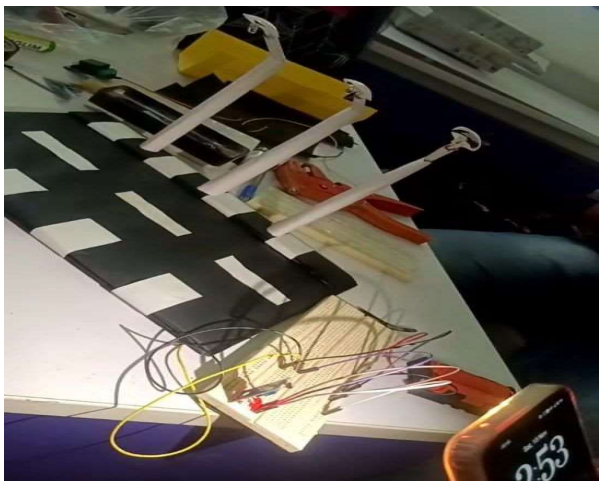

Fig. 3. Real when sensors detect light, the street light turns OFF

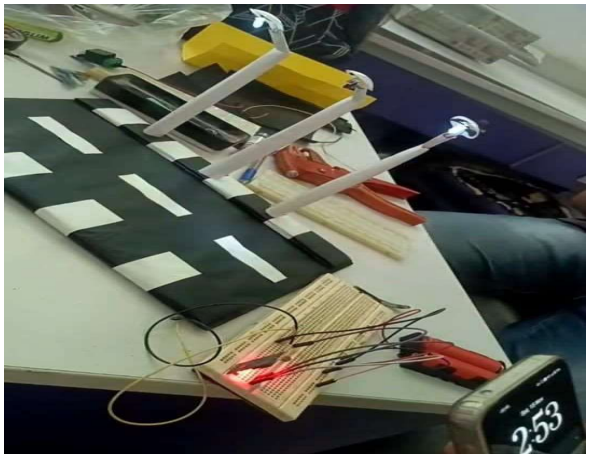

Fig. 4. When sensor detects darkness the street light turns ON automatically

The project demonstrated reliable operation without manual intervention. The switching action was smooth, and the circuit responded accurately to changes in light intensity. The system also showed energy-saving capability by ensuring that the street light operated only when required.

Thus, the automatic street light system achieved its objective of providing an efficient, cost-effective, and energy-saving solution for street lighting applications

V. Future Scope

The automatic street light system has a wide future scope as cities move toward smart, energy-efficient, and automated infrastructure. With the advancement of technology, these systems can be improved to provide better performance, higher energy savings, and intelligent control.One major development is the integration of solar power. Future automatic street lights can use solar panels and rechargeable batteries to operate without relying on the main power supply. This will reduce electricity costs and make the system suitable for remote and rural areas. Another important improvement is the use of LED lighting, LEDs consume less power, produce more brightness, and have a longer lifespan than traditional bulb Future systems will mainly use LED technology to increase efficiency and reduce maintenance.

The system can also be enhanced by adding motion sensors. These sensors car detect vehicles or pedestrians and increase the brightness only when movement is detected. This feature can further reduce energy consumption and improve safety.With the help of microcontrollers and IoT (Internet of Things), automatic street lights can become part of smart city networks

VI. Conclusion

The automatic street light system is a simple, efficient, and reliable solution for controlling street lighting based on surrounding light conditions. The system uses an LDR sensor to detect light intensity and automatically switches the street light ON during darkness and OFF during daylight. This automatic operation eliminates the need for manual control and ensures that the lights work only when required.

The project demonstrates how basic electronic components such as resistors, transistors, relays, and a power supply can be used to create an effective automation system. During testing, the system showed stable performance, low power consumption, and reliable switching. It also helped in reducing electricity wastage and manual effort.

The automatic street light system is cost-effective, easy to install and requires minimal maintenance. It can be used in various locations such as streets, parking areas, gardens, campuses, an residential areas. With further improvements like LED lighting solar power, motion sensors, and smart controllers, the system ca become more advanced and suitable for modern smart ci applications.

VII. References

[1] V. Savale et al., "Automatic Street Light," IJRASET, 2023.

[2] A. Mankawade et al., "Street Light Control System," IJRASET, 2022.

[3] S. R. Chaitrashree et al., "Automatic Street Light Control System," IJRASET, 2023.

[4] J. Patel et al., "Automatic Street Lighting Control System Using Microcontroller and Sensors," IJSRSET, 2020.

[5] M. M. Satwik et al., "Automatic Street Lighting System Using IoT," IJARIIT, 2018.

[6] A. B. Jirapure and R. T. Gulhane, "Zigbee Based Automatic Streetlighting System," IJERT, 2013.

[7] P. P. M. Krishna et al., "Automatic Street Light System," JOCAAA, 2024.