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Automatic Street Cum-Porch Light

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Abstract: *This paper presents the development and implementation of an automatic lighting system designed to control street and porch lights based on ambient light levels and motion detection. The proposed system aims to reduce energy consumption and improve safety by using sensors to activate lighting only when necessary. The system integrates LDR (Light Dependent Resistor) for daylight sensing and PIR (Passive Infrared) sensors for motion detection The design is cost-effective, energy-efficient, and suitable for urban and rural deployments.*

Keywords: LDR, LM358, Relay ,NE555

I. INTRODUCTION

The growing demand for energy-efficient systems has led to the development of smart lighting solutions. Street lights are often left on throughout the night, resulting in unnecessary energy consumption. Similarly, porch lights may remain on even when not needed. This project proposes an automatic system that intelligently controls street and porch lights based on environmental conditions and human presence.The Automatic Street-Cum-Porch Light system is a cutting-edge technology designed to automate the operation of lighting in streets, porches, and other outdoor spaces. This system uses sensors and control circuits to detect changes in environmental conditions, such as ambient light levels or movement, and adjust lighting accordingly. The primary goal is to provide illumination only when necessary, reducing energy wastage, enhancing convenience, and ensuring safety.

System incorporates various technologies to achieve its functionality. A Light Dependent Resistor (LDR) is commonly used to detect the surrounding light intensity. When the natural light levels drop below a certain threshold, the system automatically switches the light on. Conversely, during daylight or when sufficient artificial light is available, the system turns the light off, ensuring energy efficiency.

Additionally, motion sensors, such as Passive Infrared (PIR) sensors, can be integrated into the system. These sensors detect movement within a specified range and activate the lights only when motion is detected, making the system more dynamic and further reducing unnecessary power consumption.

At the heart of the system is a microcontroller or a control circuit that processes inputs from the sensors and manages the switching mechanism, often using a relay to control high-power lights. In some designs, programmable timers are included to allow precise scheduling of light operation.

II. LITERATUR REVIEW

Saving power is very important in today's life. We need to conserve energy because it is impossible to replace Most of the energy sources we rely on, such as coal and natural gas. One of the major powers consuming Factors in any city are "STREET LIGHT."

Most of the time **we** street lights are ON even after sunrise so a lot of Energy is wasted. This problem can be avoided by having an automatic light and dark sensing system that turns the street lights ON & OFF when the ambient light falls below particular intensity.

The main motive to write down this paper to avoid wasting electric energy using IoT and Street Lights. Now-a-days, human has become too busy and is unable to hunt out time even to switch the lights wherever not necessary. this technique is like, the road lights are visiting be switched on within the evening before the sun sets which they're transitioned subsequent day morning after there's sufficient light on the roads. This paper gives the only solution for

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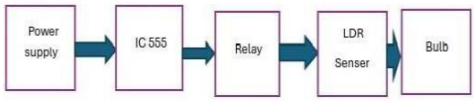
stopping the electrical power wastage. Also, it's eliminated the manual operation of the lighting. During this paper, the two sensors are used which are ultrasonic sensors to detect the movement on the road.

Smart Street light is a robotized framework which automate the road. The primary point of Smart Street light is to reduce the power utilization when there are no vehicle moments on road. The Smart road light will turn to be ON when there are vehicles out and about generally the lights will be turned OFF. With improvement in technology, things are getting to be easier and simpler for everybody around the world today. robotization is the utilization of control frameworks and information technologies to decrease the requirement for human work in the production of services and enterprises. In the extent of industrialization, robotization is a stage past mechanization, though motorization gave human operators apparatus to help the clients with the solid prerequisites of work, robotization enormously diminishes the requirement for human sensory and mental requirements also. Automation play a vital job on the world's economy and in day by day experience. Programmed frameworks are being favored over manual framework.

III. METHODOLOGY



Converts AC mains voltage (e.g., 230V) to a lower DC voltage (e.g., 5V or 12V) suitable for electronic components Step- down transformer (to reduce AC voltage) bridge rectifier (to convert AC to DC) filter capacitor (to smoothen the DC) voltage regulator (like 7805 or 7812 for constant DC output) It detects the voltage level from the LDR sensor. when light falls below a certain threshold (indicating darkness), the IC output changes state. typically used in monostable or bistable mode for this application. acts as an electromechanical switch gets triggered by the output from the IC 555.when triggered, it completes the circuit for the bulb to turn ON. provides electrical isolation between low-voltage control circuit and high-voltage bulb circuit.

Senses ambient light levels resistance is high in the dark and low in light forms a voltage divider circuit that feeds the IC 555 helps the circuit determine whether it is day or night the output load (light source) that turns ON/OFF based on ambient light can be any light – LED, CFL, or incandescent depending on the power rating and design. during the day, the LDR receives light, its resistance drops, and the voltage at the IC 555 input remains low, keeping the relay OFF at night, LDR resistance increases, voltage at the IC changes, triggering it to turn ON the relay closes the circuit and powers the bulb, illuminating the street or porch. during the night time, the system automatically controls the bulb based on the light intensity, ensuring energy efficiency and convenience the surroundings get dark, and the resistance of the LDR increases

IV. RESULT

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When the LDR was exposed to bright light (simulating daylight), the voltage across it dropped, causing the comparator output (IC1A of LM358) to remain LOW. This prevented the 555 timer from triggering, and the light remained OFF. In the absence of light, the resistance of the LDR increased. The comparator output switched HIGH, the light still remained ON indicating energy efficiency by avoiding unnecessary switching after the time delay expired, the NE555 output returned LOW, turning OFF the transistor T1 and deactivating the relay, hence switching OFF the light manual switch successfully allowed toggling between **Street** and **Porch** light control, demonstrating dual-purpose utility in a single system .Using the variable resistor (VR1), the light sensitivity threshold was calibrated this ensures that the system can be tuned to switch ON/OFF the bulb at the desired ambient light level the relay (SPDT 12V) successfully switches the 230V AC supply to the bulb, isolated from the low voltage control circuit The diode (D1) effectively protects the transistor from back EMF during switching. the circuit worked continuously for several hours without malfunction. no false triggering or flickering of the light was observed even under changing light conditions, due to the use of proper filtering capacitors and timer delay.

VI. CONCLUSION

The proposed **Automatic Street cum Porch Light** system successfully integrates ambient light sensing and motion detection to control lighting in a smart and energy-efficient manner.

The use of a Light Dependent Resistor (LDR), op-amp comparator (LM358), timer circuit (NE555), and relay switching enables the system to function autonomously without manual intervention.

The system ensures that lighting is only active during dark conditions and when motion is detected, which significantly reduces energy consumption. Additionally, the implementation of a manual switch to alternate between street and porch lighting demonstrates the system's adaptability to multiple environments. The circuit is low-cost, easy to implement, and suitable for both urban and rural residential applications. With further enhancements like solar integration and IoT-based control, the system can be scaled for smart city infrastructures.

The circuit fulfills the requirement of an automatic lighting system with optional manual area control**,** offering an efficient solution for street and porch lighting. It ensures energy saving, low maintenance, and enhances convenience by eliminating the need for manual switching.

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