**PROJECT REPORT**



**Circuits & System-2 Lab**

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**Street Lights & its Control System**

**1. INTRODUCTION:**

Street lighting is essential for urban safety and aesthetics. The aim of this project is to develop an intelligent Street Light Control System that dynamically adjusts LED brightness based on ambient light conditions. By utilizing an operational amplifier (op-amp), a Light Dependent Resistor (LDR), an LED, a Battery, and resistors, this system seeks to enhance energy efficiency and contribute to sustainable urban development.

**2. COMPONENTS:**

* Operational Amplifier (Op-Amp): An electronic component used to amplify the voltage difference between two input terminals.
* Light Dependent Resistor (LDR): A sensor that changes its resistance based on the ambient light level.
* Light Emitting Diode (LED): An energy-efficient lighting source with adjustable brightness.
* Battery: A power source that enables the system to operate independently of the grid, contributing to energy conservation.
* Resistors: Used in the circuit for current limiting and to optimize the sensitivity of the LDR.

3**. METHODOLOGY:**

The Street Light Control System operates by detecting ambient light levels through the LDR. The op-amp amplifies the LDR's signal, creating a voltage proportional to the ambient light intensity. This voltage controls the LED's brightness, resulting in dynamic and energy-efficient street lighting. The use of a battery ensures uninterrupted operation and reduces dependence on the power grid.

**4. SYSTEM DESIGN:**

The system is designed as a closed-loop feedback control system. The LDR and a fixed resistor form a voltage divider, creating an input signal for the op-amp. The op-amp amplifies this signal, and the output is used to modulate the LED's brightness. The battery supplies power to the entire system, making it versatile and adaptable to various environments.

**5. IMPLEMENTATION:**

The project was implemented on a protoboard, and the circuit connections were carefully verified. Challenges encountered during implementation included fine-tuning resistor values to achieve optimal sensitivity and ensuring proper power management. These challenges were overcome through iterative testing and adjustments, resulting in a robust and reliable system.

**6. RESULTS:**

The Street Light Control System demonstrated effective adjustment of LED brightness in response to changing ambient light conditions. Extensive testing in different lighting scenarios showcased the system's adaptability and responsiveness.

**7. ENERGY EFFICIENCY CONSIDERATIONS:**

The system's energy efficiency is achieved through the LED's adjustable brightness and the use of a battery. By optimizing illumination based on actual needs, the system contributes to energy conservation and sustainability.

**8. CONCLUSION:**

In conclusion, the Street Light Control System successfully addresses the need for energy-efficient and intelligent street lighting. The integration of advanced components such as the op-amp and LDR, coupled with the use of a battery, provides a reliable and sustainable solution for urban lighting.

**9. FUTURE ENHANCEMENTS:**

Future improvements to the system may include the integration of additional sensors for environmental monitoring, implementing wireless communication for remote control and monitoring, and exploring the possibility of incorporating renewable energy sources to further enhance sustainability.

**10.CIRCUIT DIAGRAM:**

**A diagram of a circuit

Description automatically generated**

**11. ACKNOWLEDGMENTS:**

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