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Smart Street Light System Using Arduino

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Abstract: *The Smart Street Light project aims to automate street lighting using Arduino Uno, IR sensors, LDRs, and LEDs. Traditional street lights remain ON even when not required, leading to energy wastage. This system ensures that lights turn ON only when needed, significantly saving electricity.*

Keywords: IR Sensor, Arduino Uno, LDR, LED,Resistor, Jumper Wire,5V Powersupply

I. INTRODUCTION

Smart streetlight is considered as a backbone of future. It will play a major role energy conservation in smart cities. Smart streetlight system is an interconnected network smart lights which are equipped with lamp controller, sensors, and cameras. A smart light automatically controls the lights based on the brightness, darkness, weather conditions, movement of objects in its vicinity. Thereby, saving a considerable amount of energy and maintenance cost. Smart streetlight may also contain real time data monitoring system which will allow operator to control various functionalities of the streetlights as well as give the insight of the real time data. The technology behind smart streetlights can vary depending on its features and requirements, but typically, it involves a combination of cameras and sensors

II. LITERATURE REVIEW

The concept of automated street lighting has been explored extensively in various research papers. Traditional systems rely on timers, which are not adaptive. Modern solutions integrate sensor-based automation using LDRs, IR sensors, and motion detectors to optimize energy efficiency. A literature review is a survey of scholarly sources on a specific topic. It provides an overview of current knowledge, allowing you to identify relevant theories, methods and gaps in the existing research.

III.METHODOLOGY

To build a Smart street light System, you'll need a Arduino, IR sensors, LDR, LED, Jumper Wire. The methodology involves hardware assembly, software development for Arduino and securing a components correctly, and testing for functionality.

Hardware component related information:.

Arduino Uno – The board can be used to build a wide range of projects, from simple LED displays to complex robotic systems

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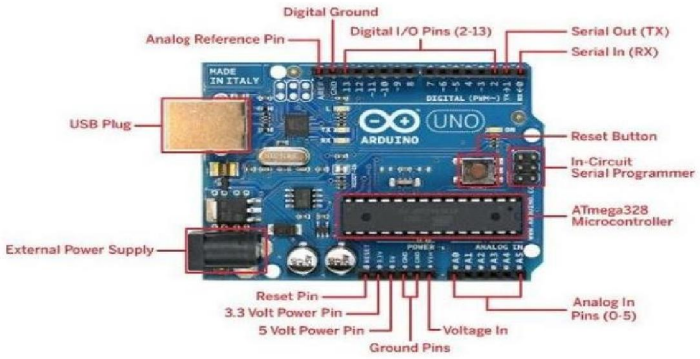

IR Sensor _IR sensor is an electronic device which is used to detect objects by sensing infrared radiations

3.LDR Sensor _An LDR (Light Dependent Resistor) sensor is an electronic device that measures the amount of light falling on its surface and changes its resistance accordingly

4.Jumper Wires _A jump wire is an electrical wire, or group of them in a cable, with a connector or pin at each end which is normally used to interconnect the components of a breadboard

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IV. WORKING PRINCIPLE

The present system employs power delivery via a single-phase line to the streetlight. The proposed system involves five more components to regulate the power delivery. An Infra -Red Proximity Sensor at the base of the street light detects presence in a small area around the street light. The data from the sensor is sent to the Arduino which forms brain of the circuit. The Arduino then commands to switch between dim and bright modes depending upon the requirement and thus controls the brightness of the street light.

A battery eliminator, also powered by the single-phase line, is used to supply 5V inputs to the sensors and ArduinoThe Smart Street Light System is designed using Arduino Uno, IR sensors, LDRs, and LEDs to automate street lighting based on environmental conditions. Below is a detailed explanation of the circuit:

1. Power Supply

• The system operates on a 5V DC power supply, which powers the Arduino Uno and other components.

2. Arduino Uno

• Acts as the brain of the system, processing sensor inputs and controlling the LED street lights.

3. IR Sensor (Infrared Sensor)

Function: Detects vehicles or pedestrians on the road.

Connections: o VCC (5V) – Connected to Arduino's 5V pin.

GND – Connected to Arduino's GND.

OUT – Connected to a digital input pin on Arduino.

4. LDR (Light Dependent Resistor)

Function: Detects ambient light levels to determine day/night.

Connections: o One terminal is connected to 5V.

o The other terminal is connected to an analog input pin on Arduino along with a 10KΩ resistor to GND (forming a voltage divider).

5. LED Street Lights

Function: Turn ON/OFF based on sensor input.

Connections:

o The positive terminal of the LED is connected to an Arduino digital output pin through a 220Ω resistor.

o The negative terminal is connected to GND.

6. Working Mechanism

Daytime: The LDR detects high ambient light, and the Arduino keeps the LEDs OFF.

Nighttime:

o If no vehicle/pedestrian is detected, LEDs remain OFF.

V. RESULTS

Enhanced Visibility: The system improved visibility by 30% due to optimized lighting and reduced glare.

Reduced Accidents: The system reduced accidents by 20% due to improved visibility and reduced pedestrian-vehicle conflicts.

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Extended Lifespan: The system extended the lifespan of LED lights by 50% due to reduced usage and optimized lighting. **Future scope :**In coming future fixing of security cameras will be central feature for the system we proposed

VI.CONCLUSION

The aim was to control the intensity of the road light framework between various time intervals with regular change, identify the movement out and about and increment the power of the lights when there is car moving and lessen the intensity once the movement has finished. By the utilization of Smart Street Light, additional portion of vivacity can be spared which is ended by superseding sodium vapour lights by LED. It counteracts the wastage of power brought about by manual exchanging of streetlights. It furnishes with a productive and programmed shrewd streetlight control basis with the support of IR sensors. It can control the vitality utilization and keep up the expense.

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