

## IoT Based Smart Street Lighting System for Smart City

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**Abstract:** This project is responsible for developing and executing advanced advancements in inserted frameworks for energy-saving road lighting. Currently, we employ a manual structure, in which the road lights are turned on the night before and turned off the next morning. Regardless, the genuine planning for these traffic lights would be switched to ON when there would be complete darkness. Power dissipation occurred to a certain extent here. As a result, we are wasting energy. Furthermore, the suggested lighting architecture is devoid of any physical operation. This new framework provides a solution for preserving vitality. This is performed by detecting and moving approaching a vehicle with the use of a PIR transmitter and an infrared receiver. Simultaneous sensor developmental detection transmits information to an ESP32 Cam, which simultaneously turns on the light. When a vehicle or a deterrent exits the Light extort turns OFF when a sense is made by a sensor for each question in a meantime the status; (Turn ON / Turn OFF) of street light of the road got to from anywhere and buttoned up web The venture was realized; a cleverly included framework that supervises roadway lighting in light of the identification of trucks, buses, vehicles, and other impediments.

**Keywords:** IoT, ESP32 CAM, LDR, LCD, LED, Ultrasonic Sensor, Power Supply.

### I. INTRODUCTION

IoT is the network of physical devices that allows the devices to communicate with each other. IoT allows remote sensing and control over the devices. These systems allow greater transparency, control, and good performance [2]. IoT has several automation applications like smart homes, smart parking, smart roads, smart lighting, etc. The current manual street light system has several problems like maintenance issues, timing problems, and connectivity issues. These problems can be resolved by IoT technology [5]. The system is based on smart and weather adaptive automatic street lighting and management [6]. It uses the latest technology in LED as the light source to restore conventional street lamps such as HID lamps or High Pressure Sodium Lamps etc... The LED lights are adopted because of their various advantages over existing technologies like power-saving due to increased current luminous efficiency, reduced maintenance cost, high color rendering index, accelerated start-up, and durability [10]. Nowadays flexibility of the streetlight system is being highly challenged. Handling remote area locations is the greatest dilemma. Manual mistakes can lead to energy wastage and lower the performance of the system [1]. The main motive of the system is energy conservation because the resources like hydro, thermal, coal that we rely upon are not easily replenished, so introducing power-saving elements like LDR Relays and LEDs can light up a large area with high-intensity light when ever needed [4]. The relay is used as an automatics witch and reduces almost 100 percent of the manual work [11].

### II. EXISTING SYSTEM

The main issue of the existing electric system is the connectivity problem as most of the connections handled by different contractors are done manually. Timer settings are performed manually. Timer often requires twelve hours continuous power supply and the further timer settings may be disrupted in the absence of continuous power supply. It supports a client-server mechanism where a single user can control the overall system [1]. It reduces heat and carbon dioxide emissions. IoT-based street light automation is a cost-effective and eco-friendly method that also eliminates the problems in the disposal of incandescent lamps and power saving.

The existing system uses a microcontroller and raspberry pi. The microcontroller has a complex structure, the number of executions is limited, and as every microcontroller does not have analog I/O so there are issues. The existing system does not have any security system, so it would be difficult to identify any fault in the street lights. Any damage cannot be identified quickly and restored. Any fault in the system has to be registered manually and every complaint has been taken care of manually. It is time-consuming. Man power is required. It is highly expensive. More energy consumption. And it also pollutes the environment.

### III. PROPOSED SYSTEM

The proposed system uses ESP32 Cam. The ESP32-CAM is a low-cost development board that also includes a WiFi camera. It allows you to create IP camera projects with various resolutions for video streaming.

The ESP32-CAM includes a PCB antenna. The street lights turn ON/OFF automatically. Reduce the cost. Energy wastage is low. Pollution is reduced. Wireless communication is efficient. Any fault in the system can be reported remotely and immediately. The complaints are sent to the control center and the complaints are taken care of in the control center. So it is time-efficient and less manpower is required.

This project is inspired by the concept of the Internet of Things. The Internet of Things (IoT) refers to physical items that are connected to the Internet. The goal is to link things to things, people to people, and all of the goods to the network in order to make the identification, management, and control easier. When the Internet of Things was first used for smart street lighting, its reach was broadened to include home health care, virtual connections, and other applications. Aside from the features of a traditional air automated monitoring system, IoT will minimize the user's workload and provide an efficient workflow, making accessing the system a simple operation.

#### IV. BLOCK DIAGRAM AND METHODOLOGY

The components PIR Sensor, IR sensor, Ultrasonic sensor, and LDR are given as input to the ESPCam and the output is viewed through LCD and blynk app (IOT Module). The PIR and ultrasonic sensor will detect the presence of humans or vehicles to ESP32Cam. LDRs are light-reliant apparatus and whose resistance increases in dark, and it minimizes when light falls on them. The resistance is very high when the light-dependent resistor; is kept in dark. The IR sensor detects the vehicle which passes through the street light. The street lights work automatically by detecting the movements of objects on the street. IR sensor is used to detect the object. Mainly, the relays are used as a switch; for the purpose of switching on/off the street light bulb.

The street lights of this Smart Street Light System have been switched on and off automatically. Traditional HID bulbs, which consume a lot of energy, have been replaced with LEDs (Light Emitting Diodes). When LEDs are combined with LDR, which allows for light intensity fluctuation, they consume very little power and operate quite well. LEDs are directed light sources that improve street light efficiency by emitting light in a specified direction.

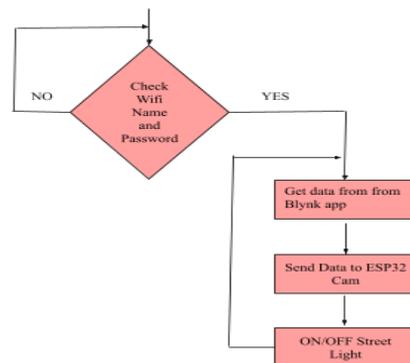


Fig. 1. Flow Diagram

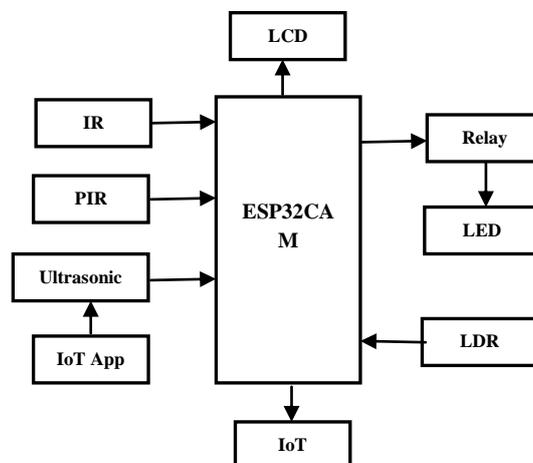


Fig. 2. Block Diagram

## V. RESULTS

### Hardware Implementation

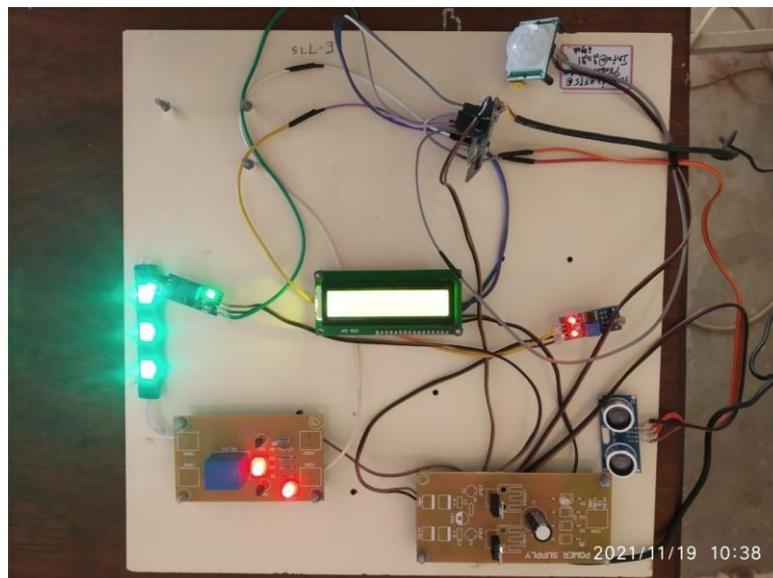


Fig. 3 Experimental Setup



Fig. 5. IoT Cloud Result

## VI. CONCLUSION

When replacing sodium vapor lamps with LEDs and adding a security function, a significant amount of energy may be saved. It reduces the amount of electricity wasted due to manual streetlight switching. The use of LDR creates an effective and intelligent automatic street light control system. It has the potential to cut energy usage and maintenance costs. It may be used in both urban and rural settings. The system is expandable and completely customizable to the user's requirements. When needed, it generates a safe atmosphere with maximum intensity light. The system's goal is to decrease maintenance costs while also increasing the system's lifespan.

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