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# IOT BASED AUTOMATED FEEDBACK SYSTEM FOR NONFUNCTIONAL STREETLIGHT

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ABSTRACT:

The "IoT-Based Automated Feedback System for Non-Functional Streetlights" is a smart solution aimed at enhancing urban infrastructure maintenance. The project utilizes Internet of Things (IoT) technology to detect and report malfunctioning streetlights in real-time. Sensors and controllers installed on streetlights monitor their operational status, transmitting data to a central server. If a streetlight malfunctions, the system automatically generates feedback and alerts municipal authorities for prompt action. This reduces manual inspections, ensures faster maintenance, and contributes to improved energy efficiency, safety, and urban management.

**Keywords**: IoT (Internet of Things), Automated feedback system, Smart solution, Real-time detection

## Introduction:

The "IoT-Based Automated Feedback System for Non-Functional Streetlights" is an innovative solution aimed at modernizing urban infrastructure management by automating the detection and reporting of faulty streetlights. In many cities, the traditional method of maintaining streetlights relies on manual inspections or complaints from the public, which often results in delays in identifying and fixing issues. Malfunctioning streetlights can lead to poor visibility, increased safety risks, and wasted energy. This project addresses these challenges by using Internet of Things (IoT) technology to create a network of sensors and controllers integrated into streetlights. These sensors continuously monitor the operational status of each streetlight, detecting faults such as power outages, bulb failures, or wiring issues in real-time.

When a problem is identified, the system automatically generates a feedback signal, sending alerts to a central control system used by city maintenance teams. This immediate notification allows for faster response times and more efficient repairs, reducing downtime and improving public safety. Additionally, the data collected by the system can be analysed to identify patterns in streetlight failures, enabling predictive maintenance and more efficient resource allocation. Overall, the IoT-based system not only enhances the reliability and efficiency of streetlight maintenance but also contributes to energy conservation and a smarter, safer urban environment.

## Objective And Scope:

Our goal is to create an IoT-based automated fault detection system that uses sensors to identify non-functional streetlights, eliminating the need for manual monitoring. Through real-time tracking, this system will continuously monitor streetlight performance, allowing for the instant detection of faults. When a malfunction is identified, the system will send immediate alerts to municipal authorities, enabling faster response times and streamlining maintenance efforts. This timely approach to repairs will help ensure that streetlights remain functional, reducing safety risks and minimizing the potential for crime in urban areas by maintaining proper lighting.

Scope:

- AI-based Predictive Analytics: Implement machine learning algorithms to predict streetlight failures before they occur, enabling proactive maintenance and reducing downtime.
- Integration with Renewable Energy: Incorporate solar panels or wind-powered solutions to make streetlights self-sustaining and environmentally friendly, reducing energy costs.
- Self-Healing Networks: Use advanced IoT protocols that allow streetlights to self-diagnose and fix minor issues without human intervention.
- Multi-functionality: Equip streetlights with other smart city functions, such as Wi-Fi hotspots, air quality monitoring, or electric vehicle charging stations, increasing the utility of urban infrastructure.
- Edge Computing: Integrate edge computing to process data locally at each streetlight, reducing the load on central servers and ensuring faster fault detection and response time.

## Literature Review :

[1] Sampath Kumar "IoT based Street Light Auto Intensity Control" in his 2022 paper, explores the effectiveness of IoT-based street light systems with auto-intensity control and fault detection, highlighting their role in improving energy efficiency, reducing maintenance costs, and enhancing public safety. By adjusting light intensity based on real-time needs and quickly identifying malfunctions, these systems offer a sustainable solution for modern urban environments,
contributing to both operational savings and improved security. Such systems also support municipal efforts to ensure public spaces are well-lit and safer, fostering a more resilient and responsive infrastructure aligned with smart city goals.

[2] Eisley Dizon "Smart streetlights in Smart City: a case study of Sheffield", in his 2022 paper examines the impact of deploying smart streetlights in Sheffield, showing that the initiative has successfully enhanced energy efficiency, reduced costs, and improved public safety and urban living standards. This case study highlights the effectiveness of smart lighting systems and offers valuable insights for future smart city developments, showcasing how such infrastructure can create more sustainable, resilient, and liveable urban environments.

[3] Mayank Solanki "Automated feedback system for non-functional streetlight" highlights the effectiveness of an automated feedback system for non-functional streetlights, which significantly improves maintenance efficiency through real-time fault detection and reporting. By reducing the need for manual inspections and minimizing streetlight downtime, the system ensures timely repairs that enhance public safety. Furthermore, it optimizes resource allocation for maintenance teams, enabling them to concentrate on critical issues and improving the overall effectiveness of urban infrastructure management. This proactive approach not only contributes to energy savings but also fosters community confidence in municipal services by ensuring that public spaces are consistently well-lit and safe for all users. Ultimately, the integration of such technology represents a significant advancement in the management of urban lighting systems.

[4] Badam Srivani- "Smart Street Light System with Automated Feedback" examines the smart street light system with automated feedback, demonstrating its effectiveness in enhancing street safety. The system employs continuous monitoring and rapid response to malfunctions, significantly reducing the risks of accidents and ensuring that streets remain well-lit. By providing real-time fault detection and reporting, it minimizes downtime and allows for timely repairs, ultimately improving public safety. Additionally, this automated approach reduces the need for manual inspections and optimizes resource allocation for maintenance teams, enabling them to focus on critical issues. Overall, the smart street light system contributes to a safer and more efficient urban infrastructure, fostering a secure environment for all street users.

[5] Prakash (2021)- "Automatic Street light intensity control" utilizes a Light Dependent Resistor (LDR) to detect day or night conditions and ultrasonic sensors to monitor movement, automatically adjusting streetlight intensity. Lights remain dim when no movement is detected and brighten upon sensing activity, reducing energy consumption and enhancing safety. This scalable, cost-effective solution minimizes human intervention and can be controlled remotely via an Android app, making it suitable for streets, university campuses, and various urban settings.

## Problem Statement :

The current streetlight maintenance system relies on manual reporting and routine inspections, resulting in delayed detection and repair of non-functional streetlights. This leads to safety risks, increased accidents, energy wastage, and inefficient resource use. An IoT-based automated feedback system is needed to provide real-time monitoring and immediate reporting of streetlight malfunctions, ensuring quicker repairs, improved public safety, and energy efficiency.

## Proposed Methodology :

### *System Overview*

The smart streetlight management system is designed to enhance urban infrastructure through real-time monitoring and automated fault detection. At its core, the system utilizes various sensors, including Light Dependent Resistors (LDRs) to measure light intensity and power sensors to monitor voltage and current. These sensors are connected to a microcontroller, which processes the data and communicates with a cloud server via a communication module such as GSM, LoRa, or Wi-Fi. The system is powered by either a direct connection from the streetlight or a separate low-power source, ensuring consistent operation. As the sensors detect the status of the streetlights, the microcontroller sends this data for analysis. If a fault is identified, the server triggers notifications to alert maintenance teams, facilitating timely repairs. This proactive approach not only reduces manual inspections but also minimizes downtime and enhances public safety by ensuring well-lit streets.


**Fig: Overview of IOT Based Automated Feedback System for Non-Functional Street Lights.**

***System Architecture***

The system architecture for the smart streetlight management involves several key components working in tandem to ensure effective monitoring and fault detection. At the core of the system, sensors such as Light Dependent Resistors (LDRs) are connected to the microcontroller's analogue input to measure light intensity, while power sensors monitor voltage and current by linking to another input on the microcontroller. For communication, a module like GSM, LoRa, or Wi-Fi is interfaced with the microcontroller's serial pins to facilitate data transmission. The entire system is powered either by a direct connection from the streetlight or through a separate low-power source.

Data flow begins with the sensors detecting the streetlight's operational status, which is then sent to the microcontroller for processing. The microcontroller analyses this data and transmits it to a cloud server via the communication module. The server subsequently logs and analyses the incoming data, triggering notifications to the maintenance team if any faults are detected, thereby enabling timely repairs and ensuring public safety. This integrated approach allows for efficient management of street lighting systems within urban environments.

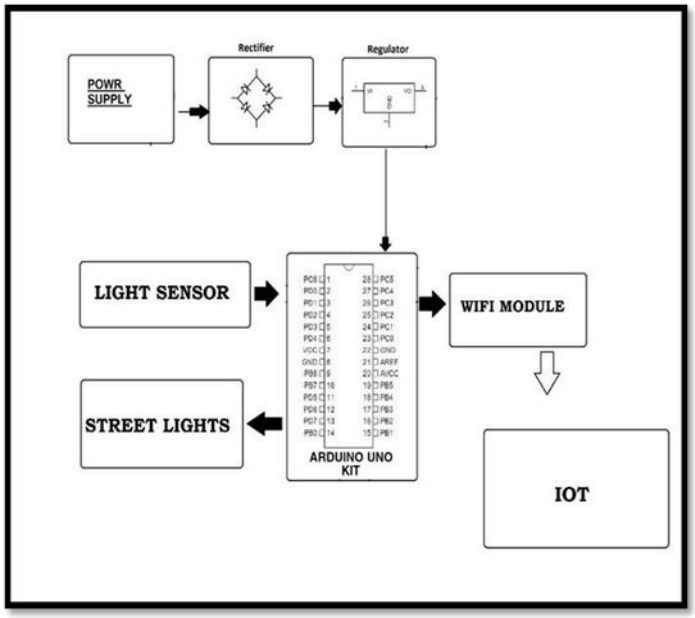


**Fig: Circuit Diagram of IOT Based Automated Feedback System for Non-functional Streetlights.**

***Hardware And Software Details***

| Name | Description |
|---|---|
| Sensors | Ultrasonic sensors for Detecting the presence of vehicles in parking slots and Infrared sensors which is Alternatively used for occupancy detection. |
| Microcontroller | Arduino For processing sensor data and managing communications with the cloud. |
| WIFI module | ESP 8266 For connecting devices to the internet. |
| Power supply | Batteries will be used. |
| Servo Motor | Which will act as authentication of users where it will open and close the gate |
| Frontend & Backend and Database | Technologies like HTML, CSS, JavaScript and at backend Django with MYSQL database |
| Cloud and API's | Google cloud and RestFull API's |

## Conclusion :

In conclusion, the IoT-Based Automated Feedback System for Non-Functional Street Lights revolutionizes urban infrastructure management by providing real-time monitoring and fault detection capabilities. This innovative system reduces energy waste and enhances public safety by ensuring timely maintenance of streetlights. By minimizing human intervention and utilizing cloud-based communication, it streamlines operations and improves efficiency. Overall, this solution contributes to the development of smarter and more sustainable urban environments.

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4] Badam Srivani " Smart Street Light System with Automated Feedback" 2022 International Journal of Modern Developments in Engineering and Science, India,2022.
[5] Prakash (2021) "Automatic Street light intensity control" uses a Light Dependent Resistor (LDR) and ultrasonic sensors to adjust streetlight brightness based on movement, improving energy efficiency.