REPORT

PHASE 1

ADAPTIVE SMART STREET LIGHTING SYSTEM WITH DAY/NIGHT & MOTION - BASED INTENSITY CONTROL

TABLE OF CONTENT

ABSTRACT:

In urban environments, street lighting plays a crucial role in ensuring safety, security, and accessibility. Traditional street lighting systems often operate on fixed schedules or lack adaptive capabilities, resulting in inefficiencies and unnecessary energy consumption. To address these challenges, this paper proposes an adaptive smart street lighting system equipped with day/night and motion-based intensity control mechanisms.

The proposed system utilizes advanced sensors to detect ambient light levels and motion within predefined zones. During nighttime or low light conditions, light sensors trigger street lights to illuminate at appropriate intensities, ensuring visibility while conserving energy during daylight hours or when sufficient natural light is available. Motion sensors further enhance efficiency by adjusting lighting levels based on detected activity, dimming lights in areas with no motion to minimize energy consumption and light pollution.

Centralized control and monitoring facilitate real-time adjustments and data collection, enabling optimization of energy usage and operational efficiency. The system's networked architecture supports remote management, allowing administrators to monitor performance, detect faults, and schedule maintenance effectively.

Key benefits of the proposed system include improved energy efficiency, reduced operational costs, enhanced safety through optimized lighting conditions, and minimized environmental impact by mitigating light pollution. Implementation of such adaptive smart street lighting systems represents a significant step towards creating sustainable and smart cities, aligning with global efforts towards energy conservation and urban resilience.

INTRODUCTION:

- In recent years, the advancement of smart technologies has revolutionized urban infrastructure, including street lighting systems. Traditional street lights, operating on fixed schedules or light sensors, often result in inefficient energy usage and suboptimal lighting conditions. In response, the concept of adaptive smart street lighting systems has emerged, promising enhanced efficiency, reduced energy consumption, and improved safety for pedestrians and motorists alike.

- This project introduces a sophisticated street lighting system that integrates day/night sensing and motion-based intensity control. By leveraging sensors and real-time data analytics, the system autonomously adjusts the brightness of street lights according to environmental conditions and presence of motion. During daylight hours, the lights dim or remain off to conserve energy. As dusk approaches, the system gradually increases brightness to ensure adequate visibility.

- Moreover, the inclusion of motion sensors enables dynamic adjustment of light intensity based on detected movement. When pedestrians or vehicles are detected, nearby lights brighten to enhance safety and visibility, thereby optimizing energy usage by lighting only when and where needed.

- This paper discusses the design, implementation, and benefits of such a system, emphasizing its potential to transform urban lighting into a responsive, energy-efficient infrastructure. Through this innovation, cities can achieve significant cost

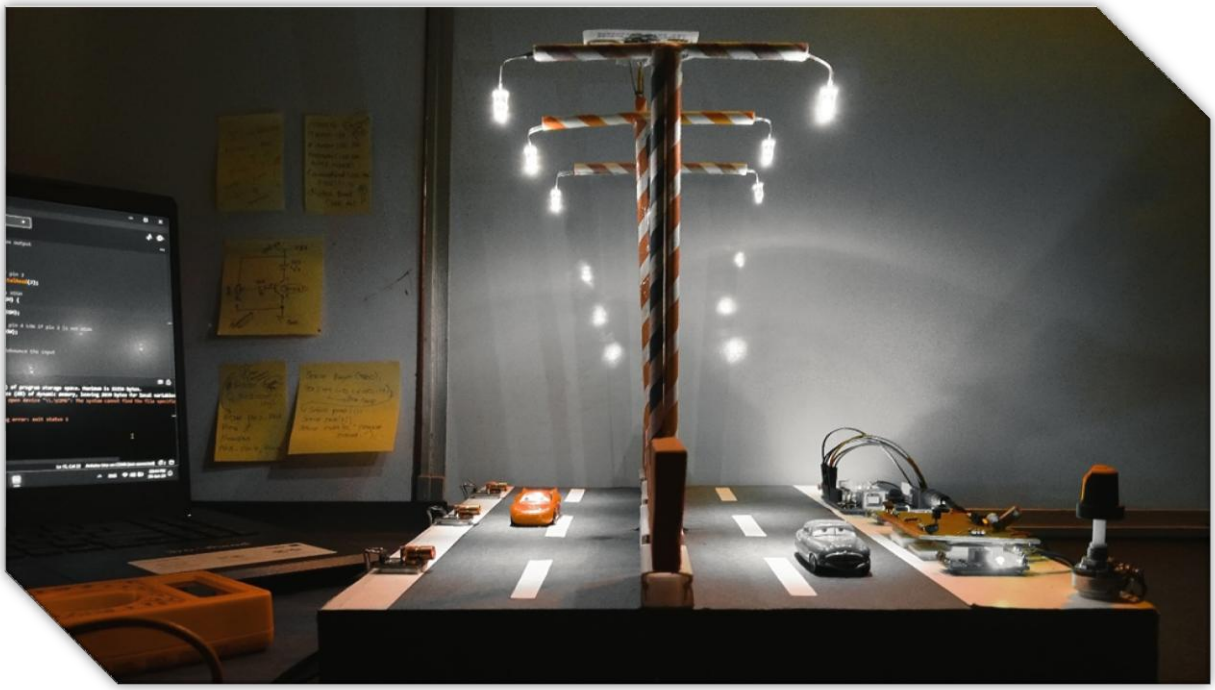
savings, reduce carbon footprint, and create safer environments for residents and visitors alike.

COMPONENTS :

SI.NO	COMPONENTS	QUANTITY
1	Arduino Uno R3	1
2	Laser sensor module	3
3	LDR module	3
4	Voltage regulator (LM7805)	1
5	Transistor (BC547)	4
6	Capacitor 1uF	2
7	LDR sensor	1
8	LED	6
9	Resistor 1k	5
10	Potentiometer	1
11	Jumper wires	As needed

OBJECTIVE:

The objective of an Adaptive Smart Street Lighting System with Day/Night and Motion-Based Intensity Control is to develop a dynamic lighting system that optimizes energy use, enhances safety, and reduces operational costs.



Specifically, the objectives are:

a) **Optimize Energy Consumption**: Reduce energy use by adjusting lighting levels based on ambient light (daylight vs. night) and detecting motion to illuminate only when necessary.

b) **Improve Safety and Security**: Enhance visibility for pedestrians and drivers by providing adequate lighting when movement is detected, thereby reducing accidents and deterring criminal activities.

c) **Cost Efficiency**: Lower electricity and maintenance costs by minimizing unnecessary illumination and extending the lifespan of lighting fixtures through controlled usage.

d) **Environmental Sustainability**: Decrease the carbon footprint by reducing overall energy consumption and utilizing energy-efficient lighting technologies like LEDs.

e) **Automation and Smart Control**: Implement an automated control system that uses sensors to monitor ambient light and motion, adjusting lighting intensity in real-time without the need for manual intervention.

f) **Data Collection and Analysis**: Gather data on lighting patterns and system performance to further optimize operations, plan maintenance, and improve future system designs.

NOVELTY:

- Adaptive Lighting Control.
- Energy Efficiency.
- Enhanced Safety and Security.
- Environmental Impact.

OUTCOMES:

Energy and Cost Savings:

- Significant reduction in electricity costs due to adaptive lighting. Reduced maintenance costs with predictive maintenance and remote monitoring.

Safety and Security:

- Enhanced safety with improved visibility when motion is detected.
- Increased community satisfaction with the lighting conditions.

Environmental Benefits:

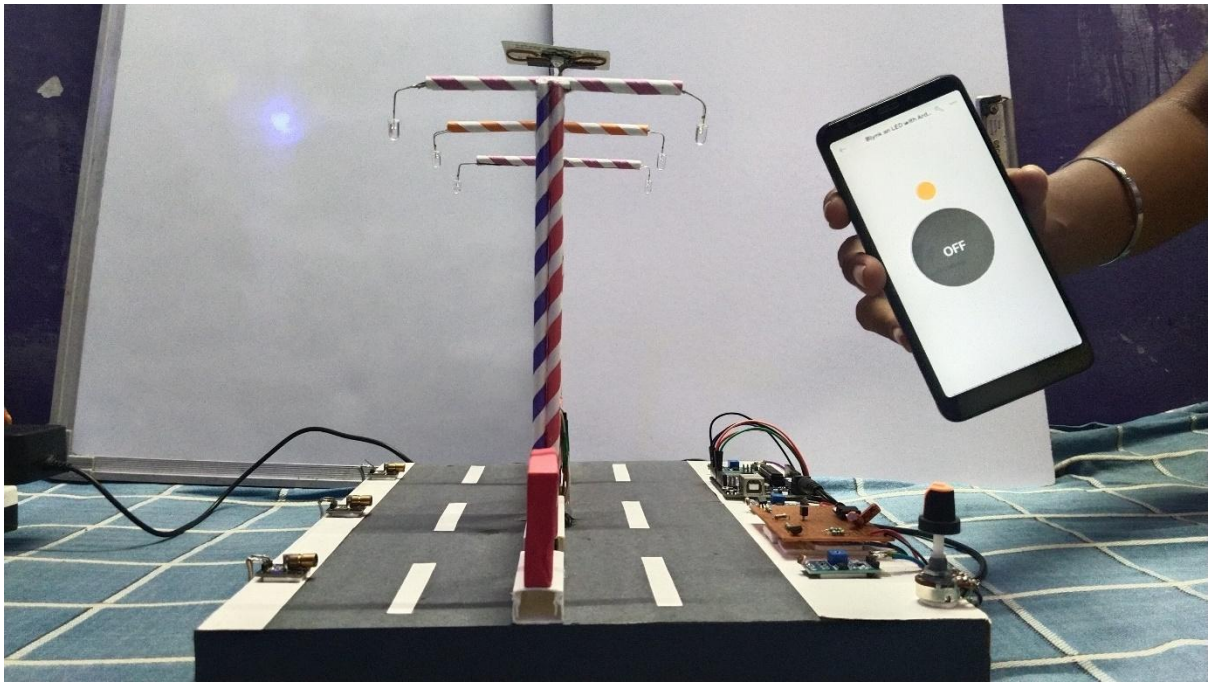
- Lower carbon footprint due to reduced energy consumption.
- Reduced light pollution, enhancing the night-time environment.
- Data-Driven Insights.

Valuable data on usage patterns and traffic flows:

- Improved planning and resource allocation based on collected data.

PHASE 2 – CLOUD BASED RTOS

DURING DAY LIGHT:



DURING NIGHT TIME: