SMART LIGHTNING SYSTEM

20CSL062 INTERNET OF THINGS AND CLOUD LABORATORY

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in partial fulfillment of the requirements

for the award of the degree

of

BACHELOR OF ENGINEERING
IN
COMPUTER SCIENCE AND ENGINEERING

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

KONGU ENGINEERING COLLEGE

(Autonomous)

PERUNDURAI ERODE – 638 060

ABSTRACT

This project presents a novel approach to enhance the efficiency and effectiveness of highway road lighting systems using an intelligent control mechanism. The proposed system integrates infrared (IR) sensors and light-dependent resistors (LDRs) to detect the presence of vehicles and ambient light conditions, respectively. By combining these sensors, the smart lighting system achieves optimal energy consumption while ensuring road safety during night time hours.

The primary objective of this project is to design an intelligent lighting system that activates and adjusts the illumination level of highway lights based on real-time environmental factors. The IR sensor detects the presence of vehicles in the vicinity, allowing the system to respond promptly and illuminate the relevant section of the road. Furthermore, the LDR sensor continuously measures the ambient light intensity, enabling the system to differentiate between daytime and nighttime conditions accurately.

PROPOSED SYSTEM

To achieve these goals, the proposed system consists of a network of strategically placed IR sensors and LDR sensors along the highway. The IR sensors detect the heat signatures emitted by vehicles, triggering the activation or adjustment of nearby lights. Meanwhile, the LDR sensors monitor the ambient light levels, ensuring that the lighting system remains operational only during low light conditions.

The integration of these sensors with a centralized control unit forms the backbone of the smart lighting system. The control unit processes the sensor data and communicates with the lighting infrastructure to regulate the illumination levels efficiently.

By implementing the proposed system, several key benefits can be realized. Firstly, energy consumption is significantly reduced, as the lights are only activated when required, leading to substantial cost savings and environmental benefits. Secondly, the system ensures enhanced road safety during nighttime hours by illuminating specific sections of the road precisely when vehicles are present. Lastly, the intelligent control mechanism allows for easy maintenance and monitoring of the lighting system, as faults and anomalies can be quickly identified and addressed.

COMPONENTS REQUIRED

- **Arduino**– a microcontroller board with various input and output pins, while the software includes an integrated development environment (IDE) for programming the board.

- **LDR Sensor** – LDR (Light Dependent Resistor) is a sensor that changes its resistance based on the intensity of light.

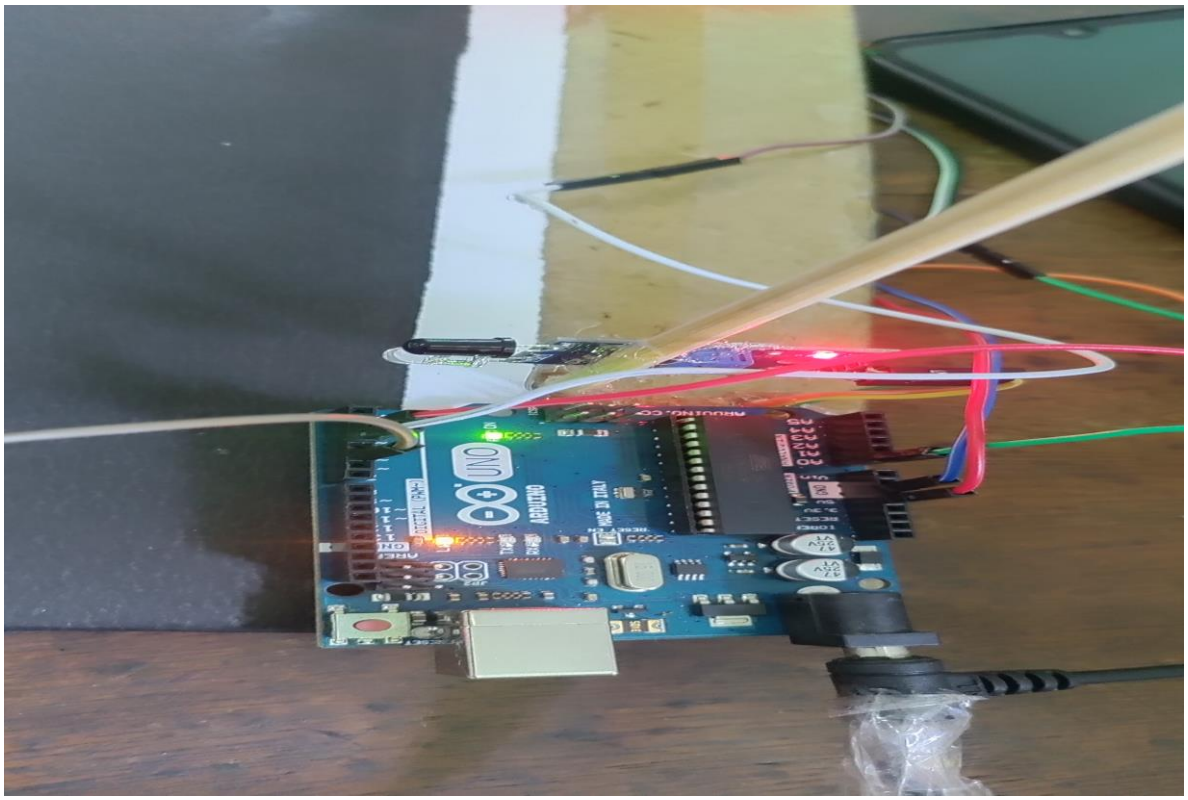
- **IR Sensor** - IR (Infrared) sensor is a device that detects infrared radiation emitted by objects and is commonly used for proximity sensing, object detection, and motion detection applications.

- **Jumper wires** - to connect two points in an electrical circuit.

- **Light Emitting Diode (LED)** – semiconductor device, which can emit light when an electrical current passes through it.

- **Breadboard** – to form simple electrical connections among different components.

HARDWARE SETUP

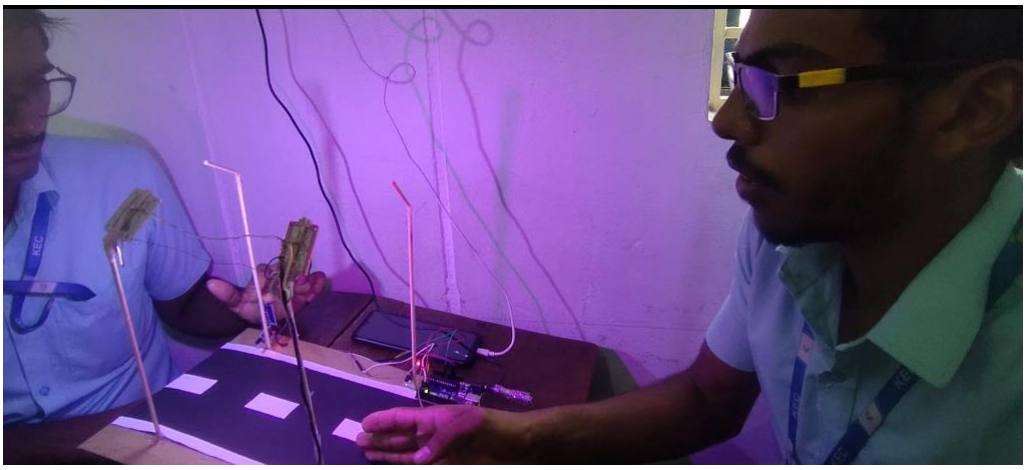


CODING

```
int IR1 = 2;

int IR2 = 3;

int LED1 = 5;


int LED2 = 6;

int LDR = A0;


void setup()

{

Serial.begin(9600);

pinMode(LED1, OUTPUT);

pinMode(LED2, OUTPUT);

pinMode(IR1, INPUT);

pinMode(IR2, INPUT);

pinMode(LDR, INPUT);

}

void loop() {

int LDRValue = analogRead(LDR);

Serial.print("sensor = ");

Serial.print(LDRValue);

delay ();

digitalWrite(LED1, LOW);

digitalWrite(LED2, LOW);

Serial.println("It's Bright Outside; Lights status: OFF");
```

```
if (LDRValue> 100 &&digitalRead(IR1) == LOW)
    {
digitalWrite(LED1, HIGH);
Serial.println("It's Dark Outside; LED1 Lights status: ON");
    }
if (LDRValue> 100 &&digitalRead(IR2) == LOW)
    {
digitalWrite(LED1, HIGH);
Serial.println("It's Dark Outside; LED2 Lights status: ON");
    }
}
```

OUTPUT



CONCLUSION

In conclusion, the integration of IR and LDR sensors in a smart highway lighting system offers an innovative and efficient solution to optimize energy consumption while maintaining road safety. By accurately detecting vehicle presence and considering ambient light conditions, this system demonstrates a practical approach to ensure well-lit highways during the night, minimizing energy wastage and contributing to sustainable infrastructure.