Task 1 Report

Embedded Systems & Internet of Things (IoT)

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Task: Embedded Systems Task-1

Mini Project: Automatic Street Light System

Platform: Arduino / Tinkercad Simulator

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1. Introduction to Embedded Systems

An **embedded system** is a special-purpose computer system designed to perform a **specific task**. It consists of hardware and software combined together and is usually part of a larger system.

Embedded systems are designed to work **automatically**, **continuously**, and with **low power consumption**.

Examples of Embedded Systems

- Washing machine
- Microwave oven
- Traffic signal system
- Smartwatch
- Automatic street lights

2. Real-World Applications of Embedded Systems

1. **Smart Home:** Automatic lights, smart fans, security systems
2. **Automotive:** Airbags, engine control units, ABS
3. **Healthcare:** Heart rate monitors, digital thermometers
4. **Robotics:** Line follower robots, industrial robots
5. **Consumer Electronics:** Mobile phones, TVs, smart speakers

3. Difference Between Microcontroller and Microprocessor

Parameter	Microcontroller	Microprocessor
Definition	CPU + Memory + I/O on one chip	Only CPU
Power Consumption	Low	High
Cost	Low	High
Usage	Embedded systems	Computers
Example	Arduino, ESP32	Intel i5

4. Component Study

4.1 Microcontrollers

Arduino UNO

- Easy to program
- Widely used for beginner projects
- Based on ATmega328P

ESP32

- Built-in Wi-Fi and Bluetooth
- Used in IoT projects

Raspberry Pi Pico

- High-performance microcontroller
- Supports C/C++ and MicroPython

4.2 Sensors

Light Sensor (LDR)

- Detects light intensity
- Resistance changes with light
- Used in automatic street lights

Temperature Sensor

- Measures temperature

- Used in weather monitoring

Motion Sensor (PIR)

- Detects movement
- Used in security systems

5. Mini Project – Automatic Street Light System

5.1 Project Objective

To design an **automatic street light system** that turns **ON at night** and **OFF during daytime** using a light sensor.

5.2 Components Used

- Arduino UNO
- LDR (Light Dependent Resistor)
- LED
- Resistor
- Connecting wires
- Tinkercad Simulator

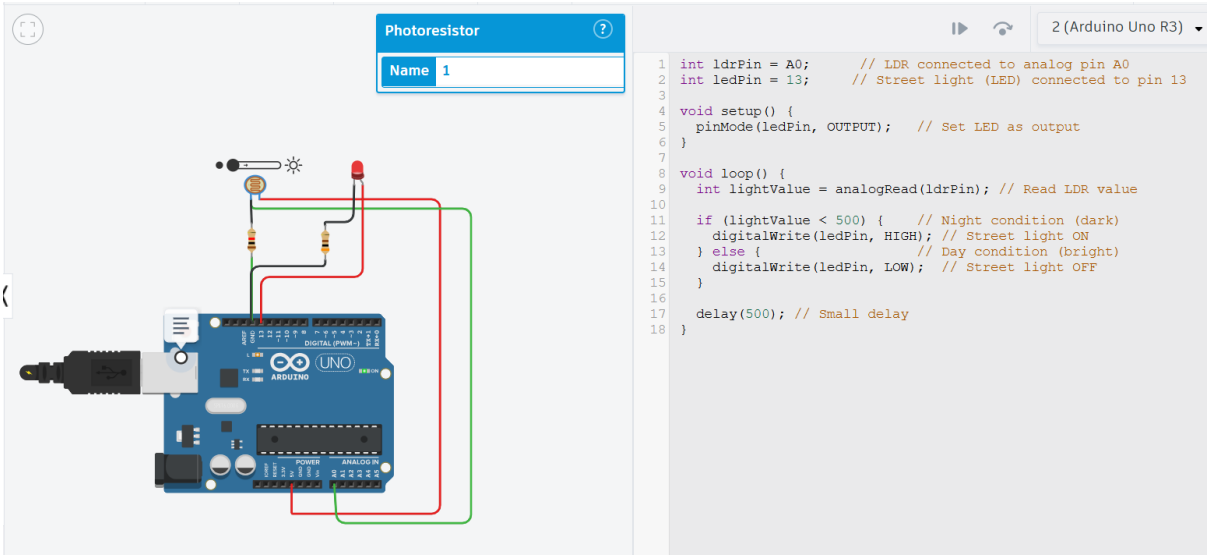
5.3 Working Principle

- The LDR senses the amount of light.
- During **daytime**, light intensity is high → LED OFF.
- During **night**, light intensity is low → LED ON automatically.
- Arduino controls the LED based on LDR input.

5.4 Circuit Description

- LDR connected to analog pin **A0**
- LED connected to digital pin **13**
- Arduino processes sensor data and controls LED

(Circuit diagram created using Tinkercad)



6. Arduino Code – Automatic Street Light

```
int ldrPin = A0;      // LDR connected to analog pin A0
int ledPin = 13;     // LED connected to digital pin 13

void setup()
{
 pinMode(ledPin, OUTPUT);     // Set LED pin as output
}
void loop()
{
 int lightValue = analogRead(ldrPin); // Read LDR value

 if (lightValue < 500) // Night condition
 {
   digitalWrite(ledPin, HIGH); // Turn street light ON
 }
 else // Day condition
 {
   digitalWrite(ledPin, LOW);  // Turn street light OFF
 }
```

```
  delay(500);
}
```

6.1 Code Explanation (Simple)

- analogRead() reads light value from LDR
- if–else decides day or night
- LED turns ON automatically in darkness
- LED turns OFF in bright light

7. Applications of Automatic Street Light System

- Street lighting
- Parking areas
- Highway lighting
- Energy-saving systems
- Smart city projects

8. Advantages

- Saves electricity
- Works automatically
- Low maintenance
- Simple and reliable

9. Conclusion

This project demonstrates the use of **embedded systems and sensors** to create an **automatic street light system**. It helps in energy conservation and reduces human effort. The project is simple, efficient, and suitable for real-world applications.

10. Tools Used

- Arduino IDE / Tinkercad Circuits
- Arduino UNO
- LDR Sensor