Smart Lamp using Arduino Uno and IR Sensor

Overview

This project demonstrates a **Smart Lamp** using an **Arduino Uno**, an **IR sensor (PIR or Proximity Sensor)**, and an **LED or relay-controlled lamp**. The lamp automatically turns **ON** when motion is detected and **OFF** when there is no motion.

Components Required

- **Arduino Uno**
- **IR Sensor (PIR or IR Proximity Sensor)**
- **LED (or Relay Module for a real lamp)**
- **Breadboard**
- **Resistor (220Ω for LED)**
- **Jumper Wires**

Circuit Connections

IR Sensor to Arduino:

- **VCC → 5V**
- **GND → GND**
- **OUT → Digital Pin 2**

LED to Arduino:

- **Anode (+) → Digital Pin 7**
- **Cathode (-) → GND (via 220Ω resistor)**

For a real lamp: If using a relay module, connect the relay module's **IN** to **Pin 7** instead of an LED.

How It Works

1. The **IR sensor detects motion** and sends a HIGH signal to the Arduino.
2. The **Arduino turns ON the LED (or relay for a real lamp)**.
3. When no motion is detected, the **lamp turns OFF**.
4. The **Serial Monitor** displays messages for debugging:
    - **"Motion Detected! Lamp ON"**

      "No Motion. Lamp OFF"

Installation & Usage

Step 1: Setup Hardware

- Connect the **IR sensor** and **LED** (or **relay module**) as per the circuit diagram.
- Power the **Arduino Uno** using a USB cable or an external power source.

Step 2: Upload the Code

- Open **Arduino IDE**.
- Copy and paste the provided **Arduino code**.
- Select the correct **Board (Arduino Uno)** and **Port**.
- Click **Upload**.

Step 3: Monitor Output

- Open the **Serial Monitor** in Arduino IDE.
- Observe the **lamp turning ON/OFF** based on motion detection.

Arduino Code

```
#define IR_SENSOR_PIN 2  // IR sensor output pin
#define LED_PIN 7        // LED or relay control pin

void setup() {
   pinMode(IR_SENSOR_PIN, INPUT);  // Set IR sensor pin as input
   pinMode(LED_PIN, OUTPUT);       // Set LED pin as output
   Serial.begin(9600);             // Initialize serial monitor
}

void loop() {
   int sensorValue = digitalRead(IR_SENSOR_PIN); // Read IR sensor
   if (sensorValue == HIGH) { // Motion detected
      digitalWrite(LED_PIN, HIGH); // Turn ON lamp
      Serial.println("Motion Detected! Lamp ON");
   } else {
      digitalWrite(LED_PIN, LOW); // Turn OFF lamp
      Serial.println("No Motion. Lamp OFF");
   }
   delay(200); // Small delay for stability
}
```

Future Enhancements

- **Add a Timer:** Keep the lamp ON for a few seconds after motion is detected.
- **IoT Integration:** Control the lamp via a mobile app using **ESP8266/NodeMCU**.
- **Voice Control:** Use **Alexa/Google Assistant** with a **relay module**.