

Motion Operated LED Using Arduino and PIR

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Abstract: This paper presents the design and development of a motion-activated LED lighting system using an Arduino microcontroller and a Passive Infrared (PIR) sensor with the objective of reducing unnecessary energy consumption in indoor and outdoor environments. The system is programmed to detect human motion through the PIR sensor, which then signals the Arduino to activate an LED light source only when movement is detected. The study was conducted in Akola, Maharashtra, India, where energy efficiency and smart automation are increasingly important. The hardware components include the Arduino UNO, PIR sensor, LED, and a Wi-Fi module (ESP8266) for remote monitoring. The system also provides flexibility for future integration with solar power and battery backup. During testing, the system consistently responded to motion within a 6-meter range and demonstrated an average energy saving of up to 40% compared to traditional lighting. The results confirm that the proposed setup operates reliably and with low power consumption. Inspired by IoT-based smart home systems, this project validates the effectiveness of PIR sensors in real-world automation applications. In conclusion, the motion-operated lighting system proves to be a cost-effective, energy-efficient, and scalable solution for intelligent lighting in residential and commercial spaces..

Keywords: Arduino, PIR Sensor, Energy Efficiency, IoT, Home Automation, ESP8266, Sensor-Based System

