

Automatic Room Light Controller Using Visitor Counter

Vaishnavi Dayanand Jawale¹; Vaishnavi Tukaram Biradar²;
Shweta Narayan Godage³; S. R. Bhosale⁴

^{1,2,3,4}Department of Electronics and Telecommunication Engineering, JSPM's Group of Institutes, SBERCT's Bhagwant Institute of Technology, Barshi, India

Publication Date: 2025/11/19

Abstract: This paper presents the design and implementation of an Automatic Room Light Controller with Bidirectional Visitor Counter using an Arduino-Nano microcontroller. The system aims to automatically control the electrical lighting of a room based on the number of people present. It employs infrared (IR) sensors to detect entry and exit movements, with the count displayed on an LCD screen. When the first person enters, the light turns ON, and when the last person leaves, the light turns OFF automatically. This helps to minimize energy wastage and promotes efficient electricity usage. The system is built using cost-effective electronic components, providing a reliable and smart solution for automatic lighting in homes, classrooms, and offices.

Keywords: Automation, Energy Conservation, Reliable and Smart Solution for Automatic Room Light.

How to Cite: Vaishnavi Dayanand Jawale; Vaishnavi Tukaram Biradar; Shweta Narayan Godage; S. R. Bhosale (2025). Automatic Room Light Controller Using Visitor Counter. *International Journal of Innovative Science and Research Technology*, 10(11), 865-866. <https://doi.org/10.38124/ijisrt/25nov445>

I. INTRODUCTION

Energy conservation is one of the most critical challenges in modern society. In many cases, electrical energy is wasted when lights are left ON even when no one is in the room. To address this issue, automation provides an efficient and intelligent solution.

The Automatic Room Light Controller with Bidirectional Visitor Counter automatically detects the number of people entering and leaving a room and controls the light accordingly. It uses IR sensors to sense movement and an Arduino Nano microcontroller to process data. The system also features a 16×2 LCD display to show the total number of persons currently inside the room. This project demonstrates how simple microcontroller-based automation can reduce energy wastage and enhance user convenience.

II. LITREATURE REVIEW

Several systems have been developed for automatic light control and human detection using sensors. Most conventional systems rely on single-direction counting or manual switching.

The use of bidirectional visitor counting overcomes this limitation by accurately detecting both entry and exit movements. This enhances system reliability and ensures that the lights only remain ON when needed. Previous studies

indicate that implementing such automation can significantly reduce energy consumption in residential and commercial spaces.

III. METHODOLOGY

The Automatic Room Light Controller with Bidirectional Visitor Counter is designed to automatically control room lighting based on the number of people present. The system uses two infrared (IR) sensors, an Arduino microcontroller, an LCD display, and a relay module. The IR sensors are placed at the entrance of the room to detect motion in both directions. When a person enters, the first sensor is triggered before the second, causing the Arduino to increment the visitor count and turn ON the light through the relay. When a person exits, the second sensor activates first, leading to a decrement in the counter.

The Arduino Uno acts as the control unit, processing input signals from the IR sensors and managing the output to the relay and LCD. The relay functions as an automatic switch to control the AC light bulb, while the LCD display shows the real-time number of occupants inside the room. When the count becomes zero, the system automatically turns OFF the light to conserve energy.

➤ *Hardware*

Fig 1 Hardware

➤ *Working Flow of the System*

The system consists of two IR sensors placed at the entrance of the room. When a person passes the first sensor and then the second, the microcontroller increments the count, indicating someone has entered. Conversely, when the person crosses the second sensor first and then the first one, the count decreases, indicating an exit. The updated count is displayed on the LCD screen. If the count is greater than zero, the relay is activated, and the light turns ON. When the count returns to zero, the relay deactivates, and the light turns OFF automatically.

➤ *Output Observation*

The system was tested in a controlled environment. The IR sensors successfully detected bidirectional movement, and the light control function responded accurately to changes in the visitor count. The LCD clearly displayed the number of persons present. The project achieved the goal of automatic light control and energy saving without manual switching. The response time was fast, and the system performed consistently under repeated testing.

IV. CONCLUSION AND FUTURE SCOPE

The Automatic Room Light Controller with Bidirectional Visitor Counter demonstrates how automation can significantly contribute to energy conservation. Using Arduino Nano and IR sensors, the system effectively detects room occupancy and controls the light without human intervention. This project provides a simple, economical, and efficient solution for modern energy management. Future enhancements could include integrating IOT technology for remote monitoring and control via mobile applications.

Future enhancement may include the integration of IOT technology for remote monitoring, motion detection sensors for improved accuracy, and mobile app connectivity for use control and analytics.

REFERENCES

- [1]. Muhammad Ali Mazidi, "The 8051 Microcontroller and Embedded Systems," Pearson Education, 2008.
- [2]. Arduino Official Documentation, <http://www.arduino.cc>
- [3]. Raj Kamal, "Embedded Systems: Architecture, Programming, and Design," McGraw Hill Education, 2011.
- [4]. Online Resource: "Automatic Room Light Controller with Bidirectional Visitor Counter Using Arduino," Electronics Hub, <https://www.electronicshub.org>