

JAYPEE INSTITUTE OF INFORMATION TECHNOLOGY

BTECH-SEMESTER-V



**Automatic Room Light Controller with
Bidirectional Visitor Counter**

SUBMITTED TO:

Dr. AMARJEET KAUR

Dr. NAVEEN CHAUHAN

SUBMITTED BY:

RAM PRATAP SINGH (22103325 B11)

LAKSHAY JOSHI (22103328 B11)

N. DEVASAIKUMAR (22103337 B11)

Project Synopsis: Automatic Room Light Controller with Bidirectional Visitor Counter

1. Introduction

In today's world, energy conservation is a key focus, particularly in homes, offices, and public spaces. Automatic systems that manage energy use can contribute significantly to reducing unnecessary consumption. One such application is an automatic room light controller with a visitor counter, which ensures that lights are only on when the room is occupied. This project involves the development of a smart system using Arduino Uno that not only controls the lighting but also counts the number of people entering and leaving a room.

The system uses infrared (IR) sensors placed at the entrance to detect movement. When a person enters the room, the visitor count increments, and the light is switched on if it was off. When a person leaves, the count decrements, and the light turns off if no one is left inside. This mechanism ensures that lights are turned off automatically, minimizing power wastage. The system's count and the light status are displayed on a 16x2 LCD screen, making it easy to monitor in real-time.

This project is simple yet effective, making it a perfect learning tool for students and hobbyists who want to explore Arduino-based automation and energy-efficient designs.

2. Objective

The primary objective of this project is to design and implement a smart system that automatically controls the lighting of a room based on occupancy, using a bidirectional visitor counter. The system will count the number of people entering and exiting the room and switch the lights on or off accordingly. Specific objectives include:

1. **Automation:** To automate the control of room lights by detecting the presence of individuals using IR sensors, ensuring that lights are turned on only when the room is occupied and turned off when it is empty.
2. **Visitor Counting:** To accurately count the number of people entering and leaving the room using bidirectional sensors and maintain a real-time visitor count.
3. **Energy Conservation:** To minimize energy wastage by turning off the lights when the room is unoccupied, promoting energy efficiency.
4. **Real-Time Display:** To provide a visual indication of the number of occupants and the current light status through a 16x2 LCD display.
5. **Cost Efficiency:** To implement the system using low-cost components such as Arduino Uno, IR sensors, and relay circuits, making it affordable and accessible for everyday applications.

This system is designed for use in homes, offices, public spaces like malls or classrooms, and any environment where automatic light control based on occupancy is beneficial.

3. Methodology

The project utilizes two infrared (IR) sensors placed at the entrance of a room to detect the entry and exit of people. The system automatically controls the room's lighting based on the number of people inside and displays the visitor count and light status on a 16x2 LCD.

1. IR Sensors:

Two IR sensors detect movement at the entry and exit points. When the first sensor is interrupted, the visitor count increases (indicating someone has entered), and when the second sensor is interrupted, the count decreases (indicating someone has exited).

2. Arduino Control:

The signals from the IR sensors are processed by the Arduino Uno, which updates the visitor count. If the count is greater than zero, the light stays on; if the count is zero, the Arduino switches the light off.

3. Relay Driver Circuit:

The Arduino controls a relay driver circuit with the help of a BC547 transistor, which powers the light bulb. This circuit ensures the Arduino can handle the required voltage and current to drive the relay.

4. LCD Display:

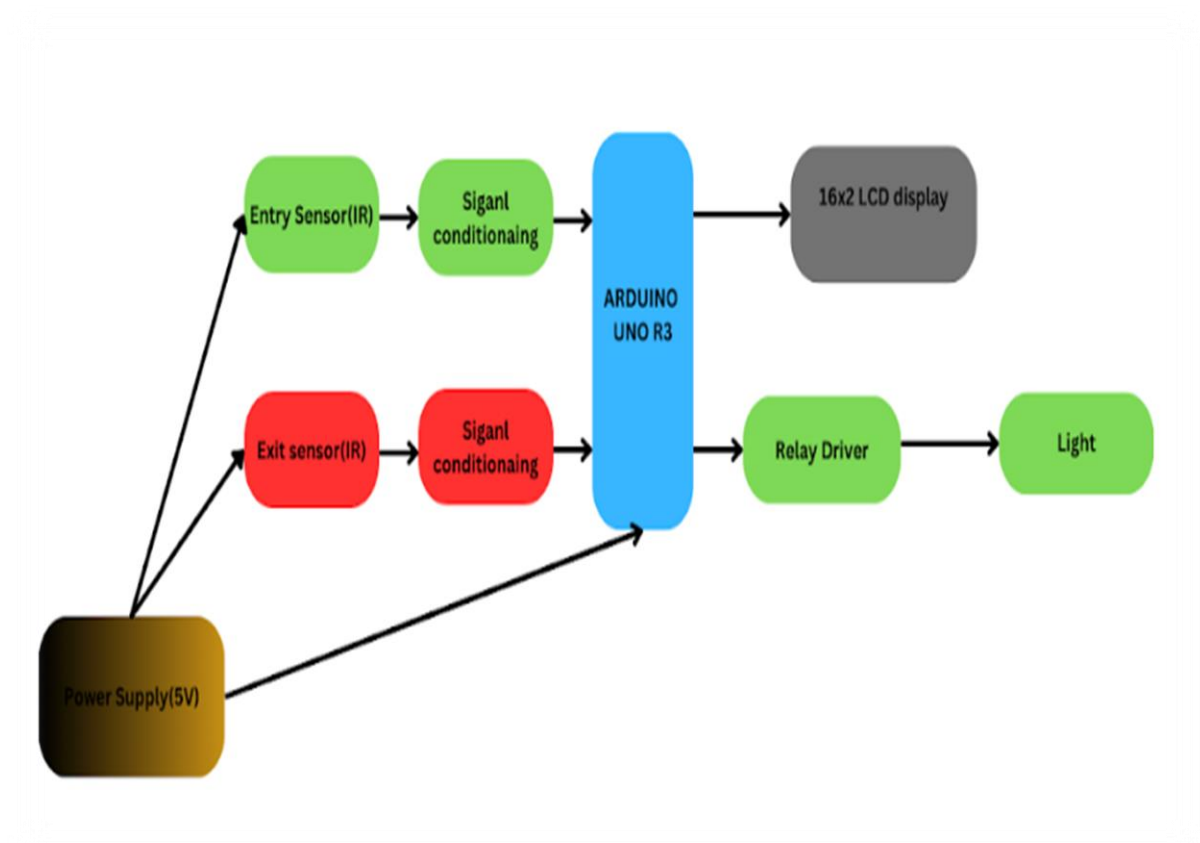
A 16x2 LCD is used to display the current number of occupants and the status of the light (ON/OFF), providing real-time updates as people enter or exit.

5. Light Control:

The light automatically turns on when the room is occupied (visitor count > 0) and turns off when the room is empty (visitor count = 0).

This methodology ensures efficient energy use by controlling the lighting based on real-time occupancy.

4.Block Diagram:



5. Expected Outcome:

The expected outcome of the "Automatic Room Light Controller with Bidirectional Visitor Counter" project is the successful development of a system that:

1. **Automates Light Control:** The system will automatically turn the room light on when a person enters and off when the room is empty, ensuring lights are used only when needed.
2. **Accurate Visitor Counting:** The project will accurately count the number of people entering and exiting the room using IR sensors, providing real-time occupancy data.
3. **Energy Conservation:** By turning off the lights when the room is unoccupied, the system will contribute to significant energy savings, making it practical for use in homes, offices, malls, and public spaces.
4. **Real-Time Monitoring:** The system will display the current number of occupants and the light status on a 16x2 LCD, offering easy monitoring.
5. **Cost-Effective and Efficient:** The project will demonstrate the ability to create an energy-efficient, automated lighting system using inexpensive components like Arduino, IR sensors, and relays.

This project serves as a useful tool for automating light control and enhancing energy efficiency in various environments.

6. Timeline:

- 1) **Week 1:** Project Planning and Component Procurement
- 2) **Week 2:** Circuit Design and Simulation
- 3) **Week 3:** Hardware Assembly
- 4) **Week 4:** Arduino Programming
- 5) **Week 5:** Testing and Optimization
- 6) **Week 6:** Final Integration and Testing
- 7) **Week 7:** Documentation and Presentation
- 8) **Week 8:** Final Evaluation

7. References

1. **Arduino Official Documentation**
Arduino.cc. (2024). *Arduino Uno Product Page and Tutorials*. Available at: <https://www.arduino.cc/>
2. **IR Sensor Module Guide**
Components101. (2024). *IR Sensor Module Overview and Working*. Available at: <https://components101.com/sensors/ir-sensor>
3. **Relay Control with Arduino**
Last Minute Engineers. (2024). *How to Control Relay with Arduino Using Transistor*. Available at: <https://lastminuteengineers.com/relay-arduino-tutorial/>
4. **LM358 Operational Amplifier Datasheet**
Texas Instruments. (2024). *LM358 Dual Operational Amplifier Datasheet*. Available at: <https://www.ti.com/lit/ds/symlink/lm358.pdf>
5. **16x2 LCD Display Guide**
Circuit Digest. (2024). *Interfacing 16x2 LCD with Arduino*. Available at: <https://circuitdigest.com/microcontroller-projects/interfacing-16x2-lcd-with-arduino-uno>
6. **Visitor Counter Using Arduino**
Engineers Garage. (2024). *Digital Visitor Counter using Arduino and IR Sensors*. Available at: <https://www.engineersgarage.com/digital-visitor-counter-using-arduino/>