

# **Title: Design and Implementation of a Smart Room System with Entry and Exit Management**

## **1.Problem Statement:**

The increasing demand for intelligent and automated living spaces has led to the development of smart room systems. This project addresses the need for a smart room with entry and exit management, capable of providing real-time status updates and automated control of room conditions. The system aims to monitor the occupancy of the room, control lighting and ventilation, and ensure security by managing door access based on the room's occupancy status.

## **2.Literature Review:**

### **2.1 Smart Room Systems:**

- Previous research has explored various aspects of smart room systems, emphasizing automation, energy efficiency, and user comfort.

### **2.2 Entry and Exit Management:**

- Limited literature is available on the integration of entry and exit management in smart rooms, emphasizing the importance of real-time tracking and control.

### **2.3 Occupancy Sensing:**

- Studies on occupancy sensing using different sensors (infrared, ultrasonic) provide insights into reliable methods for detecting entry and exit events.

### **2.4 Automation and Control:**

- The use of Logisim in smart home automation has been explored, showcasing its capabilities in designing responsive and efficient control systems.

### **2.5 Security in Smart Rooms:**

- Security concerns in smart room systems have been addressed, focusing on access control mechanisms and the integration of secure protocols.

## **3. System Components:**

### **3.1 Entry and Exit Sensors:**

- Two sensors are strategically placed to detect entry and exit events. These sensors act as the primary input to the system, triggering updates based on occupancy changes.

### **3.2 Output Devices:**

- The system controls two output devices: an AC and a light. These devices are activated or deactivated based on the room's occupancy status.

### **3.3 Door Lock Mechanism:**

- The door lock mechanism is integrated with the system to ensure security. When the room is full, the door is automatically locked, preventing unauthorized access.

## **4. Working Principle:**

### **Entry and Exit Events:**

- When an entry event is detected, the system increments the occupancy count. Conversely, when an exit event occurs, the system decrements the count.

### **Occupancy Status:**

- The microcontroller constantly monitors the occupancy count. If the count reaches a predefined threshold, the room is classified as "full"; otherwise, it is marked as "empty."

### **Output Control:**

- Based on the room's occupancy status, the system controls the AC and light. If the room is empty, the AC and light are turned off to conserve energy. In contrast, when the room is full, the AC and light are activated for user comfort.

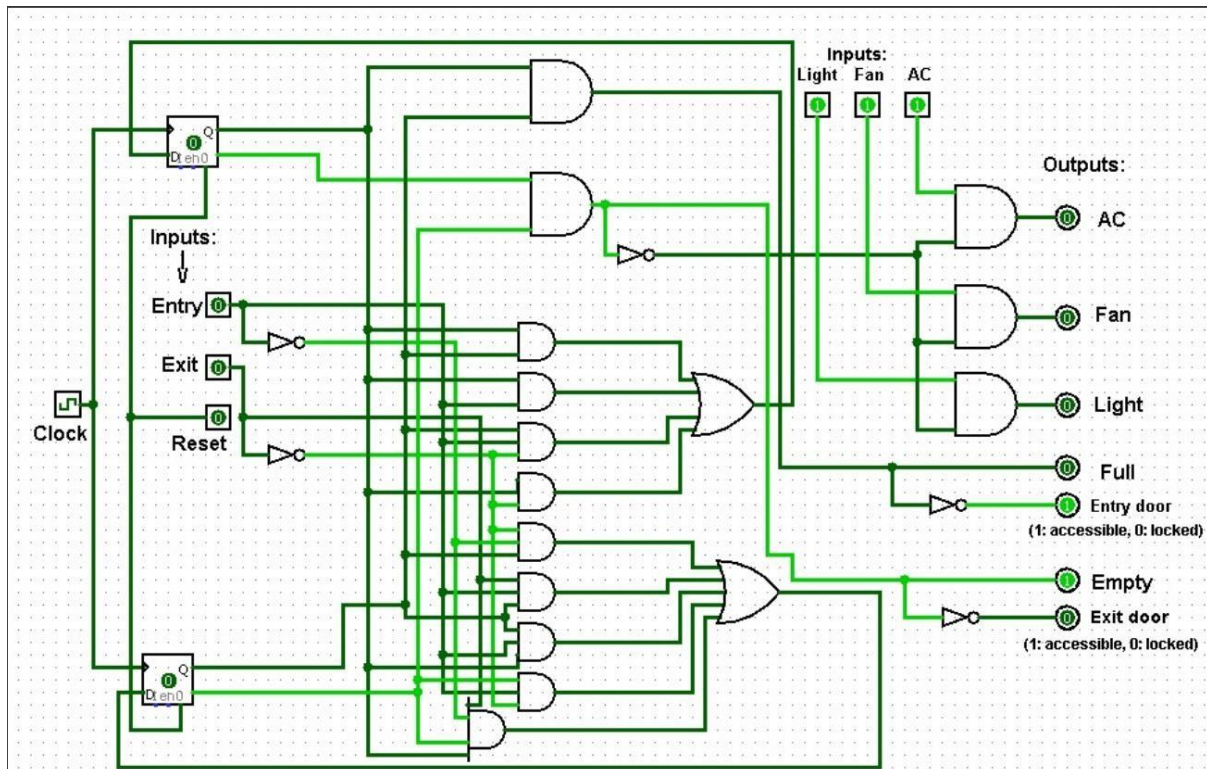
### **Door Lock Mechanism:**

- If the room is full, the door is locked to enhance security. Conversely, when the room is not full, the door is automatically unlocked, allowing entry

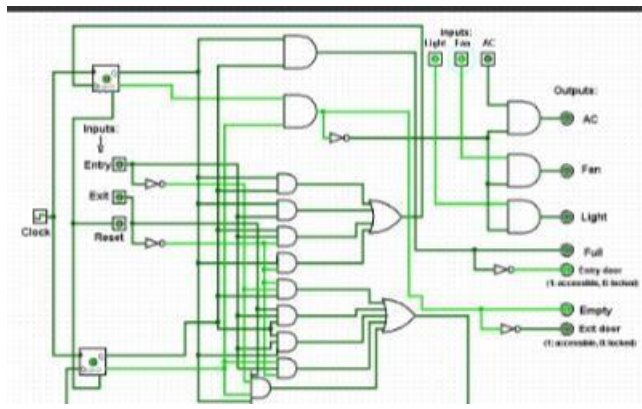
## 5. Circuit Diagram

The proposed smart room system utilizes Logisim for hardware description and synthesis. Two input sensors, one for entry and another for exit, are integrated to monitor room occupancy. The system classifies the room status into four categories: full, empty, AC-on, and light-on. Additionally, the door is automatically locked when the room is full and unlocked when it is not full.

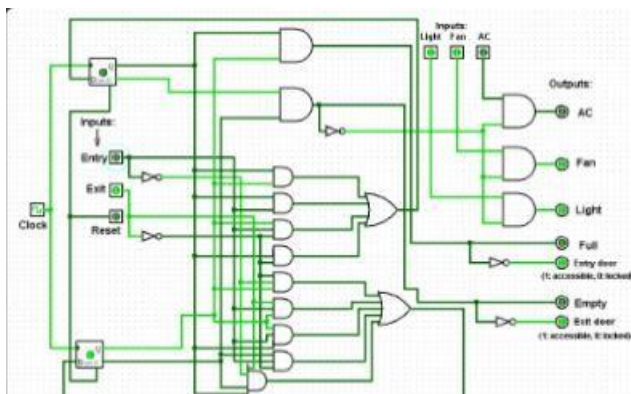
The entry and exit events trigger the system to update the room status. When the room is full, the door is locked to ensure security. The AC and light are controlled based on the room's occupancy status, optimizing energy usage and enhancing user comfort.



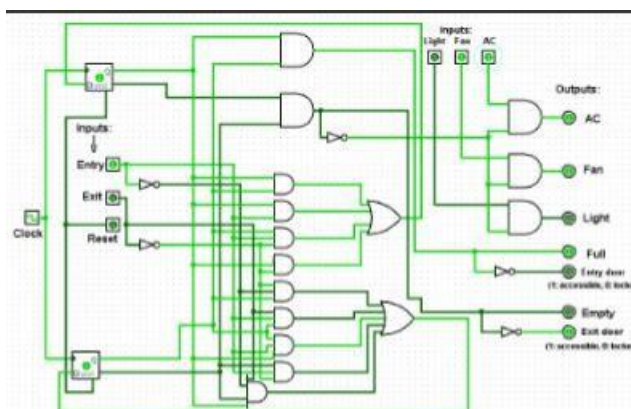
# OUTPUT



Room is empty



Neither empty nor full



Room is full

## **6. Conclusion:**

In conclusion, the design and implementation of a smart room system with entry and exit management using Logisim provide a reliable and efficient solution for real-time monitoring and control. The integration of occupancy sensing, automation, and security features contributes to a versatile and user-friendly system. This project lays the groundwork for further advancements in smart room technologies, addressing the evolving needs of modern living spaces.

The successful integration of Logisim-based hardware design and intelligent control mechanisms demonstrates the feasibility and effectiveness of the proposed smart room system. Future research can explore enhancements in sensor technologies, energy optimization, and scalability for broader applications in smart home environments.

The working of this smart room system showcases an intelligent and responsive environment that adapts to changing occupancy conditions. The integration of entry and exit sensors, logic, and connected output devices results in an efficient and user-friendly system. The door lock feature enhances security, providing a comprehensive solution for modern living spaces.

This system not only optimizes energy usage by controlling AC and light based on occupancy but also ensures security by managing door access. The flexibility of this design allows for customization based on specific user requirements and can serve as a foundation for further advancements in smart room technologies.