

# **ROOM SECURITY AND AUTOMATION**

## **GROUP MEMBERS**

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# INTRODUCTION

The Room Security and Automation project focuses on designing a secure and efficient smart room system using **Multisim** for circuit simulation. It integrates key features such as motion detection with alarms, password-based access control, automated lighting, and temperature-regulated ventilation. The system leverages sensors and relays to automate appliances and enhance security. Multisim is used to simulate and test the circuits, ensuring functionality and reliability. This project is a scalable, cost-effective solution for smart living in residential, commercial, and institutional spaces, combining convenience, energy efficiency, and robust security.

The primary objective of this project is to design and simulate a smart room system using Multisim, integrating security features like access control and motion detection with automation for appliances to enhance safety, convenience, and energy efficiency.

# OBJECTIVE

## 1. Design Security System:

- Implement a 5-bit binary digital lock for restricted access.
- Trigger an alarm after 3 incorrect attempts and notify the owner.
- Activate alarm if motion is detected while the door is unlocked.

## 2. Automate Room Features:

- Automate lighting based on room occupancy using PIR sensors.
- Integrate temperature sensor to activate air conditioner if room is hot.

## 3. Energy Efficiency:

- Design an energy-efficient system with automatic device shutdown when not in use.

# COMPONENTS

The following are the components utilized in this project:

- **PIR Motion Sensor:** Detects movement in the room.
- **Light Dependent Resistor (LDR):** Measures light intensity and automate lighting.
- **Logic Gates (AND, XNOR):** Validates 5-bit binary password

- **Temperature Sensor:** Detects room temperature for automation of Fans/AC.
- **Alarm:** To sound an alarm when motion is detected.
- **Prob\_Light:** Simulates light bulb (output for motion).
- **JK Flip-Flops:** Counts incorrect password attempts
- **DCD\_HEX:** Displays lock status (e.g., "OPEN"/"WRONG")
- **Power Supply:** For powering the system and components. (5V / 12V)

## WORKING

A room security and automation system can be designed using various components such as motion sensors, door/window sensors, alarms, and microcontrollers. The system could begin with a Passive Infrared (PIR) sensor that detects motion in the room. If motion is detected, a microcontroller (like an Arduino or a similar component) processes the signal and triggers an alarm system, such as a buzzer or siren, to alert of a potential intrusion. Additionally, the automation aspect can be integrated by adding lights controlled by a relay, which can be turned on or off based on the time of day or detected motion. For energy efficiency, the system could be set to automatically turn off devices when no motion is detected after a certain period, or it could integrate with smart home platforms to control other appliances such as fans or air conditioning based on room occupancy or temperature. The circuit can be simulated in Multisim to test the interaction between sensors, alarms, and automation features, providing a comprehensive security and home automation solution.

## APPLICATIONS

### 1. Motion Detection System:

- Using infrared sensors (PIR) to detect movement in a room. When movement is detected, a microcontroller (like Arduino or PIC) can trigger an alarm or activate a camera.
- In Multisim, components such as sensors, relays, and alarms can be simulated to check circuit behavior.

### 2. Automated Lighting Control:

- A light control system based on occupancy (using PIR sensors) or time of day. The system can automatically turn lights on or off.
- Multisim can simulate the circuits for sensors, controllers (e.g., microcontrollers or timers), and relays to automate lighting.

### **3. Temperature and Humidity Monitoring:**

- Sensors (like DHT11) can monitor temperature and humidity. If the room temperature goes beyond a set threshold, the system can trigger a fan or air conditioning system.
- In Multisim, temperature sensors and relay circuits can be designed for simulation.

### **4. Security Alarm System:**

- A comprehensive alarm system with door/window sensors, motion detectors, and cameras. The system can alert the user via SMS, email, or sound when any intrusion is detected.
- The components such as sensors, alarm units, and GSM modules can be modeled in Multisim.

### **5. Automated Curtains/Blinds:**

- Automated curtains or blinds that open/close based on time of day or light intensity (using LDR sensors).
- Multisim allows you to design circuits for sensors, motors, and controllers for simulating this automation.

### **6. Access Control System:**

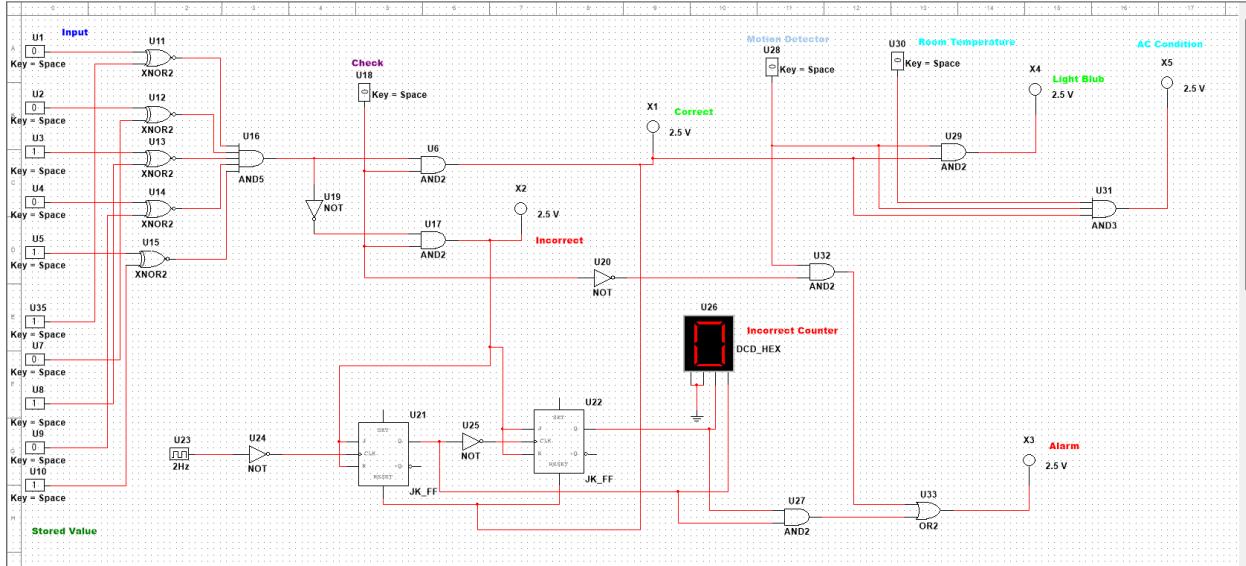
- A system that uses RFID or biometric sensors for room entry control. If an authorized tag or fingerprint is scanned, the door unlocks.
- In Multisim, you can simulate the RFID reader, controller, and locking mechanism circuit.

## **CONCLUSION**

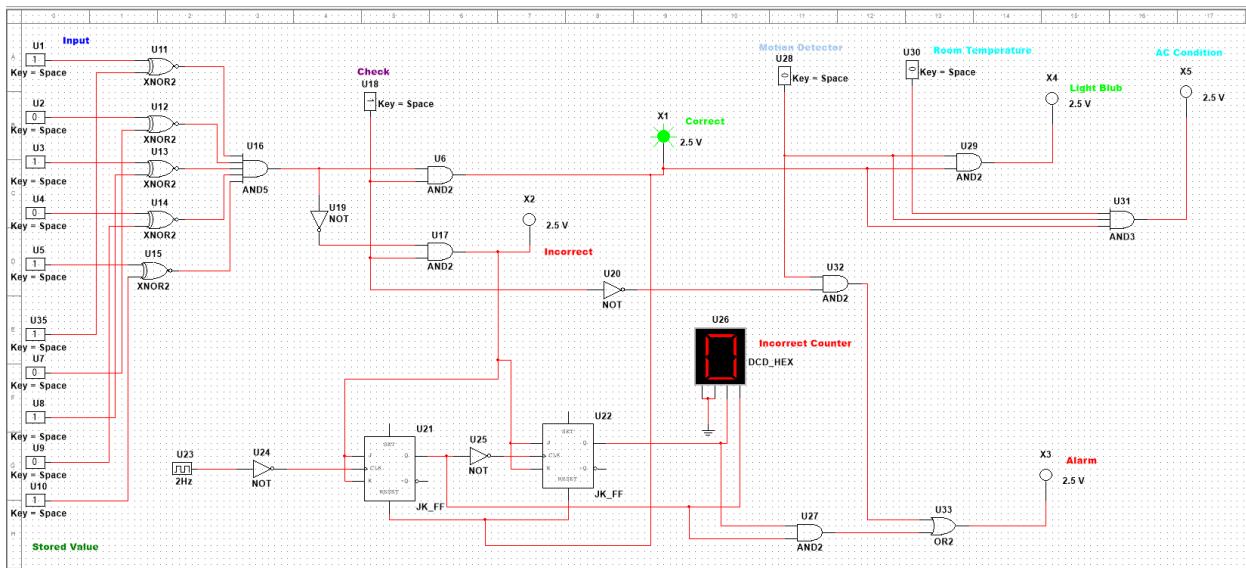
Room security and automation in Multisim provides a powerful simulation environment to design and test circuits for controlling and securing rooms. By integrating sensors (e.g., motion detectors, cameras) with automation systems (e.g., lighting, alarms, and locks), Multisim allows users to create and evaluate circuits that enhance security, optimize energy usage, and provide real-time monitoring. Through simulations, engineers can refine their designs, ensuring reliable operation before physical implementation. This approach saves time and resources while fostering innovation in the field of smart security systems.

# PROJECT WORKING :

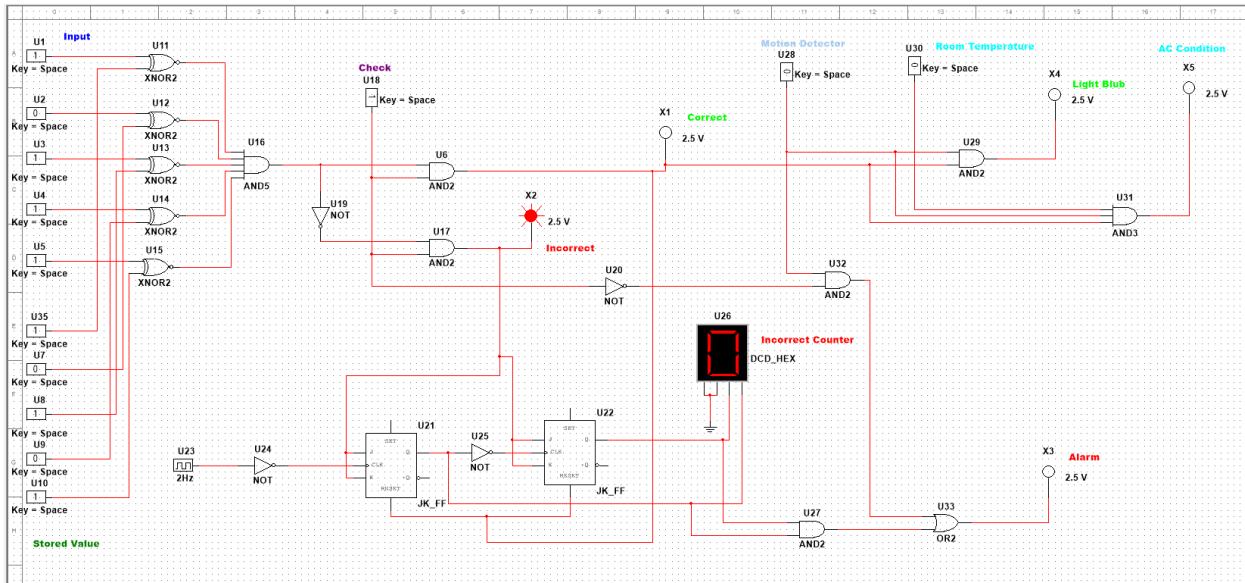
When there is no input:



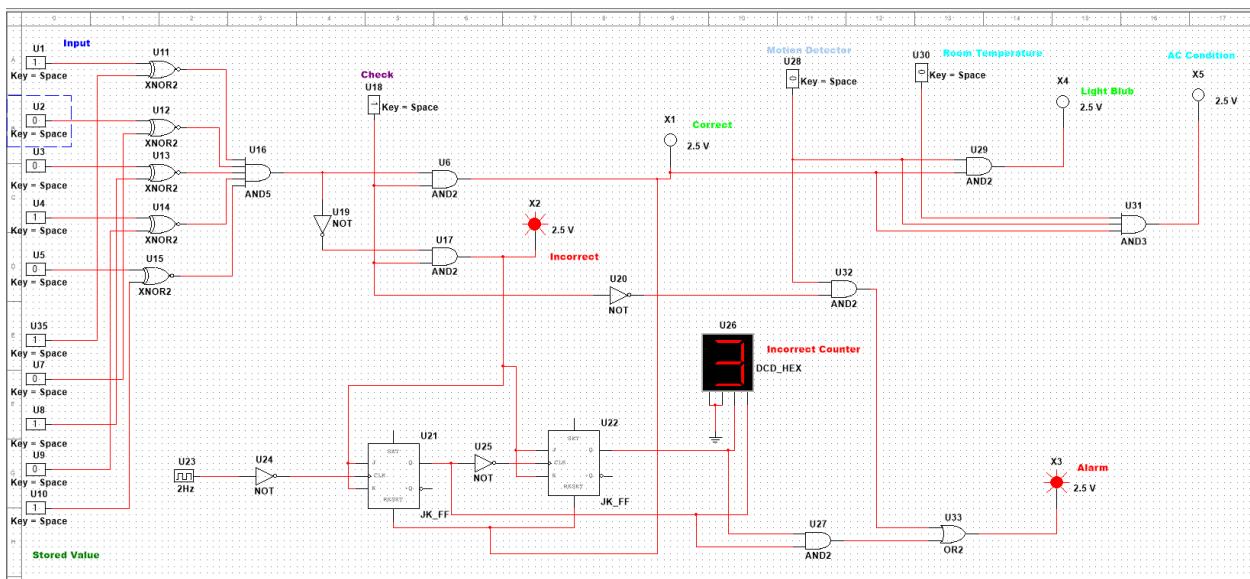
When the door password is entered correct:



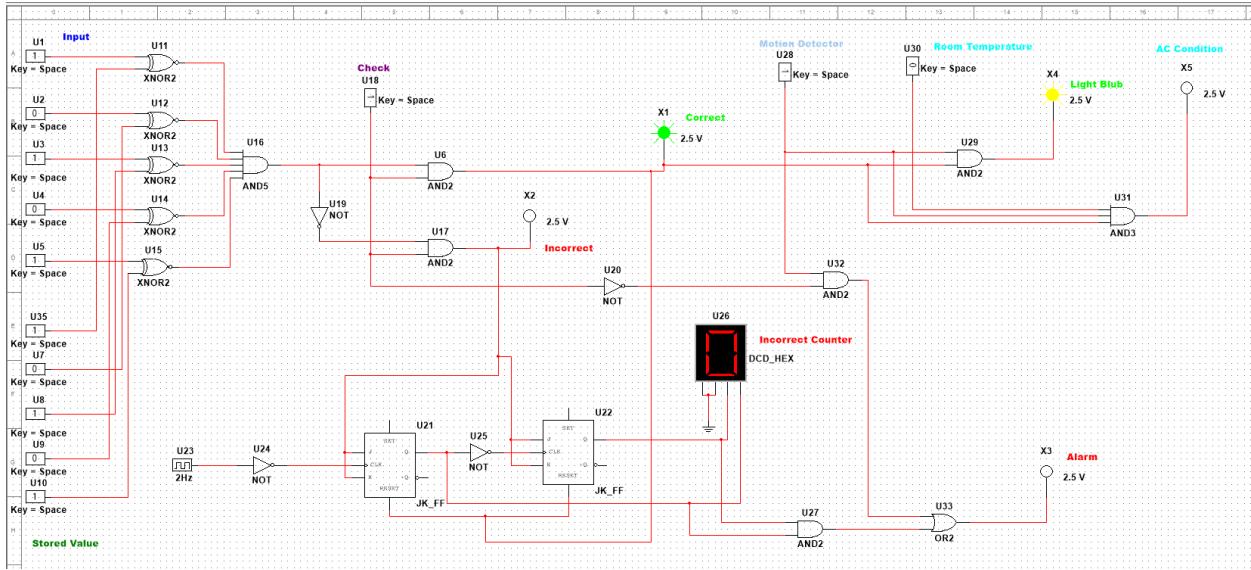
## When the door password is entered incorrect:



## When the door password is entered incorrect three times :



**When password is correct and there is movement in the room:**



**When the password is correct, a movement in the room and temperature is low:**

