Password Based Room Security And Automation System

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Group - 05.

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Abstract

Our project, "Password-Based Room Security and Automation," employs digital electronics for enhanced home security and convenience. Through 2-input XNOR gates, a JK flip-flop counter, and logic gates, the system ensures secure access and smart automation. Users input a password via a keypad, and our system validates it accurately. An intelligent alarm activates on repeated wrong attempts, while logic gates control the light and air conditioner based on correct input conditions. This project blends simplicity with innovation, offering a practical solution for modern living.

1 Introduction

The "Password-Based Room Security and Automation" project is a comprehensive endeavor aimed at enhancing room security and user convenience through innovative digital electronics solutions. The project consists of four distinct modules, each contributing to the overall functionality of the system. By integrating password verification, wrong password tracking, an intelligent alarm system, and conditional control, the project not only ensures a secure environment but also introduces automation features for a modernized living space.

2 Description of the project

The Secure Home Automation System is designed to provide a comprehensive and secure environment for residential spaces. It combines digital and analog components to implement password-protected access, monitor and respond to wrong PIN attempts, activate an alarm system in case of security breaches, and conditionally control devices such as lights and air conditioning. The project aims to enhance home security and automation, ensuring a safe and user-friendly living space.

3 Components Required

3.1 Digital Components

1. 2-input 74LS266 XNOR IC.
2. 3-input 74LS11 AND IC.
3. 2-input 74LS08 AND IC.
4. 2-input 74LS32 OR IC.
5. 74LS04 NOT IC.
6. 7476 JK Flip-Flop.
7. 555 Timer IC.
8. 4511 BCD to 7-segment Latch/Decoder/Driver. 9. Dip Switches.

3.1.1 Analog Components

1.Capacitors (1nF, 10uF).
2. Resistances (10kohm, 100kohm).
3. BJT BC547.
4. 1N4007 Diode.

3.1.2 Additional Components

1. Buzzer
2. Battery

4 Pin Diagram for The Required IC

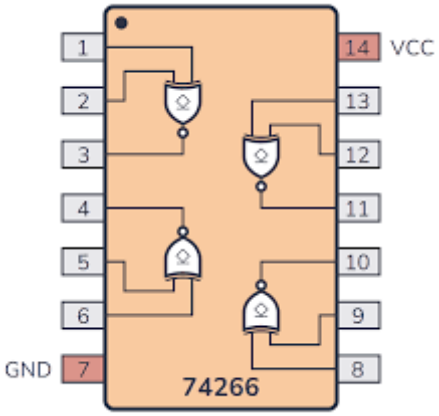

Fig. 1 74LS266 pin-diagram

Inputs		Outputs
X	Y	Z
0	0	1
0	1	0
1	0	0
1	1	1

Fig. 2 74LS266 Truth Table

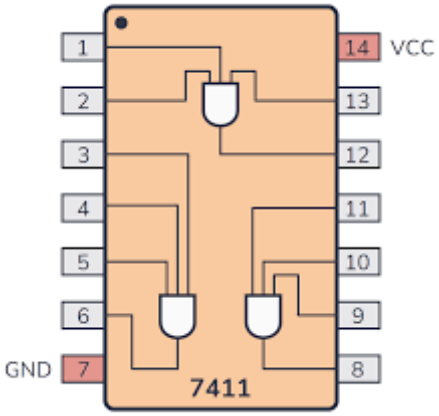

Fig. 3 7411 pin-diagram

Inputs			outputs
W	X	Y	Z = W. X. Y
0	0	0	0
0	0	1	0
0	1	0	0
0	1	1	0
1	0	0	0
1	0	1	0
1	1	0	0
1	1	1	1

Fig. 4 74LS11 Truth Table

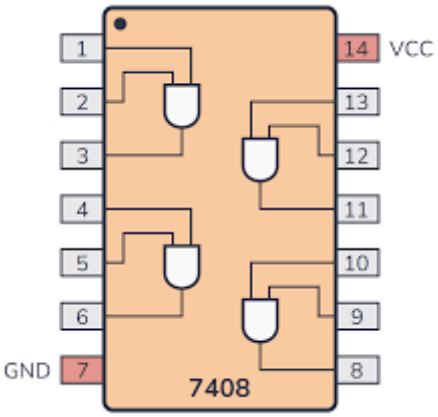

Fig. 5 74LS08 pin-diagram

Input	Input	Output
A	B	Y
0	0	0
0	1	0
1	0	0
1	1	1

Fig. 6 74LS08 Truth Table

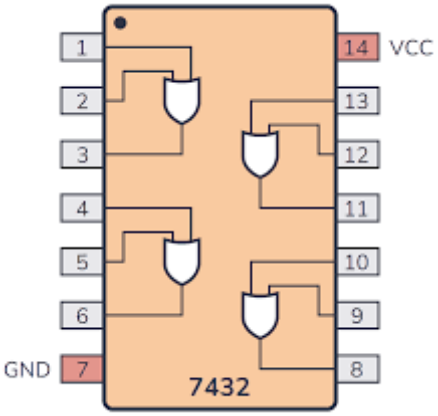

Fig. 7 74LS32 pin-diagram

Inputs		Outputs
X	Y	Z
0	0	0
0	1	1
1	0	1
1	1	1

Fig. 8 74LS32 Truth Table

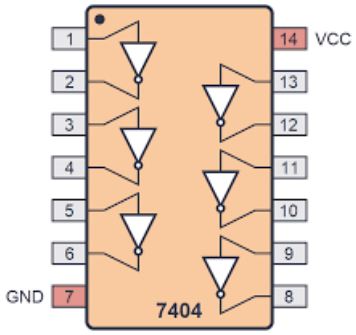

Fig. 9 74LS04 pin-diagram

Input	Output
A	Y
0	1
1	0

Fig. 10 74LS04 Truth Table

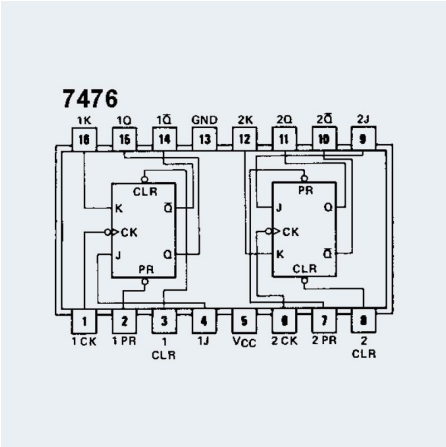

Fig. 11 74LS76 pin-diagram

Inputs			Outputs		
J	K	CLK	Q	$\bar{Q}$	Comments
0	0	↑	Q_0	$\bar{Q}_0$	No change
0	1	↑	0	1	RESET
1	0	↑	1	0	SET
1	1	↑	$\bar{Q}_0$	Q_0	Toggle

Fig. 12 74LS76 Truth Table

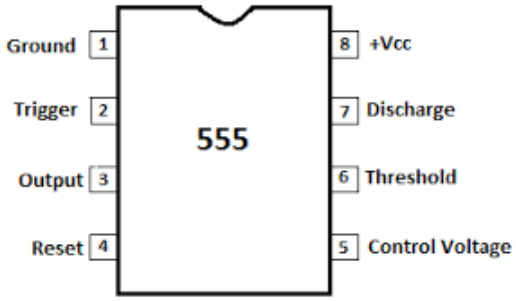

Fig. 13 555 pin-diagram

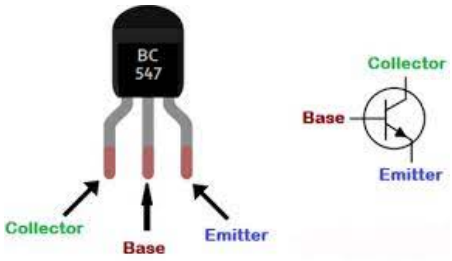

Fig. 14 BC547 pin-diagram

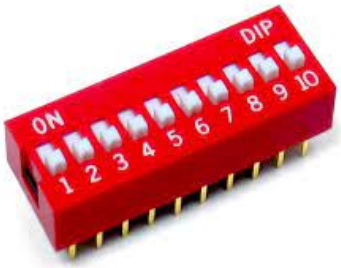

Fig. 15 Dip Switches

Fig. 16 Piezo Buzzer

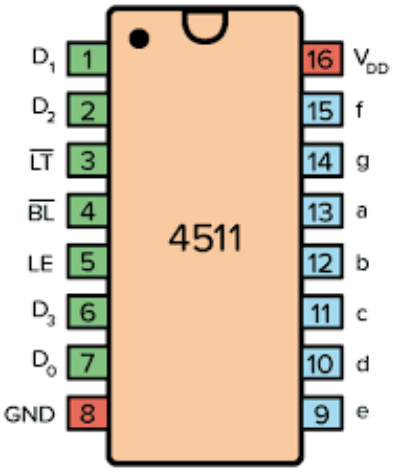

Fig. 17 4511 pin-diagram

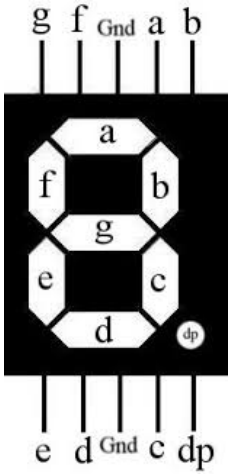

Fig. 18 BCD Sven Segment

5 Design

Logic Diagram for 3- bit Up Counter:

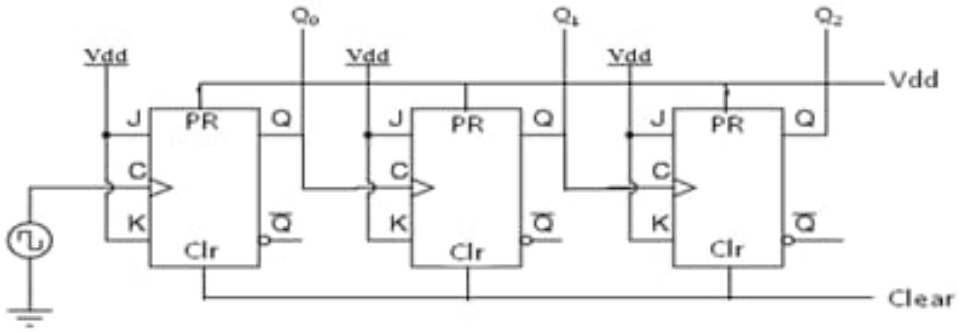

Fig. 19 3 Bit Up Counter Circuit Diagram

Comparator:
At this point we have a system that's capable of saving each number we press in one display then the other, and copying that information to the password memories. We

are still lacking the essential, the Comparator. One circuit that will compare the two (ABCD) of the display memories with the two (ABCD) of the password memories.

To understand how we did it let's look at the XNOR truth table:

Inputs		Outputs
X	Y	Z
0	0	1
0	1	0
1	0	0
1	1	1

Fig. 20 XNOR Truth Table

Notice that whenever a and a have the same value, the output is High (1). So if they are different we will have a 0 at the output. We mean that with one XNOR Gate, We can compare 2 bits one of the display memory and the other of the password memory.

This circuit processes the 6 bits from the display memories (one bit per XNOR, as the other input pairs with the password memory) and the 6 bits from the password memories, forming a 1-byte comparator. It produces a single output, signifying a High (1) only when the information in both display and password memories matches. Conversely, if there's any difference in information between the two sets of memories, even on a single bit, the output will be Low (0).

6 Full circuit diagram and explanation

6.1 Full Circuit Diagram

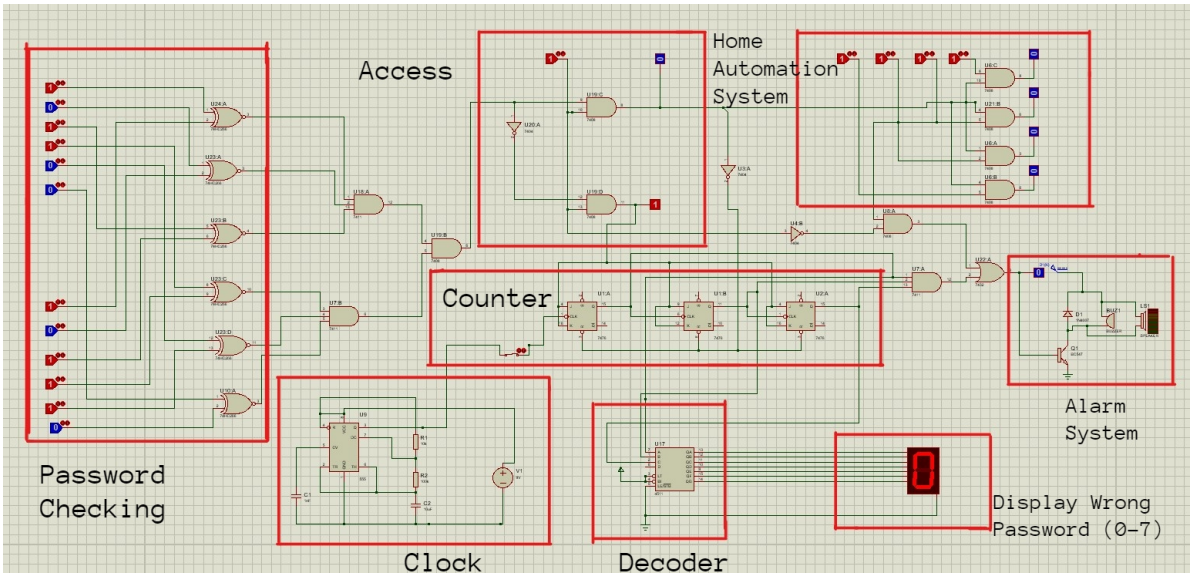

Fig. 21 Circuit Diagram

6.2 Explanation

Step 1: Input Equality Check (6-input XNOR gate):

- **Inputs:** A, B, C, D, E, F (6 digits)
- **Logic Operation:** Implement a 6-input XNOR gate to compare all input digits.
- **Output:** Z (Output is high (1) when all inputs are the same, low (0) otherwise).

Step 2: Counter using JK Flip-Flop:

- **Inputs:** Clock (C), Reset (R), J, K.
- **Logic Operation:** Utilize a 3-bit JK flip-flop counter, configured to count from 000 to 111.
- **Outputs:** Q0, Q1, Q2 (3-bit binary count representing the number of incorrect PIN attempts).

Step 3: Alarm System (Logic Gates):

- **Inputs:** Counter Outputs (Q0, Q1, Q2), Input Equality Output (Z).
- **Logic Operations:**

- Implement logic gates to determine when the counter reaches the maximum count (111).
- Activate the alarm if both the maximum count is reached and there is an indication of incorrect PIN attempts.

- **Output:** Alarm (A) - Activated when the counter reaches the maximum count and there are repeated incorrect PIN attempts.

Step 4: Conditional Control (Logic Gates):

- **Inputs:** Alarm Output (A), Input Equality Output (Z).
- **Logic Operations:**
  - Control the activation of the light bulb and AC based on the absence of an alarm and the presence of a correct PIN.
- **Outputs:** Light Bulb (LB), Air Conditioner (AC) - Activated conditionally based on the inputs.

7 Simulation Result

7.1 Password Match Simulation

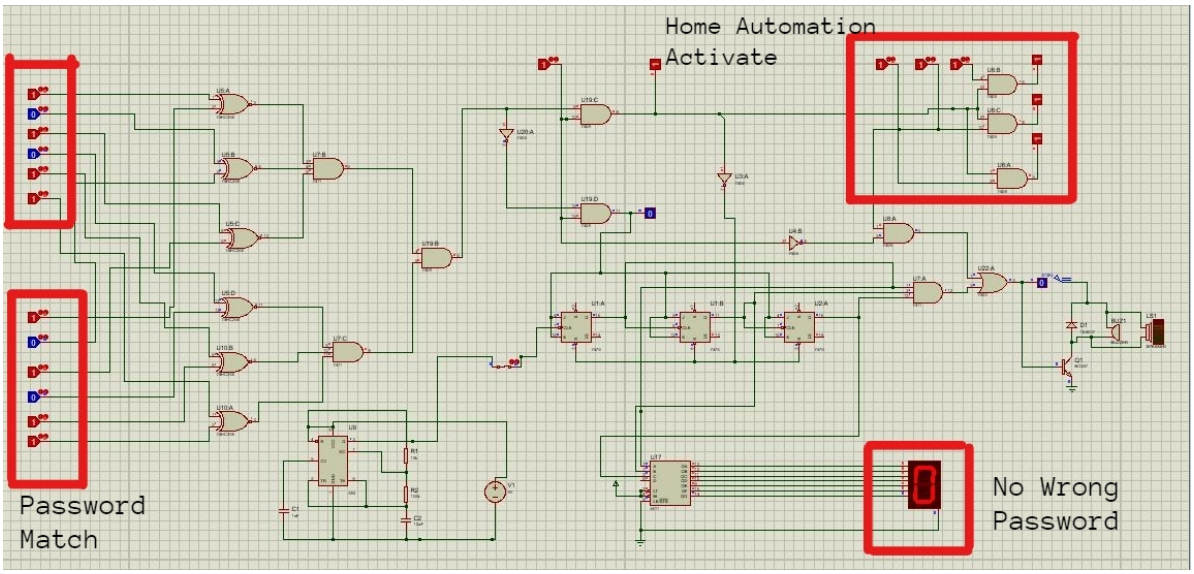

Fig. 22 Password Match

1. This simulation captures the successful match when the correct password is entered.

   Display: The display should show the system's acknowledgment of a correct password, possibly displaying "Match" or a similar indication.

   Successful Authentication: The simulation reflects the intended behavior of the system, demonstrating successful password verification.

7.2 Two Instances of Incorrect Password Entry

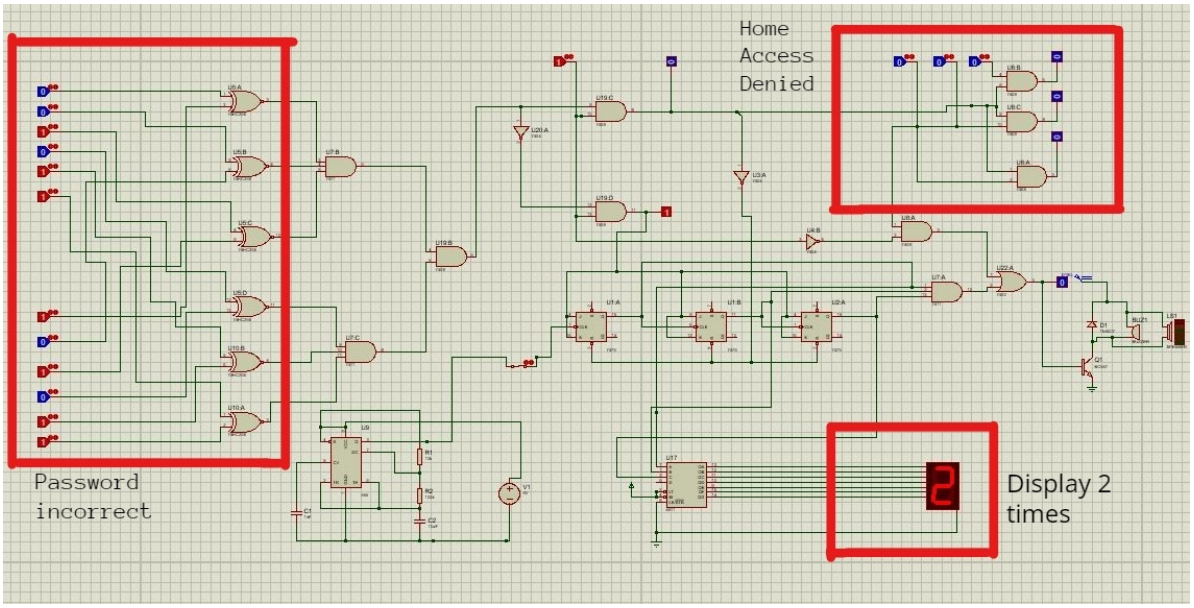

Fig. 23 2 Times Wrong Password

1. This simulation depicts the system's response to an incorrect password entered initially, followed by a correction on the second attempt.

   Display: The display on the simulation interface likely indicates the count of incorrect attempts, showcasing "1" for the first wrong attempt and "2" for the corrected second attempt.

System Behavior: The system accurately detects the correction, and the count resets, demonstrating the effective tracking and correction of wrong password attempts.

7.3 7th Time Wrong Password and Alarm Activation

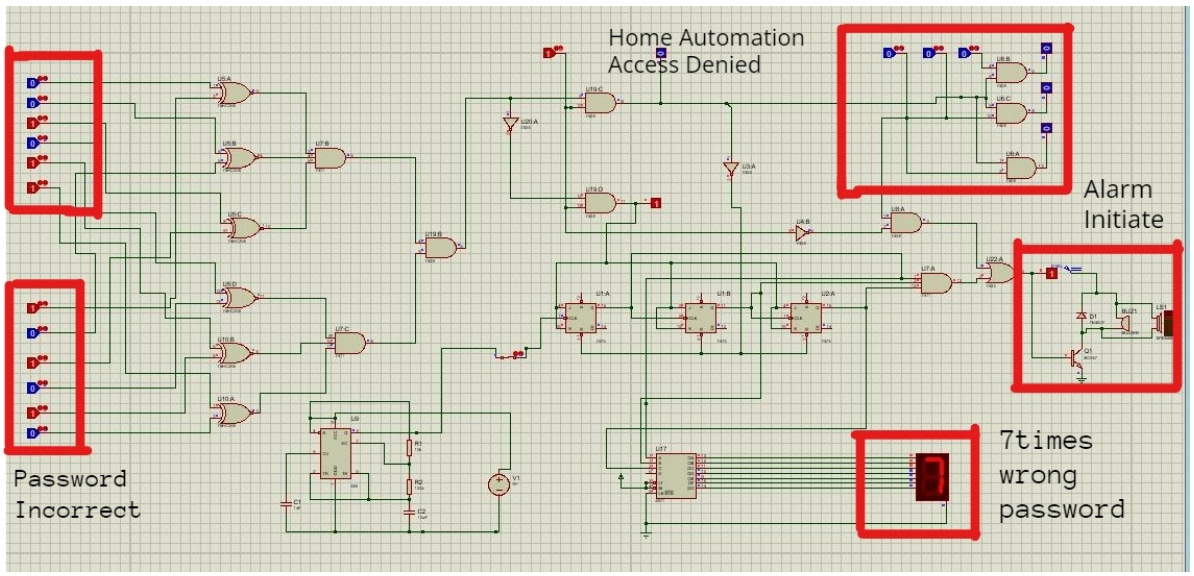

Fig. 24 7th Time Wrong Password and Alarm

1. This scenario illustrates the system's behavior when an incorrect password is persistently entered, leading to the activation of the alarm.

   Display: The display should show the increasing count of incorrect attempts, reaching "7" to signify the 7th attempt.

   Alarm Activation: As the system detects the 7th incorrect attempt, the alarm system triggers, showcasing the security feature in action.

8 Picture of the project

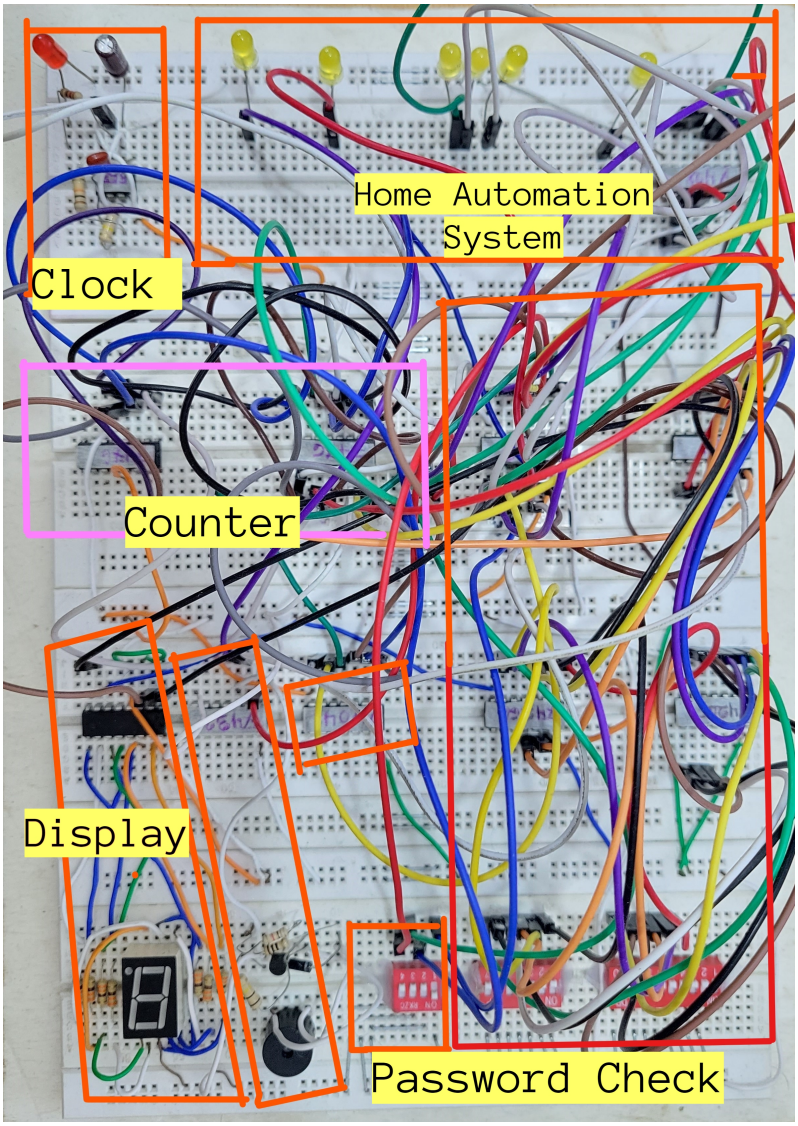

Fig. 25 Hardware Implementation

The figure presents a visual representation of the practical setup for the password-based room security and automation system. In this hardware implementation, various components such as the 3-bit counter, XNOR gates, JK flip-flop, and logic gates are meticulously arranged on the hardware platform.The image provides insight into the physical assembly of the digital electronics system, showcasing interconnected

components contributing to the project's functionality.

9 Application areas, Limitations

9.1 Application areas

The "Password-Based Room Security and Automation" project has practical applications in:

Homes: Enhance security and automate lighting and climate control.
Offices: Secure restricted areas and manage energy efficiently.
Secure Environments: Implement advanced security in labs or data centers.
Commercial Spaces: Secure storage rooms and automate commercial lighting.
Education: Control access in campuses and labs, automate classrooms.
Hospitality: Enhance security in hotels and automate guest accommodations.
Government Buildings: Control access, implement advanced security and manage energy efficiently.

9.2 Limitations

Initial Setup Complexity: The installation and initial setup of the system may require technical expertise.
Power Dependency: The system relies on a stable power supply, and disruptions may affect its functionality.
Cost: Implementation costs, including the purchase of components, may be a limiting factor for some users.
False Alarms: The system may trigger false alarms due to unexpected events or incorrect inputs.
Maintenance: Regular maintenance and updates may be necessary to ensure optimal performance.
Security Risks: As with any electronic system, there is a potential risk of security breaches or hacking attempts.
Compatibility: The system's compatibility with existing infrastructure and devices may be a limitation in certain environments.

10 Conclusion

The Secure Home Automation System offers a practical blend of security and automation. Through the integration of digital and analog components, the project delivers secure access control, tracks unauthorized attempts, and triggers an alarm for unexpected events. The system's use of XNOR gates, JK flip-flops, and a 555 Timer IC forms a robust foundation. With features like a BCD to 7-segment display, the system ensures clear user feedback.

In terms of security, the project actively verifies user credentials and responds to breaches with an alarm and audible alerts. The conditional control module adds

efficiency by linking automation elements to the correct PIN and overall security status. Striking a balance between security measures and user convenience will be key for real-world usability. Ongoing updates, maintenance, and scalability considerations will enhance the system's practicality.

Supplementary information.

1. Future Enhancements:
   - Integration of bio-metric authentication for added security.
   - Expansion of the system to incorporate remote monitoring via a mobile application.
   - Implementation of machine learning algorithms for anomaly detection.
2. Sustainability Considerations:
   - The project prioritizes energy efficiency through conditional control, contributing to a more sustainable home environment.
   - Potential integration with renewable energy sources for increased eco-friendliness.
3. User Guide:
   - A comprehensive user guide will be provided to ensure ease of use and maintenance.
   - Regular updates and support channels will be established to address user queries and concerns.
4. Security Measures:
   - Continuous monitoring of emerging security threats and updates to the system.
   - Collaboration with cyber security experts for periodic security audits.

Acknowledgments.

1. **Md. Zubair Alam, Lecturer, United International University**
   - Thank you for your insightful guidance and mentorship. Your expertise and encouragement propelled us forward, shaping the project's trajectory.

11 References

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