



Smart Door Unlock System with Android App Using IoT

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ABSTRACT: In this paper, we present a Bluetooth-based smart door lock system integrated with a mobile application for secure and seamless access control. The system is built using ESP32, a relay module, 7404 IC, solenoid lock, and a custom mobile app developed via MIT App Inventor. This solution provides users with a reliable, remote-controlled locking mechanism suitable for homes and offices. The mobile app communicates with the ESP32 microcontroller to activate or deactivate the solenoid lock through relay switching. This project offers enhanced security, user-friendly operation, and is designed as a cost-effective alternative to commercial smart locks.

Key Words: Smart Lock, ESP32, Solenoid Lock, Bluetooth, Relay, Mobile App, IoT, Home Automation.

I. INTRODUCTION:

- Traditional locks are vulnerable to theft, misplacement of keys, and limited access control. With the advent of IoT and mobile computing, smart locking systems are emerging as efficient replacements for conventional security mechanisms.
- Our proposed system enables door access through a mobile app by leveraging Bluetooth communication and an ESP32 microcontroller to control a solenoid lock.
- The system is especially beneficial in enhancing convenience and security for users who wish to monitor or control their home entrances remotely.
- The integration of electronic control and mobile interaction provides greater flexibility, and the solution is customizable and scalable for various environments.

II. LITERATURE REVIEW:

- Previous works in the field of smart locks have demonstrated the use of Bluetooth and Wi-Fi modules for door automation.
- [1] authors utilized Arduino and GSM modules for remote access but lacked real-time responsiveness. Another study
- [2] explored biometric-based locks using fingerprint scanners integrated with mobile phones. However, these approaches tend to be more complex and expensive.
- Our system simplifies the process by using easily accessible components like the ESP32 and MIT App Inventor, keeping costs low while retaining essential features like mobile control, secure relay switching, and real-time feedback through the app.

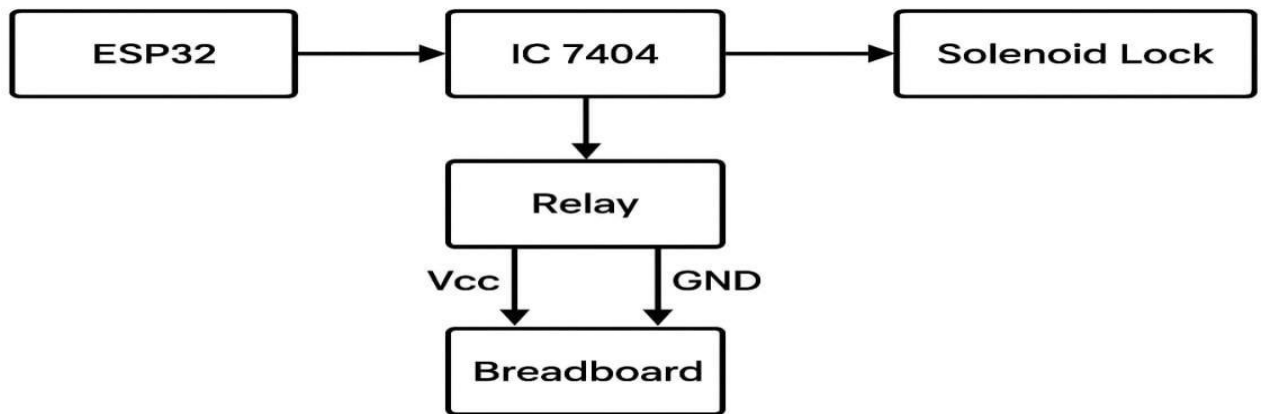
III. PROPOSED MODEL :

A. System Overview:

- The smart door lock system is composed of: ESP32 Microcontroller: For Bluetooth communication and command processing.
- Relay Module: To toggle power supply to the solenoid lock.
- Solenoid Lock: Physically locks and unlocks the door.

- IC 7404 (Hex Inverter): Logic level inverter to control relay input effectively.
- Power Supply Module: Converts AC mains to appropriate DC voltage.
- Mobile Application: Built using MIT App Inventor for user interaction. The mobile app sends commands (Lock/Unlock) to the ESP32, which then triggers the relay circuit to operate the solenoid lock accordingly.

B. Block Diagram:



C. Operating Principle:

- User opens the mobile app and connects to the device via Bluetooth.
- Upon selecting Lock or Unlock, the ESP32 receives the command.
- The 7404 IC processes the input logic (inverts it if needed) and forwards it to the relay.
- The relay switches the solenoid lock ON or OFF.
- The solenoid either engages or disengages the door latch, completing the lock/unlock operation.
- The app provides feedback like “Locked” or “Unlocked” and logs the action.

D. Mobile App Interface:

The app interface includes:

- Device List (to select paired ESP32 device)
- Lock and Unlock buttons
- Text box showing last action/time
- Bluetooth

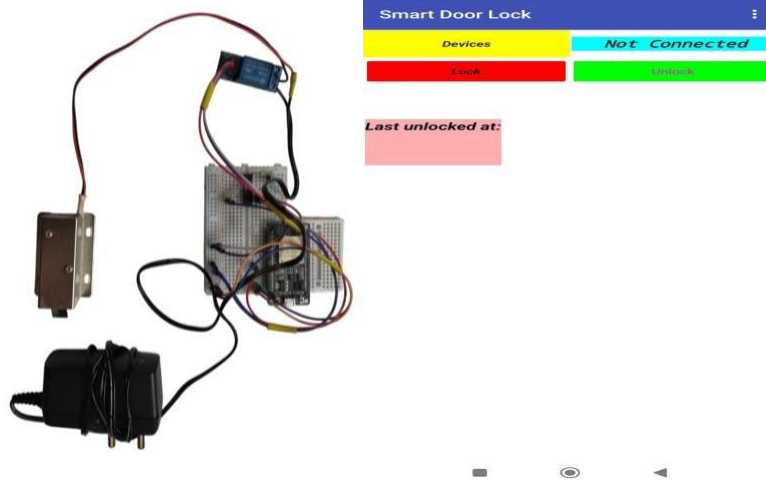
E. PERFORMANCE METRICS :

PARAMETER	OBSERVED RESULT
Bluetooth Range	~10 meters
Command response time	< 1 second
Relay Switching Time	~100 ms
Solenoid Activation Time	~1second

IV. RESULT :

The system met all initial design objectives. Its real-time performance, reliable hardware control, and cloud Connectivity demonstrate the feasibility of implementing a smart door unlocking mechanism using open-source Hardware and software tools. The results validate the core design assumptions, proving that IoT-based access Control is a practical alternative to conventional methods.

Output Screenshots:

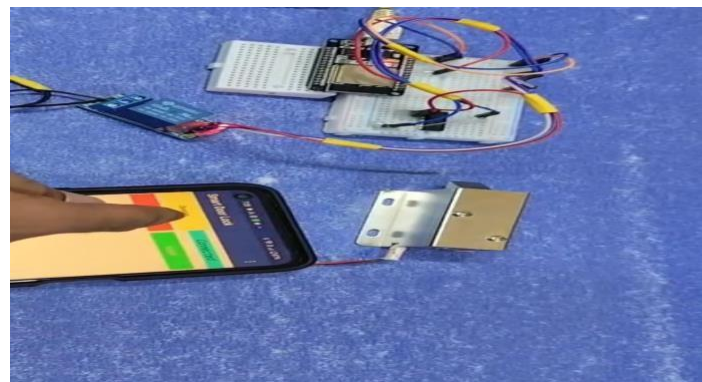


i)Overall circuit connection

ii)Cloud platform



iii)Hardware is unlocked



iv) Hardware is locked

V. CONCLUSION:

This project demonstrates an efficient and cost-effective smart door lock system using ESP32 and mobile app control. It offers a practical solution for home and office automation with minimal hardware requirements and simple software integration. Future enhancements may include biometric integration, cloud control, or Wi-Fi-based remote access to increase flexibility and functionalities.

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