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IoT Based Smart Lock System Using ESP32

Mr.U Shantha Kumar[1], Abhisheka G[2], Basavaraj S Angadi[3], Hosakeri Kirana[4], Prashanth T[5]
Assistant Professor, Electrical and Electronics Engineering[1]
Students, Electrical and Electronics Engineering[2-5]
Rao Bahadur Y. Mahabaleswarappa Engineering College, Ballari, India

Abstract: *The Internet of thing devices are interconnected physical objects that collect and share data over the internet. IoT has the potential to revolutionize many industries, including security. Traditional door lock systems have several limitations. They are often inconvenient to use, as they require users to carry keys or enter passcodes. They are also vulnerable to physical attacks, such as lockpicking or drilling. Additionally, traditional door lock systems cannot be controlled remotely, which can be a problem if a user is away from home or needs to grant access to someone else. The proposed IoT-based smart voice and keypad door lock system using ESP32 overcomes the limitations of traditional door lock systems by providing a convenient, secure, and flexible way to unlock doors*

Keywords: ESP32, IOT, SMART LOCK, HOME AUTOMATION, ACCESS CONTROL, SECURITY SYSTEM

I. INTRODUCTION

A smart lock is an advanced lock that goes beyond the traditional key and tumbler lock. It comes with extra capabilities like remote control, authentication, and connectivity to other devices and services. Its main goal is to improve security while ensuring convenience. It provides users with various methods to unlock their doors securely, such as using Smartphone apps, Keypad entry (PIN code), and ID cards. You can lock/unlock your door remotely through an app on your phone. You enter a personalized code on a keypad to lock/unlock the door. You can lock/unlock the door by scanning the ID card. Smart locks can alert you whenever the door is opened and monitor any activity happening even when you're away from home. With a smart lock, users can easily handle and monitor the lock from a distance. Users have the convenience of managing and overseeing the lock remotely with a smart lock.

II. PROBLEM STATEMENT

Traditional door locking systems rely on physical keys or basic electronic locks, which pose several limitations such as key loss, duplication, lack of remote access, and absence of real-time monitoring. With increasing concerns over security and the growing adoption of smart homes, there is a need for an intelligent locking system that provides enhanced security, convenience, and remote control.

III. LITERATURE REVIEW

Several studies have explored IoT-based smart lock systems to overcome the limitations of traditional mechanical locks. Existing research highlights the use of microcontrollers such as Arduino, Node MCU, and ESP32 for enabling wireless access control and remote monitoring. ESP32 is widely preferred due to its built-in Wi-Fi and Bluetooth, low power consumption, and cost efficiency. Previous systems have implemented authentication methods such as RFID, fingerprint sensors, keypads, and mobile applications.

IV. METHODOLOGY

The proposed system is developed using an ESP32 microcontroller as the central control unit. The ESP32 connects to a locking mechanism and authentication modules such as a keypad, RFID, or mobile application. User credentials are verified either locally or through a cloud server via Wi-Fi. Upon successful authentication, the ESP32 triggers the

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locking mechanism to unlock the door. The system continuously monitors lock status and sends real-time updates or alerts to the user's mobile device. Unauthorized access attempts are detected and logged for security purposes.

V. WORKING

The smart lock system operates using an ESP32 microcontroller connected to a door locking mechanism and authentication module. When a user attempts access, authentication data is sent to the ESP32 through a keypad, RFID, or mobile application. The ESP32 verifies the credentials either locally or via a cloud server using Wi-Fi. If authentication is successful, the ESP32 activates the motor or solenoid to unlock the door. The lock status is updated in real time and sent to the user's mobile device. In case of unauthorized access.

COMPONENTS USED

AC SUPPLY
ESP32 MICROCONTROLLER
RFID READER
KEYPAD
BUZZER
APP INTERFACE

VI. COMPONENTS DESCRIPTION

AC SUPPLY

AC (Alternating Current) supply is a type of electricity that periodically reverses direction, unlike DC (Direct Current), which flows in only one direction. This constant reversal occurs at a specific frequency, typically 50 or 60 times per second (Hertz), and is ideal for long-distance power transmission due to the ability to change voltage easily using transformers. AC power is the standard for homes and industries, used in everything from household appliances to large electric motors.

ESP32 MICROCONTROLLER

Acts as the brain of the system.
Handles sensor input, processes authentication, controls the lock mechanism, and communicates with mobile apps via Wi-Fi or Bluetooth.
Features low power consumption and multiple GPIO pins for sensors and actuators.

RFID READER

The Reads RFID cards or tags for user authentication.
Sends the card ID to the ESP32, which checks it against stored authorized IDs.
Provides a contactless and convenient access method.

VII. ADVANTAGES

• Enhanced Security – Combines multiple authentication methods (RFID, fingerprint, PIN) to prevent unauthorized access
• Remote Monitoring & Control – Users can lock/unlock doors and receive alerts via smartphone apps from anywhere.
• Convenience – Eliminates the need for physical keys, reducing the risk of lost or duplicated keys.
• Real-Time Notifications – Alerts for unauthorized access attempts improve situational awareness.

VIII. LIMITATIONS

1. Dependence on Internet/Wi-Fi – Remote access and notifications require a stable internet connection.
2. Power Dependency – The system may fail during power outages unless a backup is provided.
3. Vulnerability to Cyberattacks – IoT devices can be susceptible to hacking if security protocols are weak.

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4. Higher Cost – More expensive than traditional mechanical locks due to sensors, ESP32, and other components.

IX. CONCLUSION

The IoT-based Smart Lock System using ESP32 provides a secure, convenient, and modern solution for access control. By integrating multiple authentication methods such as RFID, fingerprint, and PIN, along with real-time monitoring via smartphone apps, it enhances both security and user convenience.

X. FUTURE SCOPE

The smart lock system can be enhanced by integrating AI and machine learning for facial recognition and intelligent access control. Voice-controlled access through assistants like Google or Alexa can add convenience. Battery backup or energy-harvesting solutions can reduce power dependency.

REFERENCES

[1]. N. Singh et al. (2021) "IoT Smart Lock using ESP8266 and Firebase" Summary: Used ESP8266 with Firebase for real-time data storage and control. Enabled access logs, status updates, and mobile app integration.
[2]. IEEE Paper (2022) "Secure Smart Lock System using IoT" Summary: Aimed at integrating facial recognition and RFID with Arduino and cloud-based logging for multi-level authentication.

ABOUT AUTHOR

	Name- Mr. U Shantha kumar Designation- Assistant professor Phone Number- 9986224671 E-mail id - shanthakumaru@rymec.in
	Name –Abhisheka G Designation-Student USN– 3VC23EE403 Phone Number–90119954285 E-mail id –abhigabhishekg76@gmail.com
	Name- Basavaraj s angadi Designation-Student USN –3VC23EE409 Phone Number–8088372563 E-mail id –abhi8951kpt@gmail.com

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	Name-Hosakeri kiran Designation- Student USN- 3VC23EE418 Phone Number-7022122559 E-mail id –hosakerikirana.eee.rymec@gmail.com
	Name-Prashanth T Designation- Student USN- 3VC23EE442 Phone Number-7204859921 E-mail id –prashanth.talavar1234@gmail.com