Door Lock System Using Mobile Fingerprint

Omkar Sutar[1], Harshwardhan Chougale[2], Saurabh kamble[3], Atharv Bhosale[4], D.K. Kamble[5]

[1,2,3,4]*Student, Computer Engineering Department, K.P. Patil Institute of Technology (Poly), Mudal, India*
[5]*Guide, Lecturer, Computer Engineering Department, K.P. Patil Institute of Technology (Poly), Mudal, India*

Abstract—This project presents a smart door lock system controlled using a mobile phone fingerprint authentication mechanism. The system enhances home and office security by eliminating traditional keys and passwords. The authorized user unlocks the door through a mobile application after fingerprint verification on the smartphone. Once authenticated, a signal is sent via IoT technology to the microcontroller, which controls the door lock mechanism. This system provides high security, convenience, and real-time access control, making it suitable for modern smart homes.

I. INTRODUCTION

In today's world, security has become a critical concern due to increasing cases of theft, unauthorized entry, and intrusion. Conventional door locking systems based on mechanical keys or passwords are prone to security breaches. Keys can be lost or duplicated, and passwords can be forgotten or hacked.

Biometric authentication provides a reliable and secure alternative as it uses unique biological characteristics of individuals. Among various biometric techniques, fingerprint recognition is widely used due to its accuracy, reliability, and ease of use. Every individual has a unique fingerprint pattern, making fingerprint authentication highly secure.

In this project, the smartphone's fingerprint sensor is used instead of a dedicated fingerprint module, reducing hardware complexity and cost. After successful fingerprint authentication through a mobile application, the door lock is controlled wirelessly using IoT technology. This system improves security, convenience, and automation while eliminating the need for physical keys.

II. LITERATURE SURVEY

Several researchers have proposed different smart door locking mechanisms using modern technologies.

A study on "Smart Door Lock System Using IoT and Android Application" describes a password-based door unlocking method through a mobile app. Although the system provides remote access, it lacks biometric-level security and is vulnerable to password theft.

Another research work titled "Fingerprint Based Door Lock System Using Microcontroller" uses a standalone fingerprint sensor connected to a microcontroller.

While the system offers strong security, it requires additional hardware and local fingerprint storage, increasing system cost.

Recent advancements in IoT-based smart home security systems emphasize the integration of mobile applications, cloud services, and wireless communication. Using the mobile phone's fingerprint sensor combines the advantages of biometric security with minimal hardware, making the system more efficient, scalable, and cost-effective.

IoT-enabled door lock systems allow real-time access control and monitoring through mobile applications. These approaches demonstrate that combining biometric verification with IoT technology provides a reliable and cost-effective solution for modern security systems.

III. BLOCK DIAGRAM
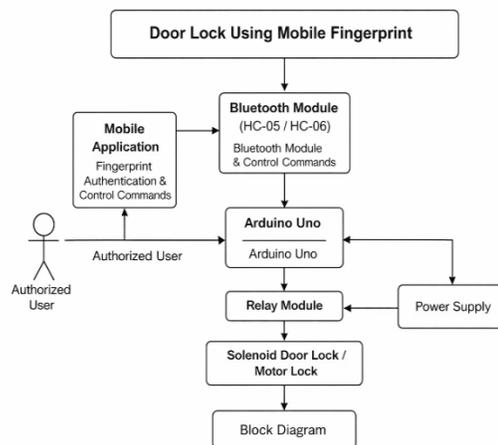
The block diagram of the Door Lock Using Mobile Fingerprint system consists of the following main components:

1. *Mobile Application:* Provides user interface for fingerprint authentication and door control.

2. *Smartphone Fingerprint Sensor:* Verifies the authorized user biometrically.

3. *Bluetooth Module (HC-05 / HC-06):* Enables wireless communication between the smartphone and Arduino.

4. *Arduino Uno:* Acts as the central control unit that processes commands.

5. *Relay Module:* Works as an electronic switch to control the door lock.
6. *Solenoid Door Lock / Motor Lock:* Physically locks or unlocks the door.
7. *Power Supply:* Provides necessary power to all components.

IV. METHODOLOGY

The working of the proposed system is simple, secure, and efficient. The authorized user opens the mobile application and authenticates using the smartphone's fingerprint sensor. If the fingerprint matches the registered biometric data stored on the phone, the application sends an unlock command wirelessly to the Arduino Uno through the Bluetooth module.

The Arduino receives the signal and activates the relay module, which supplies power to the solenoid door lock. The lock is unlocked for a predefined time interval, after which it automatically locks again. This automatic locking feature enhances safety by preventing unauthorized access.

Unauthorized users cannot unlock the door because fingerprint authentication is mandatory. Thus, the system ensures a high level of security with minimal human intervention.

A. Implementation Steps

1. Install the mobile application on the smartphone.
2. Register authorized fingerprints on the mobile device.
3. Establish Bluetooth connection between smartphone and Arduino.
4. Perform fingerprint authentication using the mobile app.
5. Send unlock command to Arduino after successful verification.
6. Arduino activates relay to unlock the door.
7. Door locks automatically after a fixed delay.

B. Results and Outcomes

After successful implementation and testing of the Door Lock Using Mobile Fingerprint system, the following results and outcomes were observed:

The system accurately unlocked the door only after successful fingerprint authentication on the mobile device, ensuring high security.

Unauthorized users were completely restricted from accessing the door, as fingerprint verification is mandatory.

Wireless communication between the mobile application and Arduino Uno using the Bluetooth module (HC-05/HC-06) was stable and reliable within the operating range.

The relay module responded correctly to control signals, enabling smooth operation of the solenoid door lock.

The automatic locking feature ensured that the door re-locked after a predefined time interval, enhancing safety.

The response time between fingerprint verification and door unlocking was minimal, providing a fast and user-friendly experience.

The system functioned efficiently with low power consumption and minimal hardware requirements.

The overall system cost was reduced by using the smartphone's built-in fingerprint sensor instead of a separate biometric module.

V. MODULE DESCRIPTION

1. Mobile Application

The mobile application provides a user-friendly interface for fingerprint authentication and door control. It ensures that only authorized users can access the door lock system..

Fig1. Mobile Application [1]

2. Fingerprint Sensor (Mobile-Based)

The smartphone's built-in fingerprint sensor is used for biometric verification. It offers high accuracy, reliability, and eliminates the need for an external fingerprint module.

Fig 2. Fingerprint Sensor [2]

3. Arduino Uno

Arduino Uno acts as the main microcontroller unit. It receives commands from the Bluetooth module and controls the relay module based on the received signals.

Fig.3AurdinoUno [3]

4. Bluetooth Module (HC-05 / HC-06)

The Bluetooth module enables wireless communication between the mobile application and Arduino Uno within a short range
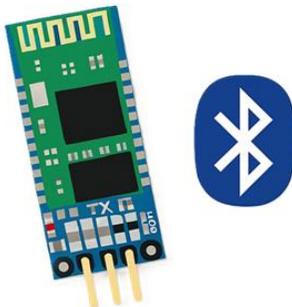

Fig.4 Bluetooth Module [4]

5. Relay Module

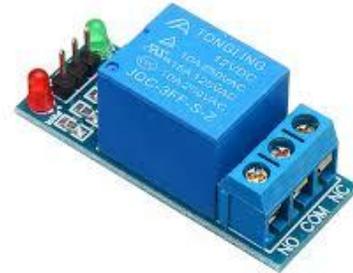The relay module functions as an electronic switch that controls the power supply to the solenoid lock.

Fig.5 Relay Module [5]

6. Solenoid Door Lock

The solenoid lock is responsible for physically locking and unlocking the door when activated.

Fig. 6 Solenoid Door Lock[6]

VI.   MERITES

Increased security through biometric verification: Mobile fingerprint authentication ensures secure and accurate user identification, preventing unauthorized access.

- *Elimination of physical keys:* The system removes the need for traditional keys and passwords, reducing the risk of loss or duplication.
- *Real-time access control:* Wireless communication enables instant door locking and unlocking with immediate system response.
- *Reduced unauthorized entry:* Biometric authentication and automatic locking significantly reduce the chances of intrusion.

- *Cost-effective implementation:* Using the smartphone's built-in fingerprint sensor minimizes additional hardware requirements.

- *Improved user convenience:* Mobile-based control offers an easy and quick method for authorized users to access the door.

VII. ABBREVIATION

- IoT – Internet of Things
- MCU – Microcontroller Unit
- RF – Radio Frequency
- Bluetooth – Wireless Communication Technology

VIII. CONCLUSION

The Door Lock Using Mobile Fingerprint system provides a secure, reliable, and modern access control solution.

By integrating mobile fingerprint authentication with IoT technology, the system significantly enhances security while reducing hardware cost and complexity. The use of a smartphone-based fingerprint sensor eliminates the need for additional biometric hardware and makes the system more user-friendly.

This project demonstrates an effective approach toward smart home automation and advanced security systems, offering convenience, safety, and technological innovation.

REFERENCES

[1] Smart Door Lock System Using IoT and Android Application, IEEE.
[2] Fingerprint Based Door Lock System Using Microcontroller, IJET.
[3] IoT-Based Smart Home Security System, International Journal of Engineering Research..