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An IoT Based and Enhanced Security of OTP Based Door Lock System

R Ravi Raman, Gudigunta Sukumar, Nadavala Yaswanth, Kappala Kumar, Damai Sandeep Kumar

Department of CSE, Assistant Professor, Narayana Engineering College, Gudur, India.

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KEYWORDS

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ABSTRACT

The OTP-Based Smart Wireless Locking System using Arduino is an innovative solution designed to enhance the security and convenience of traditional locking mechanisms. This system leverages the capabilities of Arduino micro controller[1] and wireless communication technologies[2] to create a secure and user-friendly lock system that operates based on One-Time Password (OTP) authentication. To unlock the system, users need to generate an OTP using a designated mobile application. The OTP is securely transmitted to the central control unit via a wireless communication protocol such as Bluetooth. Upon verification of the OTP's validity, the central control unit sends the corresponding command to the designated wireless lock module, [11] instructing it to unlock. The system in corporate several advanced features [5] to enhance security and functionality. Firstly, the OTP ensures a higher level of security by utilizing unique passwords for every authentication attempt, minimizing the risk of unauthorized access. The OTP-Based Smart Wireless Locking System using Arduino offers a reliable, secure, and user-friendly solution for modern access control needs.

1. INTRODUCTION

Security is the primary concern in this modern competitive world. Humans find various ways to give security but as technology is emerging on day-to-day basis chances of stealing others personal information has also increased. In view of this hazard, personal identification techniques which can recognize authorized and unauthorized user is now generating interest. In present days there are various personal identification techniques that we mostly see like password authentication, RFID authentication system. But those techniques are unreliable because the password hacking can be made easily and ID cards may get lost. Hence it is important to develop reliable,

security and safety system. The proposed system will be developed using fingerprint, OTP, and GSM. Biometric considers the automatic method of distinguishing a person or validating the identification of a person based on the behavioral or psychological characteristic. So now biometrics is used as authentication in various places.

The biometric that has been preferred for implementation of our paper is the fingerprint biometric because fingerprint biometric is effectively accessible and highly reliable when related to other biometrics. The fingerprint of all the users are saved first and verified during door access. If the fingerprint is similar to the enrolled fingerprint, then access accepted, generates OTP and through GSM sends the random OTP to the user mobile number. By using this model, users no need to remind passwords or don't need any kind of ID cards that may also get lost.

II. PROPOSED SYSTEM

The proposed system, "An IoT-Based and Enhanced Security of OTP Based Door Lock System" is designed to improve The Fingerprint or Password alone based methods have some cons now a day. To overcome this in our present proposed model we use both the fingerprint and OTP to provide more security. Initially, the authorized user's fingerprints are enrolled and stored in the fingerprint sensor memory. If the fingerprint of the user got matched then the user will get the random number as an OTP to his mobile from SIM in the GSM. In our proposed model, more locks are added to a single system and each lock is unlocked with specific address IDs. So by this instead of implementing separate door locks for every individual door, we can use only single lock system for multiple doors. If an unauthorized user tries to access it then automatically the buzzer will alarm and the LCD displays saying unauthorized user access.

When a registered user places their finger on the fingerprint scanner, the system verifies the fingerprint. If it matches the stored data, the Arduino triggers the SIM800LGSM module to send a onetime password (OTP) to the registered mobile number. The user must then enter the OTP on a 4x3 keypad, and if the entered OTP is correct, the relay module activates the solenoidal door lock, allowing access. The system is built with a focus on reducing the cost of high-end security systems while ensuring robust authentication, as shown in fig.1.

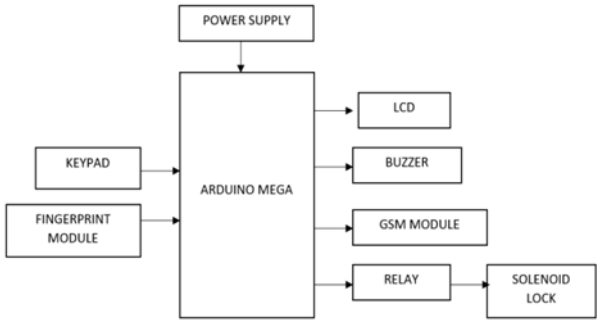

Fig.1:Block Diagram of OTP Based Door Lock System

Fig.2: Prototype of OTP Based Door Lock System

III. FLOWCHART

The Flow chart of OTP-based door lock system using Arduino and the SIM800L GSM module. The process begins with user selection, determining whether the individual attempting access is authorized or unauthorized. If unauthorized, access is immediately denied. If authorized, the user is prompted to place their finger on the fingerprint scanner for verification. If the fingerprint does not match the stored data, the system denies access and terminates the process. If the fingerprint is successfully verified, the system retrieves the user's registered mobile number from the database (DB). A one-time password (OTP) is generated and sent via the SIM800L GSM module to the registered mobile number. The user is required to enter the OTP using the 4x3 keypad. If the OTP matches, the relay module activates the solenoidal door lock, granting access for a predefined time before automatically locking again. The

system is designed with an automatic time out feature, ensuring that if the user does not enter the OTP within a specific period, the session expires, and the entire authentication process restarts. Additionally, the relay module, responsible for unlocking the door, is programmed to engage for a specific duration, typically between 5 to 10 minutes, after which the lock automatically reactivates. This ensures that the door is not left open accidentally, preventing security vulnerabilities. The LCD provides continuous feedback to the user, displaying messages such as

"Finger print Verified," "OTP Sent," and "Access Granted, "making the system intuitive and user-friendly.

For enhanced security, multiple authentication attempts are logged into the system, and failed login attempts can be reviewed to detect suspicious activity. Future improvements could include integrating a cloud based access log, allowing real-time monitoring of all access attempts. Furthermore, incorporating additional security features like RFID access or mobile app-based control can enhance convenience while maintaining a high level of protection. These optimizations make the OTP-based door lock system a robust and reliable solution for modern access control applications.

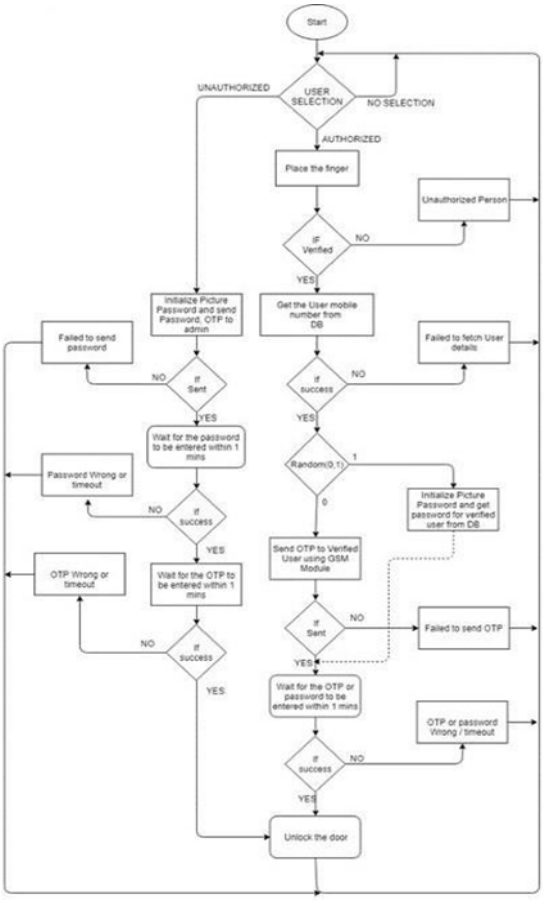

Fig.3:Flow chart of OTP Based Door Lock System

IV. RESULT

The OTP-based door lock system using Arduino and the SIM800L GSM module was successfully implemented and tested. The system efficiently authenticated users through a fingerprint sensor and generated a onetime password (OTP) sent via the GSM module to the registered mobile number. Upon entering the correct OTP on the 4x3 keypad, the relay module activated the solenoidal door lock, granting access. The LCD display provided real-time feedback at each stage, ensuring user-friendly operation. During testing, the system demonstrated high accuracy in fingerprint recognition and OTP verification, enhancing overall security. The response time of the GSM module depended on network strength, with occasional delays in OTP delivery in low-signal areas.

Further analysis revealed that the system effectively prevented unauthorized access, as both fingerprint authentication and OTP verification were required. However, improvements such as network signal strength detection, alternative authentication methods (e.g., RFID or backup pass codes), and a rechargeable battery backup could enhance reliability. Power consumption was found to be optimal, with the transformer providing stable power to all components. The system can be further expanded for smart home automation by integrating IoT-based monitoring and control features. Overall, the project successfully met its security objectives, demonstrating a cost-effective and scalable solution for modern access control systems.

V. CONCLUSION

The “IoT-Based and Enhanced Security of OTP Based Door Lock System” This paper solution is for highly secured reliable smart locker system. The system will effectively detect and control unauthorized access by considering safety of the bank locker rooms. It will convince the bank customers to use system and hence defend their valuable things from robber and also any harm. This system is used where top level security is needed. The future enhancement to this work could be done by adding some more aspect such as face recognition. Therefore it improved the reliability of bank locker and unauthorized access will be minimized. The enhancement could be further applied to identify the illegal entrance. The OTP-based door lock system using Arduino and the SIM800L GSM module successfully

integrates biometric authentication and OTP verification to provide a highly secure and efficient access control mechanism. By combining a fingerprint sensor for identity verification and an OTP system for additional security, the system ensures that only authorized users can access the door. The use of a relay module to control the solenoid lock allows for automatic unlocking and re-locking after a predefined duration, minimizing unauthorized access. Additionally, the LCD display and serial monitor output provide real-time updates, making the system user-friendly and easy to operate.

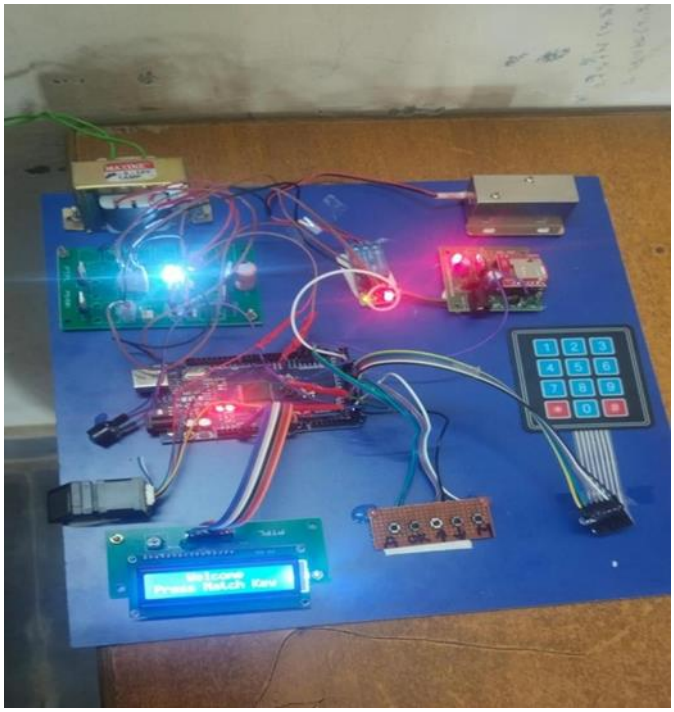

Fig.4: final output

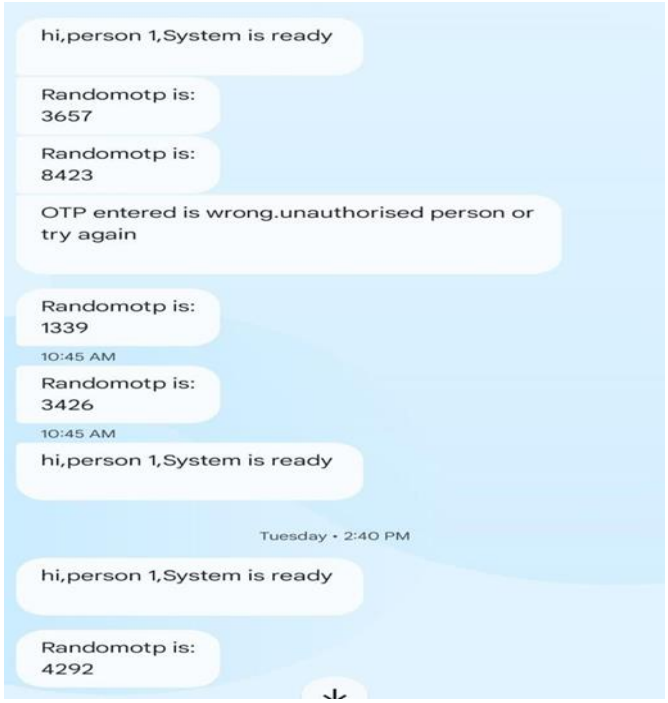

Fig.5: working output message

VI. FUTURE SCOPE

Future versions of The OTP-based door lock system using Arduino and SIM800LGSM module

offers a high level of security and reliability, making it suitable for various applications such as bank lockers, home automation, and confidential storage facilities. As technology advances, several enhancements can be made to improve the system's efficiency, security, and usability. One potential enhancement is the integration of face recognition technology to add an additional biometric authentication layer. This would make the system even more secure, as access would require both fingerprint verification and facial recognition, reducing the risk of unauthorized entry. Another improvement could be the implementation of IoT (Internet of Things) connectivity, allowing users to monitor and control the door lock remotely through a mobile application. With IoT integration, real-time notifications can be sent to users when an access attempt is made, ensuring better security monitoring.

Conflict of interest statement

Authors declare that they do not have any conflict of interest.

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