

Smart Multiple Lockers System using Biometric and One Time Password Authentication Security

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Abstract: *The Smart Multiple Locker System uses biometric authentication and One-Time Password verification for safe entry. Users register and authenticate via biometrics and receive a particular one-time Password for locker allocation. It has real-time monitoring, automatic alarms, and centralized management to ensure enhanced security. The system features tamper-proof locking, automatic locker assignment, and return detection. Ideal for schools, offices, gyms, and public places, the scalable system minimizes unauthorized access and optimizes locker space utilization. Secure, innovative, and reliable, it provides peace of mind and convenience to users, with convenience and efficiency in locker management for administrators. Efficiency and security converge in this revolutionary solution.*

Keywords: Smart Loker System, OTP and Fingerprint authentication, Multi-user locker access system, Smart storage solution etc

I. INTRODUCTION

In the modern, speedy, security-savvy age, secure and efficient storage solutions are a high priority for a number of sectors, including education, health, finance, and hospitality. Traditional locker systems all too often depend on keys, combinations, or cards, vulnerable to theft, loss, or unauthorized use, compromising security and confidentiality of contents. To meet these needs, the Smart Multiple Locker System integrates superior biometric authentication and one-time password verification to provide unparalleled security and convenience. By leveraging cutting-edge technologies, the Smart Multiple Locker System provides a firm, effective, and convenient storage solution that reduces security risks and optimizes locker utilization. Increasing demand for secure storage has moved locker systems from simple mechanical configurations to sophisticated, technology-driven solutions.

Biometric verification, particularly fingerprint and facial recognition, has been a reliable method of verifying identities, with improved security over traditional methods of verification. OTP verification adds an double layer of security to avoid unauthorized access and ensure that only authorized personnel are able to access the lockers. The Smart Multiple Locker System combines these technologies to deliver a secure, efficient, and user-friendly storage system that caters to the diverse requirements of various industries. The primary functions of the Smart Multiple Locker System are to plan and develop a consistent, biometric locker system with OTP authentication, provide an easy-to-use interface for effortless locker assignment and utilization, provide real-time monitoring and auto-alert for enhanced security, optimize utilization of the lockers, and prevent unauthorized access. The system comprises a biometric authentication module, OTP verification module, locker management system, user interface, and administrator portal.

Some of its key features are secure biometric login, OTP verification, auto-assign locker, real-time tracking and alert, tamper-proof locking system, simple and intuitive interface, and scalable and flexible architecture. The Smart Multiple Locker System offers a variety of benefits in terms of enhanced security, efficiency, convenience, cost-effectiveness, and flexibility. Using biometric authentication and OTP verification, the system ensures that only authorized individuals can open the lockers, eliminating security threats. Automated locker allocation and return detection enhance operations, reducing administration and maximizing usage of the lockers. The user-friendly accessible user interface and mobile app enable easy access, while real-time monitoring and alerts ensure prompt response to security threats. To develop the Smart Multiple Locker System, a disciplined process will be followed, i.e., requirements gathering, system design, implementation of hardware and software, testing and quality assurance, and deployment and maintenance.



Through an integral approach, the Smart Multiple Locker System shall provide a safe, efficient, and reliable storage solution that meets the specific requirements of various sectors. The success of the Smart Multiple Locker System shall rebrand secure storage solutions, making it a model for future endeavour in the industry.

II. OBJECTIVE AND LITERATURE REVIEW

2.1 OBJECTIVE

- Extensive literature survey on locker system.
- Draw block diagram of system.
- Hardware interfacing of circuit.
- Implementation and Coding of system.
- Troubleshooting & Testing of system.
- Validate the result.

2.2 LITERATURE REVIEW

Researchers have been looking into ways to improve locker system using technology. The one common approach is to use in double authentication in this system. This allows give two step authentication security system they give privacy in document. In addition to which user is come the system side it also found.

Vedant Naukarkar et al. [1] proposed a paper a bank locker system is provided which has a weight threshold sensor as one of its major components for increased security. The system employs an Arduino Uno microcontroller, a weight threshold sensor, a GSM SIM900A module, and a fingerprint R307 sensor for biometric authentication. Solenoid lock open mechanism is activated by the weight threshold sensor only if a predetermined set weight is placed on it.

Kota V Navya Priya et al. [2] proposed this system involves the combination of IoT sensors, microcontrollers, and other hardware components to develop a smart locker security system. The system utilizes two-factor authentication methods such as face recognition, fingerprint readers, and a password or PIN, to provide increased security. The software design oversees the entire system, including authenticating the process, communication from IoT sensors, and data encryption to prevent unauthorized access. There is also a provision of warning through email or SMS in the case of security vulnerability.

Dr. D. Vishnu Vardhan et al. [3] For those who are required to gain control over unwanted user access. Here, we design and install different entryway locker high-security system on the basis of unique fingerprint, OTP and GSM technology that can be used for secured offices, banks, and homes. In this, the system takes the biometric details and mobile number of a person for providing the lockers to the original people only. A single system can provide access control to multiple doors.

Varasiddhi Jayasuryaa Govindraj et al. [4] the present paper proposes a new design of a Smart door with the assistance of a biometric NFC band and OTP based authentication methods which would provide secure and convenient access to our houses. Our idea brings the potential to reduce the issues of such systems by reducing authentication time through the help of a biometric fingerprint sensor and brings in an added security feature through the help of a local server to generate OTP authentication. This method has been found to show better results and performance rate than before.

Pavithra Neelam et al. [5] proposed recommended that the main motive of this project is to implement and design a bank locker safety system based on Finger print and OTP technology. This can be applied in bank, offices and homes. Here only the valid person accesses the documents or amount from the lockers. Fingerprint and OTP is used here in this security system. In this system user first enter user name and password and mobile number. When user name and password both are correct then Finger of the person will be recognized and store with ID. When the ID get matched. Then four-digit code will send on authorized person mobile to open.

M. Arun Athithyan et al. [6] proposed system uses the biometrics and OTP. First level of this system is biometric authentication. In the subsequent stage of verification, it is using one time password followed by force-based justification for opening the locker. All the stages will be controlled by a microcontroller circuit and the locker will be



opened after verification of all the stages. The banks that are using this type of assured lockers are typically preferred by the clients due to the features.

Uma MAHESWARI K et al. [7] the proposed system becomes more efficient and dependable, and by incorporating all three stages, it is difficult to crack. The whole system's working indicates by led flashes. This method has produced better results with a higher performance rate than other traditional methods.

Priti Kandekar et al. [8] In this paper, we design and implement a Bank locker security system in which access is given to individuals whose faces are in the training database. First, we identify the face by detecting the motion of human. Then, recognition of the face is performed to verify the person's authority to enter into the sensitive region. At the same time, we monitor the coordinate of detected motion. Not detecting the face ultimately sends the estimated coordinate to aesthetic gun for automatically firing at the intruder.

III. MATERIALS AND METHODS

To develop the smart locker system, we will follow a five-step process. First, we'll gather requirement from user to understand their needs and desired functionalities. Then, we'll design the system architecture including hardware selection (Locker System, Finger Print Sensor, etc) and software development for data collection, analysis, visualization. In the implementation phase, we'll install the chosen sensors on Locker, configure data transmission and develop the locker system for to specific place. Finally, after through testing to ensure everything functions as intended, we'll deploy the system at the collage and provide maintenance and support.

Our system contains following steps:

- Develop an object detection system
- Develop a System to the real-time one-time password at user.
- Develop the two-step verification.
- Develop the first verification for finger print sensor.
- Develop the one-time password authentication system give the locker.

3.1 Existing work

The area of smart lockers system describes how much systems use double authentication security to the locker and provide real-time otp to the user to the Telegram application. Additionally, it highlights the use of Telegram Bot technology and Finger scanning technology for user identification.

3.2 Proposed Work

In The proposed IoT-based The Smart Multiple Locker System with Biometric and One-Time Password Authentication Security, in comparison, offers a different yet equally secure solution for safeguarding personal belongings. Like the IoT-based Smart Locker System, the locker system prioritizes both security and convenience. It utilizes biometric authentication, such as fingerprint to grant access, and an OTP ensures an additional layer of verification. This combination of advanced technologies offers a high level of protection against unauthorized access, making it ideal for industries where the confidentiality and security of stored items are critical. While both systems relay on cutting-edge technologies to improve their respective services, the Smart Multiple Locker System primarily addresses the need for efficient Locker and monitoring, whereas the locker system focuses on secure storage solutions. Both solutions emphasize real-time data processing, security, and streamlined user experience. The finger scanning than after finger is valid to send the otp at register mobile number, user enter the otp at keypad than after otp is verified to otp than otp in wrong than system will be restart than otp is too valid to move on the next step is locker is open.



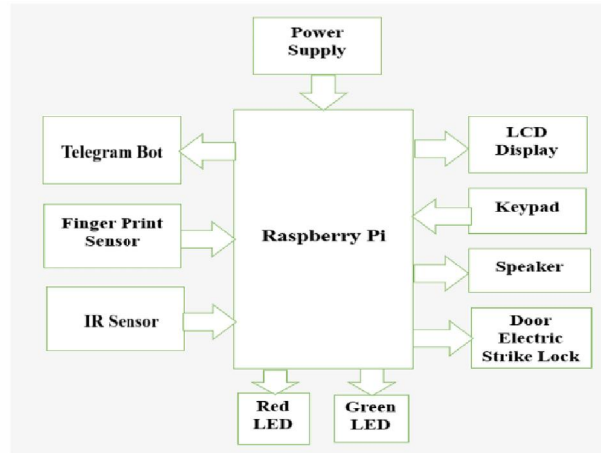


Fig 3.2.1. System Architecture

These smart multiple lockers system using biometric and one time password authentication security leverages the Internet of Things to create a more efficient and safer security experience for user. Onboard Telegram Bot and Fingerprint sensor act as the system's double layer security constantly give the security of the like documents and etc. The motion sensor detects the object and give the information for any object is come to the in front of the system. Then that time red led will be on. The lcd display is display the information. keypad is used as the enter the otp. fingerprint sensor is used to the scanning the and matching the finger at stored finger give the output for finger is match or not. Telegram Bot is used as the otp send process. Door electric strike lock used as the security system purpose.

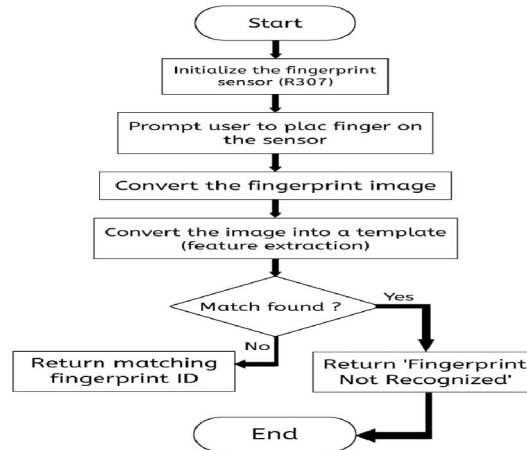


Fig 3.2.2 Fingerprint Flow Diagram



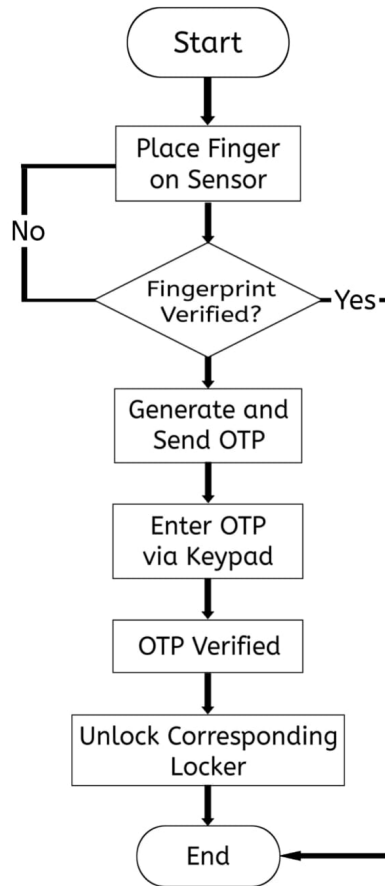


Fig 3.2.3 Flow diagram

3.3 Algorithm

Fingerprint Sensor

1. The fingerprint sensor is used as the enroll finger algorithm is also used.
2. Initializes Telegram Bot throw OTP is set as an output.
3. Loop
4. Continuously checks for new finger.
5. Reads finger, checks type and compares with stored data.
6. Compares Finger data with stored data.
7. Controls OTP based on verification outcome.

3.3.1. Telegram Bot

1. Include necessary libraries such as python-telegram-bot in raspberry pi.
2. Define the CHAT_ID and TOKEN_ID, as well as variables for OTP recipient numbers.
3. To Create at Bot father and get_id as Telegram.
4. Send at OTP to registered Telegrams Bot.



IV. RESULTS AND DISCUSSION

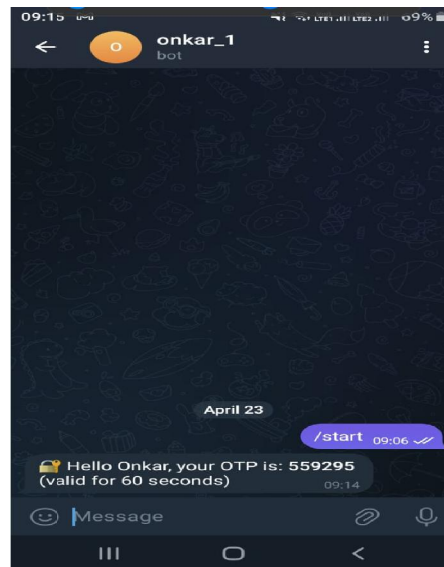


Fig. 4.1 OTP



Fig.4.2 Result

V. CONCLUSIONS

The Smart Multiple Lockers System integrates biometric and OTP authentication, ensuring secure storage. It enhances security, eliminates key management issues, and provides real-time monitoring. Suitable for banks, and secure



facilities, this system sets a new standard for storage solutions, providing a robust platform for protecting valuable assets efficiently.

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REFERENCES

- [1]. "Secure Bank Locker System with Biometrics", Ms. Binu¹ M. Arun Athithyan² G.K. Felins³ A. Mohammed Anish⁴ D. Sathish Kumar⁵ Assistant Professor^{2,3,4,5} Scholars^{1,2,3,4,5} Department of Electronics and Communication Engineering^{1,2,3,4,5} Sri Ramakrishna Institute of Technology Coimbatore, Tamil Nadu-641010, India, March 2017.
- [2]. "Smart Locker: IOT based Intelligent Locker with Password Protection and Face Detection Approach", Niaz Mostakima, Ratna R Sarkar^b, Md. Anwar Hossain^c, a Department of Electrical and Electronic Engineering, Atish Dipankar University of science and Technology, Uttara Dhaka 1230, Bangladesh, May 2019.
- [3]. "Bank Locker Security System Using Machine Learning with Face and Liveness Detection", Priti Kandekar¹, Aishwarya Pisare¹, Rupali Margale¹ BE, Computer Department, Marathwada Mitra Mandal's College of Engineering, Pune, India, April. 2021.
- [4]. "IoT Based Bank Locker System using Finger Print and OTP", 1R. Reddi¹ Rani² Pavithra Neelam¹ PG Scholar, 2Assistant Professor^{1,2} Department of ECE, Siddhartha Educational Academy Group of Institutions, Tirupati, Andhra Pradesh, India, January 2021.
- [5]. MAHESWARI¹ K1a, Uma, et al. "Smart Multi Verification Based Security System." El Cezeri Journal of Science and Engineering, El-Cezeri, Apr. 2022.
- [6]. "Bank locker security system with 2 step verification using GSM" M. SHRESHTA¹, P. BHAVANA², P. MANASA³, Mr. G. HARISH KUMAR⁴, 1,2,3 UG Students, Department of ECE, Malla Reddy Engineering College for Women (UGC-Autonomous) Maisammaguda, Hyderabad, Telangana, India, Nov. 2022.
- [7]. "SMART LOCKER", 1Athang Bachhav, 2 Omkar Gaikwad, 3Aditya Pawar 4Pranav Changond 1,2,3,4 Student, 1,2,3,4 Information Technology 1,2,3,4, Maratha Vidya Prasarak Samaj's Karmaveer Baburao Ganpatrao Thakare College of Engineering, Nashik, Maharashtra, India, March. 2022.
- [8]. "OTP Based Secure Locker System", 1Vishwasgowda M, 2C B Biddappa, 3R Shakti Kanthan, 4 Ms. Manasa E, 5Ms.Gloriya Priyadarshini 1Student, 2Student, 3Student, 4Assistant Professor/Mentor, 5Head of the Department Bachelor of Computer Application, Department of Computer Science St. Philomena's College, Mysuru, India, March. 2022.
- [9]. "Bank Locker System using Fingerprint, OTP and Threshold Weight", Vedant Naukarkar¹, Nishant Waghade², Shubham Dukale³, Prof. Sarika. S. Patil⁴, 1Student, Department of ENTC, Sinhgad college of Engineering, Vadgaon, Pune, June. 2023.
- [10]. "IoT Based Smart Bank Locker Security System Using Two-Way Authentication", 1Anjali¹ T, 2Bhoomika D R, 3Kota V Navya Priya, 4Bhoomika R and 5Syed Ateequr Rehman, 1,2,3,4,5 Dayananda Sagar Academy of Technology & Management, Bengaluru, India

