



A Survey on “Smart Authentication Door Locking System

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Abstract: The Smart Door Lock System is intended to give better access control and monitoring capabilities for homes, offices, and other structures. To improve the building's security, this system makes use of many elements such as electronic locks, keypads, biometric scanners, mobile apps, and cloud-based platforms. This system aims to replace conventional lock and key systems with more sophisticated and secure ones that provide more comfort, flexibility, and control. The Smart Doorlock System uses a number of different components, including an Arduino Uno, GSM module for OTP, keypad, LCD display, linear solenoid, relay, and IP camera. This essay gives a general overview of the Smart Door Lock System, outlining its elements, workings, and prospective uses. The study also analyses new trends and future directions in research on smart door lock systems, as well as the benefits and difficulties of deploying this system. In order to serve as a reference for researchers, practitioners, and stakeholders interested in this technology, the goal of this study is to provide a thorough understanding of the Smart Door Lock System and its possible impact on building security.

Keywords: Arduino UNO, GSM Module, Biometric Scanners, Linear Solenoid, Mobile Application, IP Camera.

I. INTRODUCTION

A smart door lock system that makes use of various parts, including an Arduino Uno, a GSM module for one-time passwords, a keypad, an LCD display, a linear solenoid, a relay, and an IP camera, to offer a safe and practical access control solution for residential or commercial buildings.

When a valid OTP is entered on the keypad and verified by the GSM module, the system should permit authorised people to enter the building. Real-time feedback on the input and output status of the system should be available from the LCD display.

To physically lock and open the door, utilise the linear solenoid and relay, respectively. To give live video feed of the entrance area that can be viewed remotely via a mobile application or website, the IP camera should be linked into the Application system. Users should be able to administer and monitor access control to their premises using the mobile application or web site, including creating OTPs, monitoring live video, and operating the door lock.

Strong encryption algorithms for data transmission and storage should be used in the system's architecture, along with considerations for security and dependability. The system should also have the flexibility to add or remove components as needed and be expandable to accommodate various building sizes and layouts.

II. LITERATURE REVIEW

A significant amount of research has been done recently to create smart door locking systems. Because to their affordability and ease of use, Arduino microcontrollers have become a popular alternative for managing smart door locks.

In a study by Mustafa et al. (2018), a Bluetooth module, keypad, and Arduino microcontroller were used to create a smart door locking system. The solution added an extra degree of security by allowing customers to lock and unlock the door using a mobile application "A Comparative Study of Smart Door Lock Technologies" by A. Almogren et al. (2019): This study compared Bluetooth, Wi-Fi, and Z-Wave smart door lock technologies. Z-Wave was found to be the most secure and dependable technology after the authors compared each one's security, dependability, and usability.

K. Lee et al. (2018): Says “The current state of key management systems and smart door locks was investigated in this survey. The authors pointed out a number of important problems, including interoperability issues, usability issues, and security concerns. To address these problems and enhance the overall user experience, they recommended that more research be conducted.”

Study suggested an NFC (Near Field Communication)-based smart door lock solution. A prototype system that let users use their mobile phones to unlock their doors was created and put into practise by the authors. They assessed the system's use and security and discovered that it was dependable and practical.

Y. He et al. (2020) discuss “The available research on the security of smart lock systems was compiled in this review article. The authors noted a number of weaknesses and dangers, including Bluetooth and Wi-Fi attacks and password cracking. They indicated that additional study was required to boost these systems' security and reduce these hazards.”

Zhang, Chen, Lai, and (2020) focused on: The user experience of smart door lock systems was the focus of a study conducted by Lai, Chen, and Zhang in 2020. Researchers polled 120 participants in their study and discovered that users were generally happy with the practicality and security of smart lock systems. Yet, the survey also discovered that consumers wanted to have a backup key in case the system failed and that they were concerned about the systems' dependability.

III. PROBLEM STATEMENT

To create a system that only allows authorised people access to a location that is secure, practical, and user-friendly. With cutting-edge features like remote access, biometric authentication, and real-time monitoring capabilities, the system should offer an alternative to conventional lock-and-key systems.

IV. PROPOSED SYSTEM

The proposed system deals with the more affordable, user-friendly system that only allows authorised people. The Smart Doorlock System is a security solution that utilizes various components such as Arduino Uno, GSM module for OTP, keypad, LCD display, linear solenoid, relay, and IP camera to provide secure access control and real-time video footage. It is a versatile and cost-effective security solution that has numerous applications in different settings, including homes, offices, and commercial buildings. The system provides unique One-Time Password (OTP) generated by the GSM module to unlock the door, which is entered through the keypad and displayed on the LCD display. The linear solenoid is responsible for locking and unlocking the door, and the relay acts as a switch to control the power supply to the solenoid. The IP camera provides live video footage of the door and its surroundings, which can be streamed to a designated mobile device or computer for real-time monitoring. Overall, the Smart Doorlock System is a reliable and user-friendly security solution that can be customized to suit different security needs.

Components to be used:

• Arduino UNO

The Arduino is a piece of open-source hardware and software that enables efficient use by the user. This tool is used to realize electronic circuits ranging from simple to complex. These microcontroller devices aid in the sensing and management of things in real-time environments and circumstances. Arduino is combined with Integrated Development Environment (IDE) software. IDE is a program that can be used in designing or sketching programs for Arduino boards. Market prices for these boards are lower. Numerous inventions have been made in it, and it still exists now.



Figure 1: Arduino UNO

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• **GSM Module:**

GSM Module for OTP: A mobile phone can communicate with a computer or microcontroller using a GSM (Global System for Mobile Communications) module. A smart door lock system can use a GSM module to send One Time Passwords (OTPs) to the mobile phones of authorised users.



Figure 2: GSM Module

• **Keypad:**

An input device used to enter a passcode to unlock the door is a keypad. To unlock the door, the user must push the appropriate buttons in the right order, which are placed in a grid style.



Figure 3: Keypad

• **LCD Display:**

LCD Display: An LCD (Liquid Crystal Display) display is a flat-panel display that exploits the light-modulating characteristics of liquid crystals. In a smart door lock system, the state of the door lock, such as whether it is locked or unlocked, can be shown on an LCD display.



Figure 4: LCD Display

• **Linear Solenoid:**

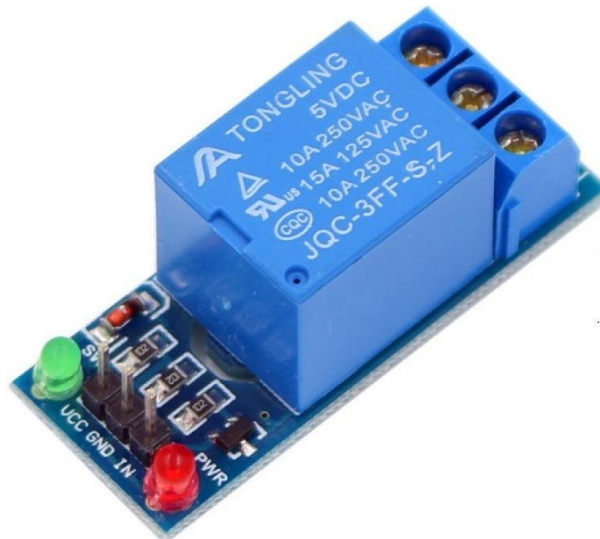
Linear Solenoid: An electromechanical device known as a linear solenoid transforms electrical energy into linear motion. In a smart door lock system, the door can be physically locked or unlocked using a linear solenoid.



Figure 5: Linear Solenoid

• **Relay:**

Relay: A relay is a switch that is electrically controlled and used to send low-power signals to high-power devices. The linear solenoid that locks or unlocks the door can be controlled by a relay in a smart door lock system.



V. METHODOLOGY

The user approaches the door and places their finger on the fingerprint sensor.

The fingerprint sensor records the fingerprint image and compares it to the templates that are stored in the system database to determine whether or not the fingerprint is valid. If the fingerprint is accurate, the system uses the GSM module to send an OTP to the user's registered mobile number.

The user enters the OTP using the keypad on the door after receiving it on their mobile device. If the OTP entered by the user is valid, the system releases the door lock, allowing the user to open the door. The door remains locked and the user is instructed to try again if the OTP is wrong or invalid.

The door's keypad notifies the user when the OTP needs to be entered and displays system status information, such as whether the door is locked or unlocked.

The IP camera captures live video footage of anyone who enters or exits the door, which can be accessed by the authorised personnel for security monitoring.

If the user fails to enter the correct OTP after a certain number of attempts, the system may trigger an alarm or notify the authorised personnel.

The smart door lock system makes use of a fingerprint biometric for user identification, a GSM module for OTP generation and transmission, a keypad for user input and system status display, an IP camera for live video feed, and a door lock for controlling physical access. The IP camera adds additional security monitoring, and the multi-factor authentication system offers a high level of security for the door lock system, making it difficult for unauthorised people to get entry.

VI. CONCLUSION

The proposed Advance door lock system is an advanced and reliable solution for access control. It supports multi-factor authentication, which includes physical access control via a door lock, biometric identification, and the creation of OTPs. The technology is practical for users because it has a keypad for display and an app for remote access. The system also comes with an IP camera that records live video, adding to the monitoring and surveillance options to improve the facility's security.

VII. FUTURE ENHANCEMENT

In the future, Advance door lock system include may insert advance biometric for better scanning, fast message through GSM, more flexibility, Customized access: The smart lock can be set up to recognise specific users Emergency Access Provide a mechanism that permits authorised personnel to enter the home in case of an emergency.

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