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SMART DOOR MONITORING AND LOCKING SYSTEM USING SIM900 GSM SHIELD AND ESP32

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ABSTRACT: ***The development of a smart door system represents a significant stride in addressing the paramount concern of home security through the utilization of cutting-edge technology. This innovative system amalgamates components such as the ESP 32 microcontroller, GSM Technology, and assorted electronic elements to provide a comprehensive security solution for residential premises. At its core, this system boasts an ESP 32 microcontroller, serving as the central processing unit orchestrating the diverse functionalities seamlessly. The microcontroller interfaces adeptly with an array of sensors strategically positioned to monitor the door's state, promptly detecting any unauthorized access attempts.***

Leveraging this capability, the system promptly generates a one-time password (OTP) and dispatches it via SMS to the designated owner's mobile device whenever the door is accessed without proper authentication, thus fortifying security measures. To furnish users with visual cues regarding the door's status, the system incorporates a sophisticated lamp control mechanism. Through this feature, individuals can discern whether the door is securely locked or accessed, enhancing situational awareness and bolstering peace of mind. Moreover, the integration of voice recognition technology stands as a testament to the system's advanced capabilities, facilitating hands-free operation for seamless user experience.

The convergence of IoT and embedded technologies underpins the functionality of smart door monitoring systems, empowering homeowners with a diverse array of security enhancements. By harnessing the power of modern technology, this system transcends conventional security measures, offering a holistic approach to safeguarding residential premises against potential threats. In essence, the development of this smart door system underscores a paradigm shift in home security paradigms, underscoring the efficacy of leveraging contemporary technology to mitigate risks and fortify protective measures. As technology continues to evolve, innovations like these promises to redefine the landscape of residential security, ushering in an era of heightened safety and peace of mind for homeowners worldwide.

Keywords: ESP 32; SIM900 GSM; Smart Door; OTP notification, IOT module.

CHAPTER 1
INTRODUCTION
1.1. General

The development of a smart door monitoring and locking system represents a pivotal advancement in leveraging contemporary technology to safeguard residential premises. This innovative project seamlessly integrates two cutting-edge technologies: the ESP32 microcontroller and the SIM900 GSM shield, along with various other electronics components, to deliver a comprehensive security solution. At its essence, this system is designed to address the critical vulnerabilities associated with

traditional door locking mechanisms by harnessing the power of embedded systems and the Internet of Things (IoT). By combining the robust capabilities of the ESP32 microcontroller and the SIM900 GSM shield, enhancing both monitoring and control functionalities. The core functionalities of this system are meticulously designed to cater to the multifaceted aspects of home security. Door monitoring, facilitated by the ESP32 microcontroller interfacing with an array of sensors, enables real-time detection of the door's status, whether it is open or closed. This seamless integration allows for prompt action in the event of unauthorized access, with the generation of a one-time password (OTP) and its transmission via SMS to the designated owner's mobile device. Moreover, the system offers remote locking and unlocking capabilities through SMS commands, empowering homeowners with unprecedented control over access to their premises, regardless of their physical location. The inclusion of a lamp control mechanism provides visual feedback on the door's status, further enhancing situational awareness and peace of mind. Furthermore, the integration of voice recognition technology epitomizes the system's commitment to user-centric design, offering a hands-free operation option for added convenience and accessibility. In essence, this project embodies the fusion of embedded systems and IoT technologies to create a sophisticated yet user-friendly smart door monitoring and locking system. As the demand for enhanced home security solutions continues to rise, initiatives like this pave the way for a safer and more connected future in residential security applications.

Example: Sarah uses a smart door system with ESP32 and SIM900 GSM technology to receive SMS alerts and remotely control her door's locking, ensuring her home's security even when she's away.

1.2. Scope of the project

1. Development of a smart door system leveraging modern technology to address the critical issue of home security.
2. Utilization of ESP32 microcontroller and GSM Technology along with other electronic components.
3. Core functionalities include door monitoring, OTP-based authentication, remote locking/unlocking via SMS, lamp control, and voice recognition.
4. Primary objective is to provide homeowners with a cost-effective yet robust security solution.
5. ESP32 microcontroller serves as the heart of the system, interfacing with various sensors to monitor door status.
6. OTP-based authentication mechanism enhances security by generating SMS alerts for unauthorized access attempts.
7. Remote locking/unlocking capabilities via SMS commands offer added convenience and flexibility to homeowners.
8. Lamp control mechanism provides visual feedback on door status, enhancing security and user awareness.
9. Integration of voice recognition enables hands-free operation, minimizing physical interaction with the system.
10. Incorporation of IoT module facilitates communication with other IoT-enabled devices, offering a comprehensive approach to home security with real-time monitoring and predictive maintenance capabilities.

1.3. Objectives of the project

1. Develop a smart door system leveraging modern technology to address home security concerns.
2. Integrate ESP32 microcontroller and GSM technology for robust functionality.
3. Implement door monitoring capabilities to detect open or closed states.
4. Establish OTP-based authentication for enhanced security measures.
5. Enable remote locking and unlocking of the door via SMS commands.
6. Incorporate lamp control mechanism for visual feedback on door status.
7. Integrate voice recognition for hands-free operation.
8. Ensure cost-effectiveness without compromising functionality.
9. Enable communication with other IoT devices for comprehensive home security.
10. Facilitate real-time data exchange and proactive threat detection through IoT capabilities.

1.4. Justification and Relevance

The smart door system described offers a holistic approach to addressing home security concerns by integrating modern technologies such as ESP32, GSM, and IoT. Its OTP-based authentication, remote locking/unlocking, and voice recognition features enhance security while providing convenience. The system's affordability makes advanced security accessible to all homeowners. Furthermore, its integration with IoT enables real-time monitoring, data analytics, and predictive maintenance, offering proactive security measures. With its comprehensive features and cost-effectiveness, the system is relevant and justified in providing peace of mind and safeguarding people's belongings, addressing critical safety issues in homes of varying sizes and economic backgrounds.

CHAPTER 2
LITERATURE SURVEY
2.1. General

After the study of many literatures about design, process and working of the smart door, some of them describe the methodology how to monitor the status of the door. Lots of features have been consider for monitoring the smart door such as Finger recognition, Message, Key password, OTP based, camera module, buzzer etc,. So, lots of literatures have been found which gives the relevance information and methodology of monitoring the smart door and working.

2.2. Historical Background

The evolution of security systems has been marked by significant technological advancements over the years. Ramses Wanto Tambunan et al.'s paper (2022) represents a contemporary approach to security, integrating RFID, fingerprint, and keypad systems. Mohammed Amenulleh's work from 2013 signifies a pivotal moment in the integration of microcontrollers into security systems. This era saw the increasing affordability and prevalence of microcontrollers, facilitating their incorporation into various applications, including digital door lock security systems. Amenulleh's focus on GSM/CDMA technology highlights a shift towards wireless communication for remote monitoring and control, laying the groundwork for future developments in smart security systems. Murthy et al.'s research in 2018 builds upon these foundations by leveraging GSM technology for advanced alert systems in home security. By this time, GSM networks had become widespread, enabling seamless communication between security devices and users' mobile devices. This marks a transition towards more connected and responsive security solutions, catering to the growing demand for remote monitoring and instant notifications. Sumalatha et al.'s paper in 2016 addresses the specialized security needs of the banking sector. The integration of RFID and GSM technologies reflects a growing concern for securing valuable assets like bank lockers. This period witnessed a heightened focus on enhancing security measures in financial institutions, driven by regulatory requirements and increasing incidents of security breaches.

CHAPTER 3
PROBLEM STATEMENT

The critical issue of home security, particularly the safety of people's belongings, is among the most pressing concerns for homeowners. Traditional door locking mechanisms often lack the sophistication needed to address modern security challenges effectively. Instances of unauthorized access or breaches in security pose significant risks to property and occupants. The system addresses the need for enhanced security through features such as door monitoring, OTP-based authentication, remote locking/unlocking, and visual feedback mechanisms.

One of the primary problems the smart door system seeks to solve is the vulnerability of traditional locks to unauthorized access attempts. By incorporating OTP-based authentication, the system provides an additional layer of security, ensuring that only authorized individuals can access the premises.

Voice recognition technology offers a solution to this problem by enabling hands-free operation of the door. Homeowners can simply issue voice commands to unlock or lock the door, eliminating the need for physical interaction and enhancing convenience. Additionally, the integration of visual feedback mechanisms, such as the lamp control mechanism, enhances security by providing instant visual confirmation of the door's status. This addresses concerns regarding the reliability and visibility of security measures, ensuring that homeowners can easily verify the security status of their premises.

By incorporating IoT capabilities, the smart door system gains the ability to communicate with other IoT-enabled devices such as security cameras, motion sensors, and smart home hubs. This interconnectedness allows for a more holistic approach to home security, with the smart door system serving as a central component in a network of integrated devices.

CHAPTER 4
EXISTING WORK

The innovative smart door monitoring and locking system enhances home security and convenience through real-time notifications and visual cues. Key features include SMS alerts for door activity and a lamp control mechanism for visual status indication. Customizable and seamlessly integrating with smart home ecosystems, the system utilizes Arduino Uno microcontrollers and GSM technology for robust performance and affordability. Representing a significant advancement in home security, it offers comprehensive solutions to critical security concerns with ease of use and accessibility for a wide range of users.

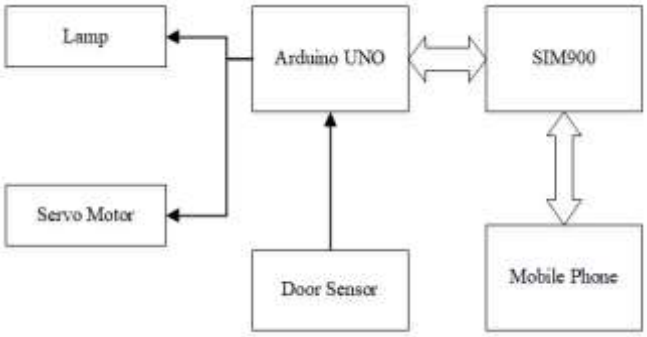


Figure 1: Block diagram of existing work

CHAPTER 5
PROPOSED WORK

The smart door system integrates ESP 32 microcontroller and GSM technology for home security. Door sensors trigger security measures; OTP-based authentication sends SMS alerts for unauthorized access. Remote control via SMS adds flexibility. Lamp control confirms door status visually. Voice recognition enables hands-free operation. Affordable components maintain functionality. IoT integration communicates with other smart devices, enhancing security. Cloud services enable remote monitoring. Advanced analytics and predictive maintenance enhance proactive security. Overall, the system offers a comprehensive, cost-effective solution, ensuring peace of mind and affordability for all households.

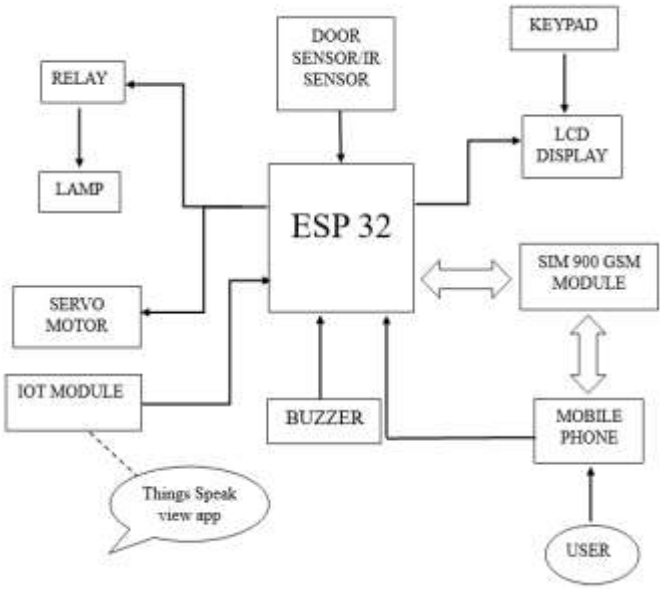


Figure 2: Block diagram of proposed model

Hardware Requirements:

- ESP32
- SIM900 GSM module
- Servo motor
- Relay
- LCD Display
- Keypad
- Buzzer

IR sensor Software Requirements:

- Thingspeak view app
- Arduino Bluetooth control app

5.1. Components Used

Following components has been used to construct this project

5.1.1. ESP32

ESP32 comes with an on-chip 32-bit microcontroller with integrated Wi-Fi + Bluetooth + BLE features that targets a wide range of applications. ESP32 is highly-integrated with in-built antenna switches, RF balun, power amplifier, low-noise receive amplifier, filters, and power management modules. ESP32 adds priceless functionality and versatility to your applications with minimal Printed Circuit Board (PCB) requirements. Hybrid Wi-Fi & Bluetooth Chip.

Figure 3: ESP32 Board

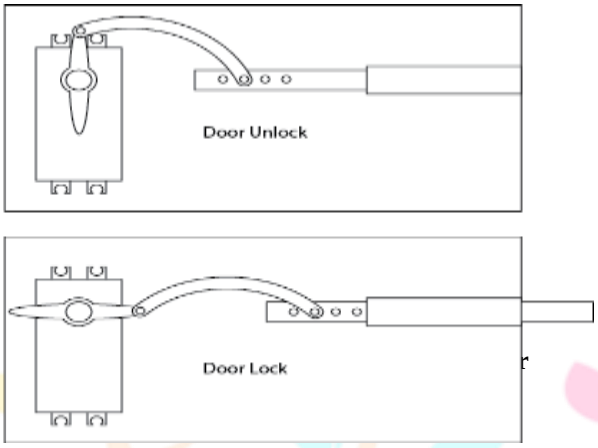
5.1.2. SIM900 GSM module

SIM 900 GSM/ GPRS shield is a GSM modem specifically designed for the ESP32 which can be integrated into a great number of Embedded projects. This shield can be used to accomplish almost anything a normal cell phone can; SMS text messages, make or receive phone calls, connecting to the internet through GPRS, TCP/IP, and more. The shield supports quad-band GSM/GPRS network, meaning it works pretty much anywhere in the world**.**

Figure 4: SIM900 GSM module

5.1.3. Servo motor

A servo motor is a rotary actuator that follows for precise control of the angular position. It consists of a motor coupled to a sensor for position feedback. It also requires a servo drive which uses the feedback sensor to precisely control the rotary position of the motor. The lock can be locked and unlocked by the servo motor. To unlock the lock switches the servo motor to 0 degrees and to lock the lock switches the servo to 90 degrees.



5.1.4. Relay

Relays are switches that open and close circuits electromechanically or electronically. When a relay contact is normally open (NO), there is an open contact and when it is Normally Closed (NC), there isa closed contact when the relay is not energized. In either case, applying an electrical current to the contacts will change their state. The lamp can be switch on and off by break one of the wires and connect the two broken ends to the relay. One end goes to NC or NO point and the other goes to the common (COM) point.

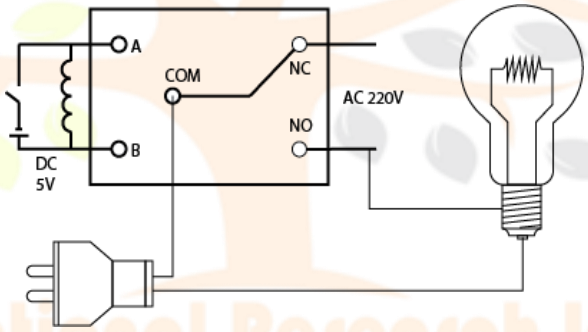


Figure 6: Relay and lamp

5.1.5. LCD display

The term LCD stands for liquid crystal display. It is one kind of electronic display module used in an extensive range of applications like various circuits & devices like mobile phones, calculators, computers, TV sets, etc. These displays are mainly preferred for multi-segment light-emitting diodes and seven segments. The main benefits of using this module are inexpensive; simply programmable, animations, andthere are no limitations for displaying custom characters, special and even animations, etc.

Figure 7: LCD display

5.1.6. Keypad

A 4*4 matrix keypad can be implemented separately or within the physical product itself, such as a security access controller, where it is used for PIN identifications. Either way, the mechanism of the mechanical keypad remains the same when hardware and firmware designers are concerned. Keypad is used as an input device to read the key pressed by the user and to process it. 4x4 keypad consists of 4 rows and 4 columns. Switches are placed between the rows and columns. A key press establishes a connection between the corresponding row and column, between which the switch is placed.

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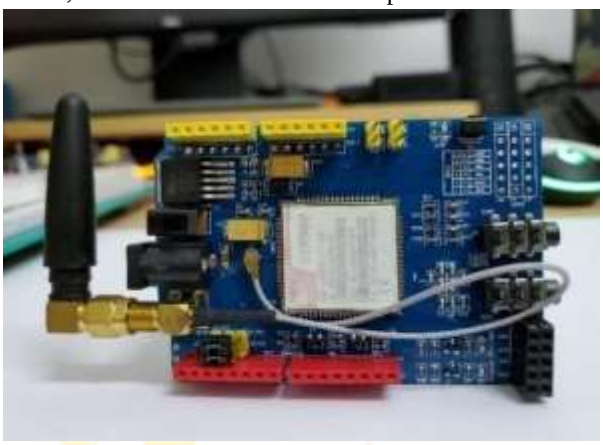

Figure 8: 4*4 Keypad

5.1.7. Buzzer

A buzzer or beeper is an audio signaling device, which may be mechanical, electromechanical, or piezoelectric (piezo for short). An audio signaling device like a beeper or buzzer may be electromechanical or piezoelectric or mechanical type. The main function of this is to convert the signal from audio to sound. Generally, it is powered through DC voltage and used in timers, alarm devices, printers, alarms, computers, etc. Based on the various designs, it can generate different sounds like alarm, music, bell & siren.

Figure 9: Buzzer

5.1.8. IR sensor

The project uses IR sensor is a device that uses infrared technology to detect objects or changes in the environment IR sensors can detect a wide range of physical properties such as temperature, motion, and proximity. A contactless infrared (IR) digital temperature sensor (MLX90614) then senses the body temperature of the human and if the temperature is above the brink temperature, the output signal is transmitted to the direct current (DC) motor that's used to unlock the door.

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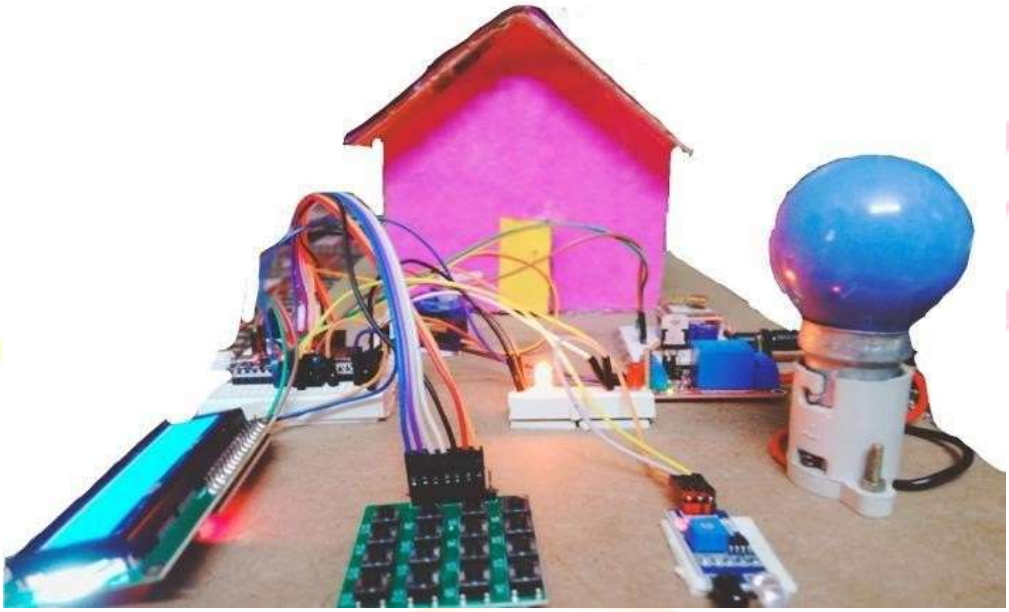
5.1.9. Thingspeak view

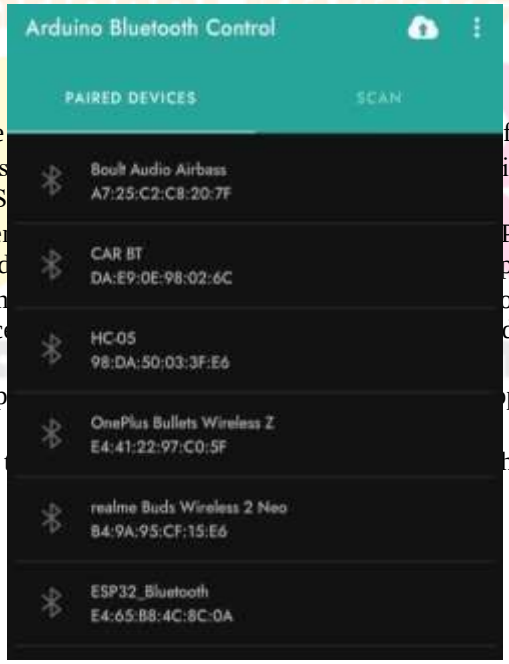
Thingspeak view is a platform providing various services exclusively targeted for building IOT applications. It offers the capabilities of real-time data collection, visualizing the collected data in the form of charts, ability to create plugins and apps for collaborating with web services, social network and other APIs. It provides instant visualizations of data posted by your devices to Thingspeak. It is often used for prototyping and proof of concept IoT systems that require analytics.

Figure 11: Thingspeak view app

5.1.10. Arduino Bluetooth control

Arduino Bluetooth Control is an application that allows you to control your Arduino board (and similar boards like ESP 32) via Bluetooth, and so to create awesome and fully customized projects, with the new features available within the app. The settings section allows you to adapt the application to your needs, through a very simple and intuitive interface. The application also smartly remembers your blue-tooth module and tries to connect automatically to the latest one you have used, so you won't have to select it every time you use it.





5.2. Algorithm of the proposed system

STEP 1: Power on the kit with respective f ESP 32 get connected to mobile phone.
STEP 2: Even the proposed kit is respons is referred to be “Smart door monitoring and locking system” through SIM900 GS
STEP 3: The IR sensor senses the move P sends to respective mobile user. After entering the OTP of 4 digits using keypad p get switched ON.
STEP 4: Through Arduino Bluetooth con oice control commands. This takes place by connecting the paired Bluetooth devic d OFF through the voice commands and the process can be navigated by a LED.
STEP 5: The status of the door will be up p, along with the data (including month, year, and date) and time.
STEP 6: If the entered OTP is incorrect, t he entered OTP is mismatched.

CHAPTER 6
RESULTS AND DISCUSSION

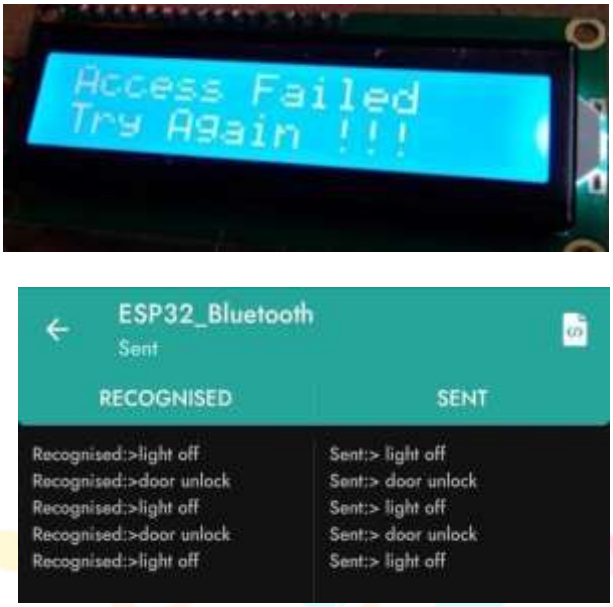


Figure 13: Project Kit

6.1. OTP based monitoring

If the entered OTP is correct, then the door will unlock and it displays as **"Access Granted Door Opening"** and if the entered OTP is incorrect, it displays as **"Access failed Try again!"** and the buzzer gets into active state.

Figure 14: Access Granted

Figure 15: Access failed

6.2. Bluetooth based monitoring

Through voice control commands, the door status can be monitored. If the command is **"door unlock,"** the door will unlock, and automatically, the lamp will turn on. To turn off the lamp again, the command **"light off"** is used.

6.3. Analytics of system

The status of the door will be updated every second in the ThingSpeak View app, along with the data (including month, year, and date) and time.

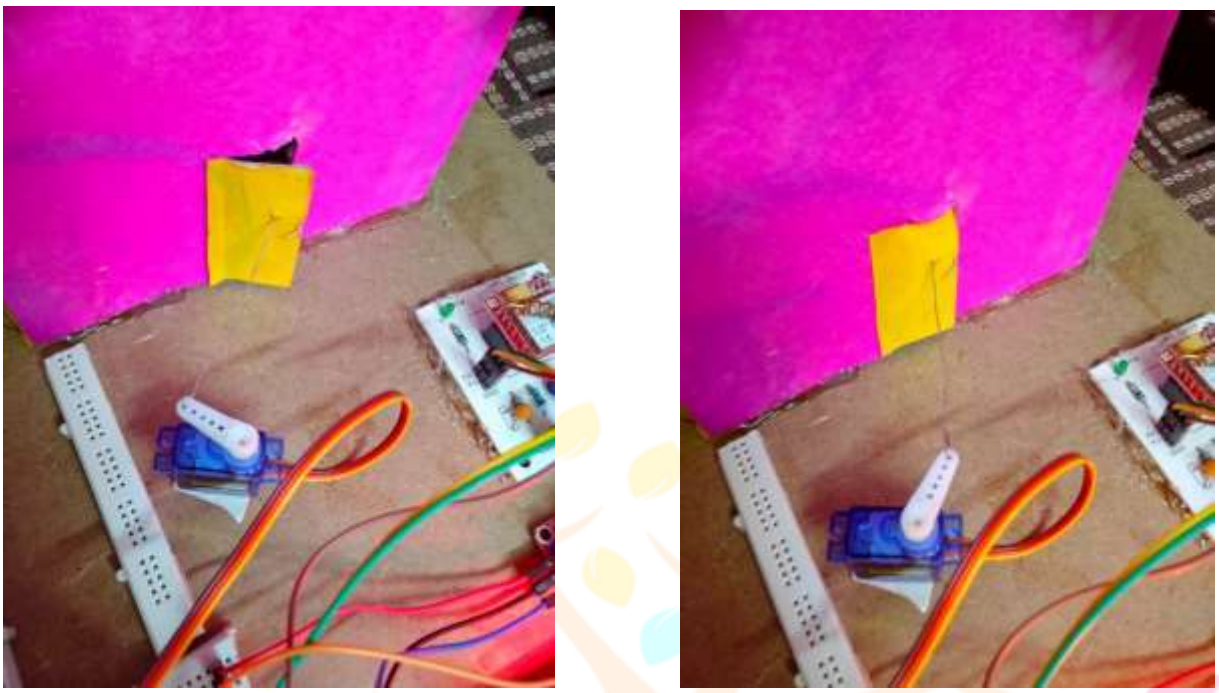


Figure 17: Analytics of system

6.4. Door lock and unlock

The door is locked and unlocked using a servo motor. When the servo motor turns 90 degrees, the door unlocks, and when it turns to 0 degrees, the door is locked. The door status can be changed either by entering an OTP or through voice commands. After unlocking, there is a delay of 5 seconds before the door automatically locks again.

Figure 18: Door status monitoring

6.5. Lamp status based on door

The lamp turns on and off based on the door status. If the door is unlocked either by OTP or voice commands, the lamp turns on, providing visual feedback. The lamp remains on until the user provides a command through voice to turn it off. The lamp functions

in sync with the door's status, activating when the door unlocks via OTP or voice commands, serving as visual confirmation. Once illuminated, the lamp persists until the user issues a voice command to deactivate it. This setup offers a seamless interaction experience, integrating security measures with user convenience.

Table 1: Comparison of proposed model with previous model

Ref	SIM900 GSM module	OTP Based	Bluetooth Based Monitoring	Servo motor	IOT module	Buzzer
[1]	Present	Present	Not present	Not Present	Not Present	Not Present
[2]	Present	Not Present	Not Present	Not Present	Not Present	Present
[3]	Present	Present	Not Present	Not Present	Not Present	Not Present
[4]	Not Present	Present	Not Present	Present	Not Present	Present
[5]	Not Present	Not Present	Present	Present	Not Present	Present
Present work	Present	Present	Present	Present	Present	Present

CHAPTER 7
CONCLUSION AND FUTURE SCOPE

7.1. Conclusion

The development of the smart door system represents a significant advancement in addressing the critical issue of home security through modern technology. By leveraging the capabilities of the ESP32 microcontroller, GSM technology, and other electronic components, the system offers a comprehensive solution that combines advanced functionalities with user-friendly features. The integration of OTP-based authentication, remote locking/unlocking via SMS, lamp control, and voice recognition not only enhances security but also provides convenience and peace of mind to homeowners.

Moreover, the system's affordability ensures accessibility to a wide range of users, making advanced home security technology more attainable. With the addition of the IoT module, the smart door system evolves into a central component in a network of interconnected devices, enabling a more comprehensive approach to home security. Real-time data exchange and synchronization, coupled with cloud-based services, empower users with greater flexibility and control over their home security.

Furthermore, the integration of IoT capabilities opens up possibilities for advanced analytics and predictive maintenance, allowing the system to proactively identify security threats and enhance its effectiveness in safeguarding the home and its occupants. The proposed smart door system not only addresses the immediate need for home security but also lays the foundation for future innovations in the field, promising a safer and more connected living environment for all.

7.2. Future scope

- **Enhanced Connectivity:** Future systems may integrate with emerging communication technologies such as 5G networks, enabling even faster and more reliable communication between the smart door system and other connected devices.
- **Artificial Intelligence and Machine Learning**: Incorporating AI and ML algorithms can enhance the system's ability to recognize patterns, detect anomalies, and adapt to users' behaviors, thereby improving security and usability.
- **Biometric Authentication:** Integration of biometric authentication methods such as fingerprint or facial recognition can further strengthen security and provide seamless access control.
- **Integration with Smart Assistants:** Seamless integration with popular smart assistants like Amazon Alexa or Google Assistant can enhance user experience by allowing voice commands for door control and status updates.
- **Integration with Smart Home Ecosystems:** Future systems may seamlessly integrate with broader smart home ecosystems, allowing interoperability with a wide range of devices such as security cameras, lights, and thermostats for comprehensive home automation and security management.
- **Energy Efficiency:** Implementing energy-efficient designs and components can reduce power consumption and environmental impact while ensuring uninterrupted operation of the smart door system.
- **Customization and Personalization:** Providing users with more customization options and personalized settings can enhance user satisfaction and adaptability to diverse living environments and user preferences.

CHAPTER 8
REFERENCES

[1] Ramses Wanto Tambunan 1), Abdul Aziz Ar-Rafif 2) , and Mia Galina 3*) Multi-Security System Based on RFID Fingerprint and Keypad to Access the Door Jurnal Teknik Elektro, Vol. 14, No.2, October 2022, pp. 125 - 131 ISSN: 1858-1463 (print), 2580-6807 (online)

[2] Murthy, B. Rama, O. Jagadish, K. Tanveer Alam, V. Mahammad Dada, and K. Priyanka Gandhi. "Development of GSM Based Advanced Alert Home Locker Safety Security System Using Arduino UNO." (2018).

[3] Sumalatha, Ch, A. Viyayamanasa, K. Ramasrujana, I. Meghamala, and K. Lakshmi Prasanna. "Bank Locker Security System Using RFID and GSM Technology." International Journal for Research in Applied Science & Engineering Technology 4, no. 4 (2016).

[4] R. Srinivasan, T.Mettilda, D.Surendran, K.Gobinath, P.Sathishkumar, 'ADVANCED LOCKER SECURITY SYSTEM', International Journal of Advance Research In Science And Engineering,IJARSE, Vol. No.4, Special Issue (01), March 2015.Dasd.

[5] Abhishek S. Parab,Amol Joglekar, 'Implementation of Home Security System using GSM module and Microcontroller', Abhishek S. Parab et al, / (IJCSIT) International Journal of Computer Science and Information Technologies, Vol. 6 (3) , 2015, 2950-2953.

[6] Crystalynne D. Cortez, Jaswinder S. Badwal, Jocelyn R. Hipolito, Ditche Jane C. Astillero, Melvie S. Dela Cruz, and Jaira C. Inalao, 'Development of Microcontroller-Based Biometric Locker System with Short Message Service', Lecture Notes on Software Engineering, Vol. 4, No. 2, May 2016.

[7] Wadhwani, Siddharth, Uday Singh, Prakarsh Singh, and Shraddha Dwivedi. "Smart home automation and security system using Arduino and IOT." Int. Res. J. Eng. Technol 5, no. 02 (2018): 1357-1359.

[8] Nasution, Tigor Hamonangan, Muhammad Anggia Muchtar, Ikhsan Siregar, Ulfi Andayani, Esra Christian, and Emerson Pascawira Sinulingga. "Electrical appliances control prototype by using GSM module and Arduino." In 2017 4th International Conference on Industrial Engineering and Applications (ICIEA), pp. 355-358. IEEE, 2017.

[9] Arduino, Store Arduino. "Arduino." Arduino LLC (2015).

[10] Mohammed Amenulleh " Microcontroller based programmable digital door lock security systems by using key pad GSM/CDMA Technology", IOSR Journal of electrical and Electronics Engineering (IOSR-JEEE), volume 4, issue 6(Mar.-Apr .2013).

[11] K.Mahardi, J.W.Simatupang and E.Rismauli, "Security Home Door Automation Using Multi Sensors," Journal of Electrical and Electronics Engineering, vol. 3, no. 1, p. 88, 2019.

[12] M.Andriansyah, M.Subali, I.Purwanto and A.Irianto, "e-KTP as the Basis of Home Security System using arduino UNO," in 4th International Conference on Computer Applications and Information Processing Technology (CAIPT), Kuta Bali, Indonesia, 2017.

[13] A.Vadakkan, A.Babu.V.K and C.Pappachan, "DOOR LOCKING USING KEYPAD AND ARDUINO," International Research Journal of Modernization in Engineering Technology and Science, vol. 3, no. 11, p. 783, 2021.

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