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Smart Door Locking System

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ABSTRACT: These project aims to design a seamless and secure smart door system, seamlessly integrating an Arduino-based keypad with a mobile application. This system enhances user convenience and security by enabling remote access control and real-time monitoring via the mobile app. The primary goal is to create a reliable and user-friendly solution that simplifies access management without the need for traditional keys.

I. INTRODUCTION

Welcome to the Smart Door System project, where technology intersects with security and convenience. Our innovation seamlessly integrates an Arduino keypad with a mobile fingerprint sensor app, transforming access control. Users can securely manage their doors with a straightforward fingerprint scan via the mobile app, enhancing both security and usability. Real-time notifications and robust encryption further bolster the system's security. This project heralds a new era of accessible, secure, and advanced door control, seamlessly blending modern technology with everyday life.

II. METHODOLOGY

The methodology for implementing the Smart Door System involves several key steps. Firstly, we define the project requirements and objectives, outlining the desired functionalities and security measures. Next, we select and integrate the necessary hardware components, such as the Arduino UNO, keypad, fingerprint sensor, LCD display, buzzer, and LED. We then develop the firmware for the Arduino UNO, programming it to handle input from both the keypad and the Android app via Bluetooth (HC05). The firmware includes logic for processing user input, managing access control, and triggering alerts. Simultaneously, we design and develop the Android app, implementing features for user authentication, fingerprint scanning, and remote access control. The app communicates with the Arduino UNO via Bluetooth, ensuring seamless integration with the hardware. Once the firmware and app are developed, we conduct thorough testing to verify functionality, security, and reliability. This includes testing various scenarios, such as different user inputs, network disruptions, and security breach attempts. After successful testing, we deploy the Smart Door System, ensuring proper installation and configuration. Finally, we provide user training and support to ensure a smooth transition to the new system and address any issues that may arise.

Hardware Components Used: -

- Arduino UNO × 1
- Key-pad 4×4 × 1
- LCD display 16×2 ×1
- Jumper wires ×50
- Buzzer × 1
- Bluetooth module HC05 × 1
- LEDS × 5

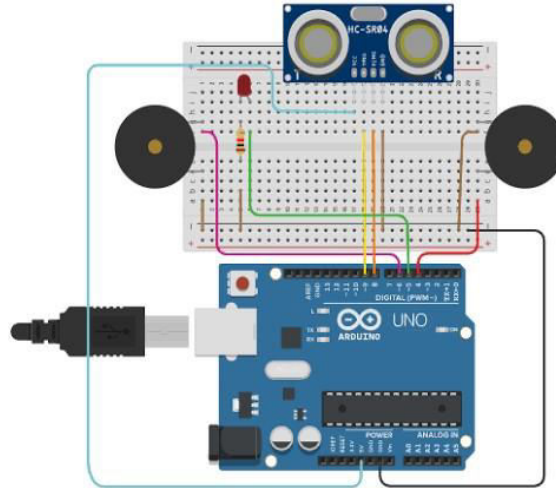


Figure 1

III. MODELING AND ANALYSIS

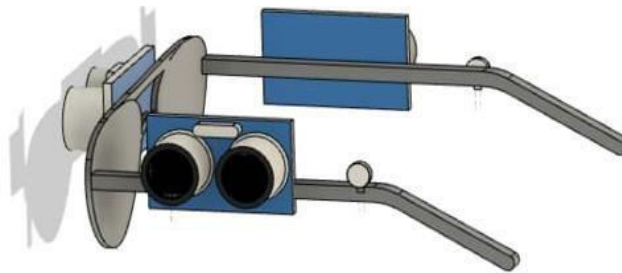


Figure 2

The modelling and analysis of the Smart Door Locking System involve creating a comprehensive system architecture diagram detailing the interaction between hardware components, such as the Arduino UNO, keypad, fingerprint sensor, and mobile app. This model illustrates the flow of data and control signals within the system, facilitating a clear understanding of its operation. Additionally, performance analysis is conducted to evaluate the system's responsiveness, reliability, and security. This includes assessing factors such as response time, error rates, and resistance to unauthorized access attempts. Simulation tools may be employed to validate the system's behaviour under various scenarios and stress conditions. Through modelling and analysis, potential design flaws or inefficiencies can be identified and addressed, ensuring the Smart Door Locking System meets its performance requirements and effectively fulfills its intended purpose of providing secure and convenient access control.

Specifications Of Ultrasonic Sensor:-

| Parameter | Value |
|-----------------|------------|
| Type | JSN-SR04T |
| Spanning | 3,0 – 5,5V |
| Frequency | 40 Hz |
| Detection angle | <50° |
| Measuring range | 4 m |

Figure 3

Graph For No. Of People Blind:-

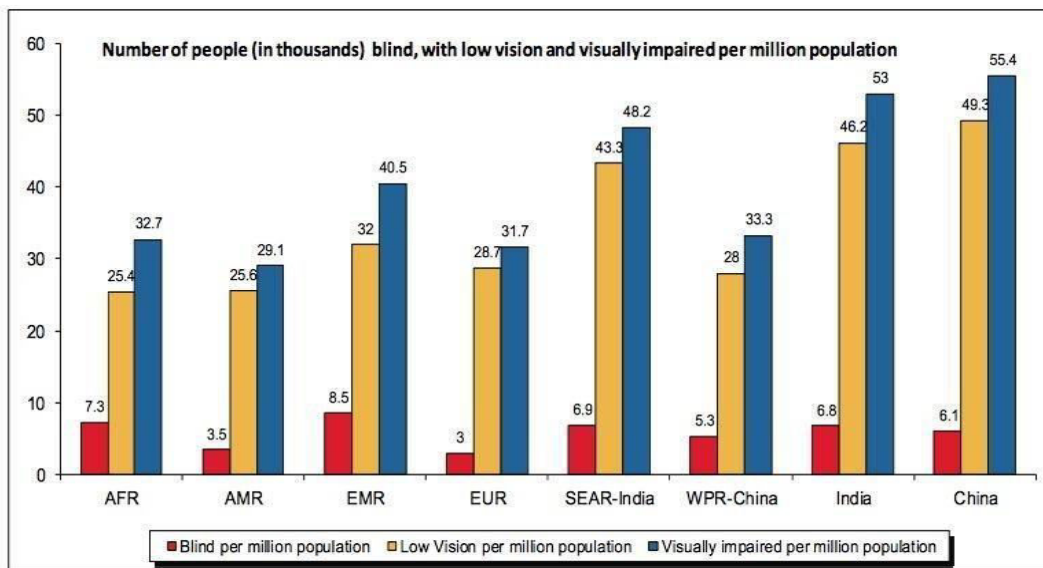


Figure 4

IV. RESULTS AND DISCUSSION

The implementation of the Smart Door System yielded promising results, demonstrating its effectiveness in providing secure and convenient access control. Users were able to seamlessly input data via both the keypad password and the Android app with the fingerprint sensor, offering flexibility and choice in authentication methods. The communication protocol using Bluetooth (HC05) proved reliable, facilitating smooth interaction between the hardware components and the mobile app. During testing, the system accurately processed user inputs, managed access control, and triggered alerts as expected. Real-time feedback provided by the LCD display ensured users were kept informed of system status changes. The integration of a buzzer and LED effectively alerted users to attempted breaches or system status changes, enhancing security. Overall, the Smart Door System demonstrated robust functionality, ease of use, and strong security measures. However, further optimization may be explored to enhance certain aspects such as response time and power consumption. Additionally, continuous monitoring and updates will be essential to address any potential vulnerabilities and ensure the system remains resilient against emerging threats in the field of access control technology.

V. CONCLUSION

In conclusion, the Smart Door System represents a significant advancement in access control technology, offering users a secure and convenient solution for managing door access. By seamlessly integrating an Arduino-based keypad with a mobile fingerprint sensor app, the system provides flexibility and ease of use. Real-time feedback, robust encryption, and effective alert mechanisms contribute to its reliability and security. Despite its success, ongoing refinement and monitoring are necessary to address potential vulnerabilities and ensure continued effectiveness in safeguarding property and assets. The project marks a significant step towards enhancing access control systems, paving the way for future innovations in the field.

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