International Journal of Scientific Research in Engineering and Management (IJSREM)
Volume: 09 Issue: 04 | April - 2025 SJIF Rating: 8.586 ISSN: 2582-3930

Automatic Gate Control for Highly Secure Organization Using RFID,GSM Technology and Biometric Authentication

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Abstract

The main objective of this research is to the intimate fake person entering into a highly secured organization like Hospitals, Schools, Industries and Colleges using RFID,GSM And Biometric Technology. Traditionally, most of the people used to enter into secured places to steal or create unwanted problems which violating the terms and condition of the organization. In this regard, the proposed research article claims to forward fake person to the corresponding or authorized person in the same instance of time. Thereby, the accomplishment of the aforesaid security system is maintained by RFID Tag-based database by the organization. A novelty approach restricts unauthorized people from getting into the secured organization or zone. The suggested module in this proposed research works more efficiently which suits real-time execution.

Key words: RFID,GSM Module,Bio Metric, Gate Control

1. Introduction

This paper introduces an Automatic Gate Control System for Highly Secure Organizations that combines RFID, GSM, and biometric authentication technologies to provide a robust and multi-layered security solution. The system aims to ensure that only authorized personnel can access restricted areas, enhancing the overall safety and integrity of the organization.

The RFID technology facilitates efficient identification of authorized individuals by utilizing RFID tags or cards, while GSM technology allows real-time communication, providing remote access control and alert notifications for security personnel in case of security breaches or unauthorized access attempts. To further strengthen security, biometric authentication (such as fingerprint recognition or facial recognition) is integrated into the system, ensuring that access is granted only to individuals whose biometric data is registered in the system.

2. Methodology

a real-time automatic gate control system which imposes highly secured organizations like Schools, Hospital, Industries, Colleges, etc where authorized persons are only allowed into the organization. In contribution to the aforesaid organization, the real-time security system is developed to bring the advance to the new technology from manual to the automation. This efficient system incorporates Arduino UNO, RFID module, LCD, Motor, GSM module, Bio metric and Mobile to implement the complete secured system. The functionality of the entire system proposed in this research is modeled as per the need of the secured organization.

The functional block diagram illustrates the main core as Arduino UNO, RFID, GSM, LCD and Motor to compute and identify the fake people entering into the organization at the right time instant.

3. System Design and Implementation

3.1 Hardware Components

- **Microcontroller:** Arduino UNO R3 for handling the communication and allowing only authorized person through the gate

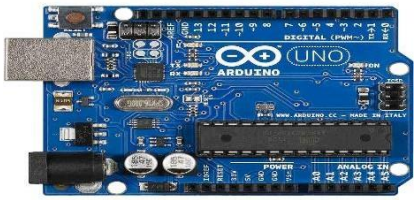


Fig 1 : Arduino UNO R3

- **GSM Module:**To send alert notification to the user

Fig 2: GSM SIM800L Module

- **L298N Driver Circuit:** The L298N is a versatile and widely used dual H-bridge motor driver IC that allows you to control the speed and direction of DC motors

Fig 3 : L298N

- **Power Supply:** 5V/12V adapter depending on the microcontroller requirement and Communication module Requirements
- **Bio-Metric Authentication Module**: The R307 is a popular optical fingerprint sensor used for biometric authentication in security systems.

Fig 4: R307 Bio Metric authentication

3.2 **Software Development**

- **Microcontroller Firmware:** Programmed using Arduino IDE with relevant libraries (SPI.h, MFRC522.h, Adafruit_Fingerprint.h, Wire.h, LiquidCrystal_I2C.h etc.).
- **Communication Protocol:** Data to send to the user through Gsm Module

3.3 **Working Principle**

1. User scans an RFID card → Arduino verifies it.

2. If valid, fingerprint verification is required → If successful, the gate opens.

3. GSM module sends alerts for unauthorized access attempts or remote control.

4. Motor Driver (L298N) controls the gate → Opens for an authorized user and closes after a delay.

5. LCD displays authentication status, and the buzzer sounds in case of unauthorized access.

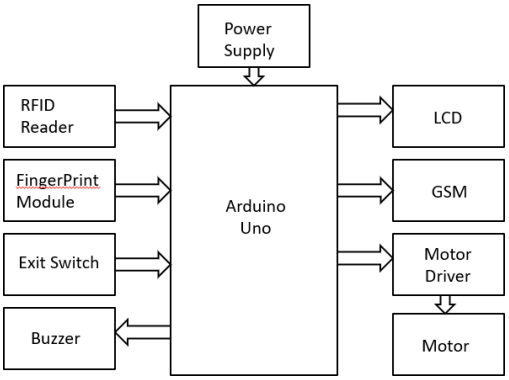
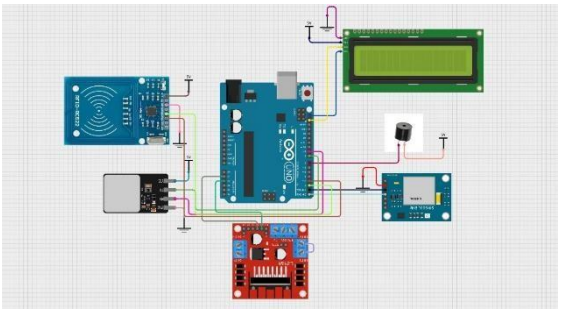


Fig 4: Block Diagram of Automatic Gate Control For Highly Secure Organization Using RFID, GSM Technology And Biometric Authentication



Schematic Diagram

4. Applications and Benefits

1. Banking Institutions

- **Application:** High-security access for bank staff to vaults and restricted areas.
- **Benefits:** Multi-layered security (RFID + fingerprint) ensures only authorized personnel enter

2. Hospital Restricted Areas

- **Application:** Control access to sensitive areas like operation theaters, pharmacies, and patient records rooms.
- **Benefits:** Protects confidential medical data and ensures patient safety.

3. Defense & Military Facilities

- **Application:** Secure gates for military bases, control rooms, and storage of sensitive equipment.
- **Benefits:** Quick identification, real-time GSM alerts for any security breach.

5. Future Enhancements

 Integration with Cloud-Based Systems: In the future, the system could be integrated with cloud-based platforms for real-time data storage and analysis.

 Multi-Factor Authentication: While the current system uses RFID and biometric authentication, additional layers of security could be added by integrating multi-factor authentication (MFA).

 Improved Biometric Authentication: Biometric authentication is a key feature of the system, and future work could focus on integrating more advanced biometric methods, such as iris scanning, voice recognition, or even gait recognition.

6. Conclusion

The proposed system in this research counts more secure to the organization in real-time. the new technique proposed in this research is more unique and comfortable to large organizations to secure their properties without been stolen by the unknown person. The RFID module with GSM technology plays an important role to implement a complete real-time system for security applications. The main agenda of the proposed systems is obtained by modeling an efficient algorithm burned into the Arduino project board which controls all the interference at the right time in real-time application.

Acknowledgments

We would like to express our sincere gratitude to all those who have supported and contributed to the successful completion of this project. First and foremost, we would like to thank [Dr.CH.Venkat Rao] for their invaluable guidance, expertise, and continuous encouragement throughout the development of this project. Their insightful feedback and support have been instrumental in shaping the direction and success of this work.

We also extend our gratitude to [Sanketika Institute of Technology and Managemenet] for providing the necessary resources and infrastructure that made this research possible. Special thanks to the technical and administrative staff for their assistance and cooperation.

We would like to acknowledge the contributions of everyone on our team who helped with the implementation of the RFID, GSM, and biometric systems, as well as the testing and troubleshooting phases of the project.

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