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RFID Door Lock System Using Arduino Uno and GSM Module

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ABSTRACT: This Project is constructed on the basic idea on providing aid to the security on door locks. The RFID and Keypad Door lock and Alert System Using Arduino uses a GSM module & RFID Card Reader, which, upon scanning the right tag and entering right pass, will open door, and send confirmation message, through GSM, otherwise will send alert message. This Project not only scans the right Tag but also sends an Alert message to our Respective SIM card indicating that the Tag is incorrect. This Project involves the use of Arduino, GSM module, RFID Reader, motors, Display and input devices. This project idea is implemented for providing security using electronic equipment and materials. The Tag will be the input for the door to open. When it is used, input password signal would be given through the keypad, which then unlocks the door, sending a confirmation SMS to the Respective Mobile User. In case of incorrect Tag, the door remains locked due to servomotor's movement remains stationary and it will send an alert message of incorrect tag used to the same Mobile User.

KEYWORDS: RFID DOOR LOCK SYSTEM using Arduino and GSM Module (SIM900A).

I. INTRODUCTION

This Project is constructed on the basic Idea of installing security on doors using Simple Electronic material and connection medium. Radio-frequency identification (RFID) technology has gained significant popularity in recent years, and its application has extended to door lock systems due to its convenience and security. An RFID door lock system uses radio waves to communicate between the RFID reader and the RFID tag or card. The system provides a reliable and efficient method for controlling access to various areas, eliminating the need for traditional keys and passwords.

The proposed system aims to develop an RFID door lock system using Arduino and GSM module SIM900A. The system uses an RFID tag or card to authenticate the user and unlocks the door if the data matches with the stored data. The system also sends a text message to the authorized user when the door is opened, increasing the level of security.

The system consists of three main components, the RFID reader, the Arduino Uno board, and the GSM module SIM900A. The RFID reader reads the unique ID of the RFID tag or card, and the Arduino Uno board processes the information received from the RFID reader and verifies it against the stored data. If the data matches, the system sends

a signal to the servo motor to unlock the door. The GSM module SIM900A sends a text message to the authorized user when the door is opened.

The system's design and development include the RFID reader circuit, the Arduino Uno board programming, the servo motor control, and the SIM900A GSM module integration. The RFID reader circuit comprises an antenna, a voltage regulator, and a microcontroller. The Arduino Uno board programming includes reading the RFID tag or card data and controlling the servo motor. The SIM900A GSM module integration enables the system to send text messages to the authorized user when the door is opened.

The proposed system provides an effective and reliable solution for securing doors while providing additional features. It is easy to use and provides a higher level of security compared to traditional keys. The system can be further improved by integrating it with other technologies to enhance its functionality. The system's proposed design and implementation details are discussed in this paper. The paper also includes the results of testing and evaluating the system's effectiveness and usability.

In conclusion, the proposed RFID door lock system using Arduino and GSM module SIM900A is a viable solution for securing doors. The system provides an advanced security solution that eliminates the need for traditional keys and passwords. The system is reliable and efficient and provides additional features like sending text messages to the authorized user when the door is opened. The system's design and implementation details and the results of testing and evaluating the system's effectiveness and usability are discussed in this paper. On scanning the wrong tag or on entering the wrong password, it will start buzzing. This project uses components like Arduino, RFID Reader, Solenoid, Display, RFID Card and input devices. The Working is given as follows:

On scanning the right tag and on entering the right password, the door will be opened.

GSM module & RFID Card Reader which, upon scanning the right tag and entering right pass, will open door and send confirmation message, through GSM, otherwise will send alert message.

II. RELATED WORK

Today people are facing more problems about security in all over world, nowadays security is the most essential issue everywhere in the world; so security of everything gains higher and higher importance in recent years.

Due to the advancement in recent techniques, some door lock security systems are based on microcontroller, GSM, GPS, biometrics like face recognition, Iris scanner, RFID, Smart Card and password etc. Each system has their own advantages and disadvantages. In most of systems, SMS technique is used for communication so the system will become cost effective, more reliable and it will take less time to deliver message. As security becomes major problem nowadays, the security monitoring systems today needs to make use of the latest technology security systems used for digital door lock are utilizing inactive RFID tags. With the help of this, it ensures that only valid person can get entry. Such systems are working in real time basic for opening the door in which user have to place the tag in contact with RFID detector, then the entryway gets opens. This system ought to have the capacity to minimize the trained or specialized human error during secured door access.

The use of RFID technology in door lock systems has become increasingly popular in recent years, and various studies have been conducted on the subject. Many of these studies have focused on the development of RFID door lock systems using various technologies, including microcontrollers, wireless communication modules, and sensors.

One study proposed the development of an RFID door lock system using a PIC microcontroller. The system used a 125 kHz RFID reader module to read the RFID tag's data and used a PIC microcontroller to process the data and control the servo motor to lock or unlock the door. The study concluded that the system was reliable and effective in securing doors.

Another study proposed an RFID door lock system that used a wireless communication module to communicate between the RFID reader and the microcontroller. The system used a 13.56 MHz RFID reader and a wireless communication module to send the data to the microcontroller. The system was also integrated with a keypad for

additional security. The study concluded that the system was effective in securing doors and provided added convenience.

In a different study, the authors proposed an RFID door lock system that used a fingerprint sensor in addition to the RFID reader. The system used an 8051 microcontroller to process the data and control the servo motor to unlock the door. The study concluded that the system provided a higher level of security compared to traditional RFID door lock systems. While these studies provided valuable insights into the development of RFID door lock systems, they did not explore the integration of the GSM module in the system. The proposed system in this research paper aims to fill this gap by integrating the GSM module SIM900A to provide additional security features. This integration enables the system to send text messages to the authorized user when the door is opened, further enhancing the system's functionality.

Latest RFID based door lock security systems are based on the Arduino platform where, when the card is put close to the RFID module, it reads the card data and it matches with the data stored in the program memory and shows authorized/unauthorized entry.

III. METHODOLOGY

The RFID door lock system using Arduino and GSM module SIM900A consists of three main components: the RFID reader, the Arduino Uno board, and the GSM module SIM900A. The system uses an RFID tag or card to authenticate the user and unlocks the door.

The RFID reader reads the unique ID of the RFID tag or card. The Arduino Uno board then processes the information received from the RFID reader and verifies it against the stored data. If the data matches, the system sends a signal to the servo motor to unlock the door. The GSM module SIM900A sends a text message to the authorized user when the door is opened.

Arduino boards The RFID reader communicates with the Arduino through the SPI protocol and different boards have different SPI pins. To test if the RFID reader is working properly or not, upload the "dumpinfo" from the examples in the Arduino IDE and see if it is showing the information of the tags on the serial monitor or not. The I2C LCD communicates with the Arduino through the I2C protocol. Different Arduino boards have different I2C pins. The I2C pins on Arduino Uno and Arduino Nano are A4, A5. Next, connect the keypad with Arduino. The 4x4 keypad has 8 connections but we don't require the last column of the keypad. We only require numbers for the password. So we won't use the last pin of the keypad which is for the fourth column. You can also use a 4x3 keypad instead of a 4x4 keypad. For powering the SIM900A module, the recommended power to use is 5V, 2A but I have used the 5V, 1.5A power adapter and it worked fine. Once you have powered the SIM900A module, the power light will light up and on pressing the power key, the status LED should light up and the net light should start blinking. At this point, make a call from your mobile to the SIM you have placed in the SIM900 module. If you are successful in making the call, then your SIM is working properly with the SIM900A module. In the end, connect the power source to the Arduino. I have used three 18650 cells.

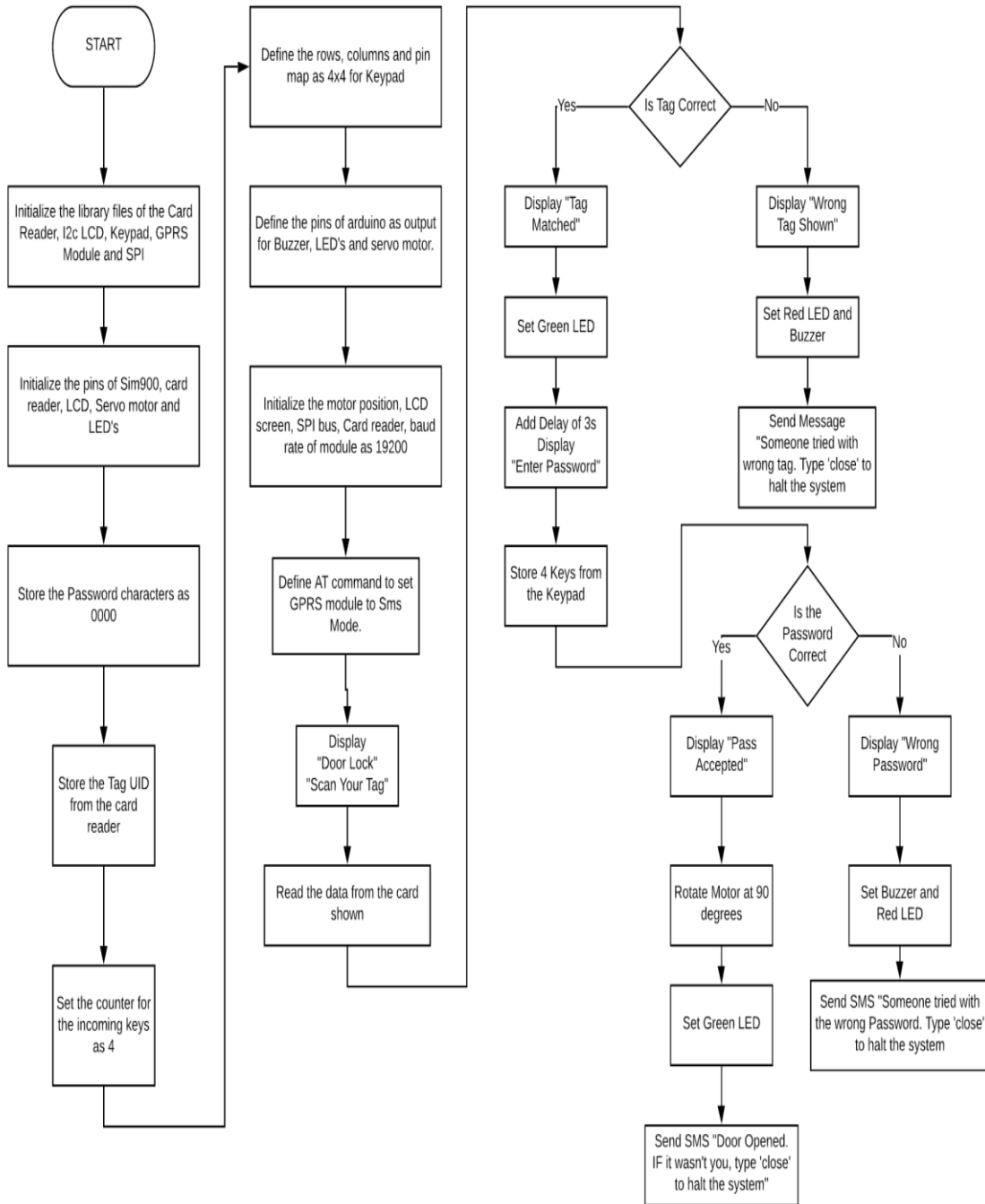
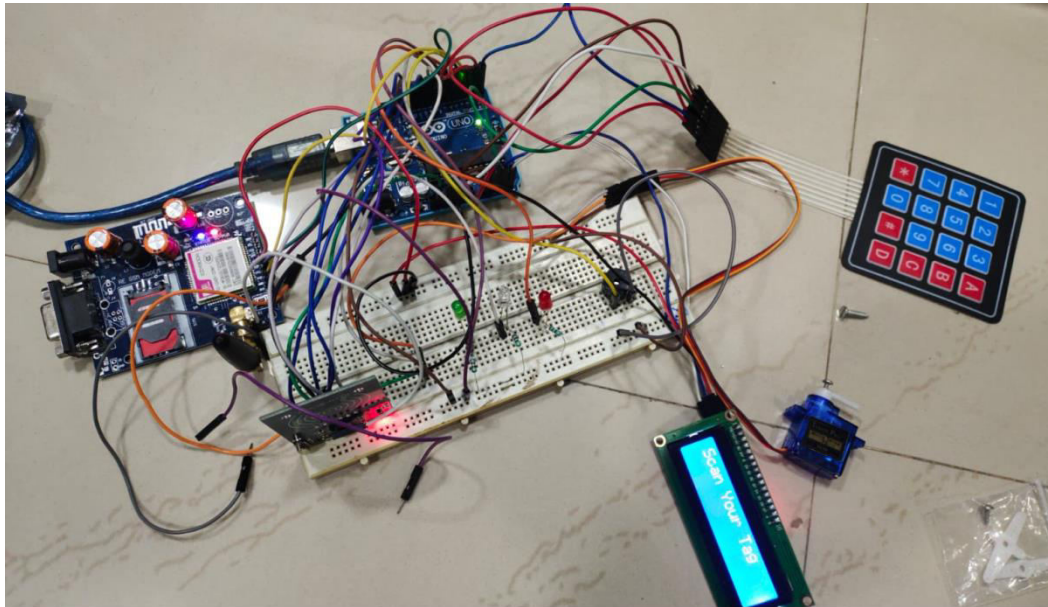


Fig1.Flow Chart

IV. EXPERIMENTAL RESULTS



(a)



(b)



(c)



(d)



(e)

On scanning the wrong tag or on entering the wrong password, it will send us an alert. On scanning the right tag and on entering the right password, it will send us a confirmation message that the door has opened. You can halt the system by sending 'close' message to Arduino and it will only go back to normal mode when you will send the 'open' message to



Arduino. During halt time, it will not scan any tags and it will only look for messages. You can also open the door by sending message to Arduino

V. CONCLUSION

In conclusion, this research paper developed an RFID door lock system using Arduino and GSM module SIM900A. it will send us a confirmation message that the door has opened. You can halt the system by sending 'close' message to Arduino and it will only go back to normal mode when you will send the 'open' message to Arduino. During halt time, it won't scan any tags and it will only look for messages. The system provides a reliable and effective solution for securing doors while providing additional features like sending text messages to the authorized user. The system can be further improved by integrating it with other technologies to enhance its functionality.

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