Rfid Based Door Locking System Using Gsm Module

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Abstract—**despite its centrality to national development, security remains a global problem. Various methods used to control access to select places, such as key lock systems and extremely intelligent lock systems, do have their limits. In order to circumvent some of these restrictions, this article details the development of a security lock that makes use of the Radio Frequency Identification (RFID) network and the Global Systems for Mobile (GSM) communications technology. A user is identified via an RFID tag in the proposed lock system. We can see that the actual lock mechanism will function as intended since the outcomes of the simulation were good.**

Concerns about the protection of people's personal possessions at home rank high on the list of critical security issues. As a general rule, a locked door is an indicator that the home is secure. Therefore, this is an effort to create a smart door that can be locked & unlocked by RFID cards, monitors the door's status, and alerts the owner via SMS. A number of electrical parts, including an Arduino UNO and GSM technology, make up this system. The appliance has been designed, built, and tested in a controlled environment, and the results confirm its functionality. All types of homes may benefit from this technology, and its low-price tag makes it accessible to everyone.

Index Terms—**Arduino Uno Board, RFID Module, SIM900aGSM Module, Security lock, SMS Notification.**

I. INTRODUCTION

To keep themselves and their possessions safe, people utilise a wide variety of security systems. The first line of defence against break-ins and theft is a home security system that protects residents and their possessions [1]. To secure their houses, lockers, cabinets, and additional belongings, the majority of people rely on key locks. The problem is that committed burglars and criminals may readily break key locks. One solution to this issue is to install a smart door tracking and locking system that lets users know when the door is open or closed, as well as whether the

lock is locked or unlocked. All of the lock's states will be saved by this mechanism. If someone breaks into the home without the owner's knowledge or unlocks the lock, they will get an SMS alerting them to the situation. The owner may verify the status using their mobile phone. The registered owner may also get an SMS notification on the door's state, whether it's locked or unlocked. Banks, residences, workplaces, and other similar establishments require a reliable locking system. Electronic (automatic) identification systems and key (traditional door lock) systems are the two main types of security locks [1]. To sum up, locks are often really straightforward devices used to address rather basic problems [2]. Radio frequency identification (RFID) is a novel technology that allows for the rapid and accurate remote identification of items via the use of data dissemination, collection, and management systems that include electronic readers and microchips [3]. An antenna, a chip, plus a reader are the three main components of an RFID device. An integral part of any RFID system, the database stores information on the items that have been tagged. The chip contains information on the thing that is linked to it [4]. The security elements of RFID and GSM were included throughout the design process of the lock system.

II. DESIGN METHODOLOGY

For further protection, we recommend an RFID-GSM safety system that integrates RFID's built-in security features with GSM-based message notification. Radio-frequency identification (RFID) systems employ radio signals (wireless technology) to identify objects, and they are almost ubiquitous in modern life [8]. Using the built-in security features of the GSM system is an addition that makes the system more reliable. It is a computerised mobile phone system that is utilised by almost every country and territory. Full duplex telephone service is a perfect use for GSM

communication [12]. More and more, people rely on their mobile phones for a variety of tasks, including communication, entertainment, and calculation. Here is how the suggested security system works: After reading the tag's ID number, the RFID reader sends that information to the microcontroller for processing. If the number is correct, the microcontroller will then send an SMS message to the verified user's mobile phone. The unauthenticated user receives a message from the microcontroller via SMS if the identification number is incorrect; the authorised user receives a message from the microcontroller.
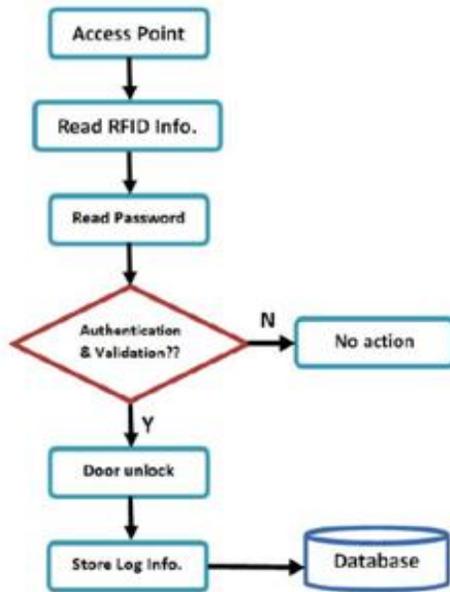

Figure 1: Flow diagram of the Proposed System

A. GSM Module
The SIM900a GSM module, there are a total of six ports on it: input, antenna, TX/Rx, buzzer, SIM, and serial. The GSM module's primary role is to provide communication between a user and an item by acting as a transmitter and receiver via the medium of mobile phone sets. Following is a list of the GSM SIM900a's features.
1. Voltage Range: 7–15V AC or DC
2. It offers serial transistor logic for a simple and straightforward connection to microcontrollers and Arduino controllers.
3. The SIM900a has a serial baud rate adjustment range of 9600 – 115200 bps.
European Telecommunications Standards Institute (ETSI) established the GSM, which is supplied as the worldwide standard for mobile communication. This

document's primary objective is to detail the protocols that make up mobile phones' the second generation (2G) electronic cellular networks. A warning message may be sent using the GSM module and an Arduino Uno microcontroller board, as mentioned before. In this case, the GSM module's interconnected transmitter port serves as the output port of the PIC. The GSM module's ground port is grounded, and the Arduino Uno's receiver port is wired to it. A user's RFID tag is detected by an RFID receiver, which verifies the tag's authenticity and then communicates with the Arduino controller via a GSM mobile device and a GSM kit. At this point, the Arduino controller notifies the authorised user and instructs the motorised lock to open or shut the door.
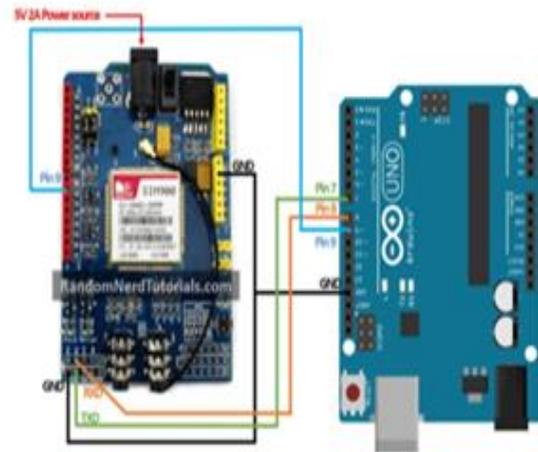

Fig: interfacing sim900a with Arduino uno microcontroller

B. MFRC522 RFID Reader Module
The MFRC522 module is an SPI breakout board device that includes a 13.56MHz card-detecting MFRC522 integrated circuit. This particular kind of RFID tags is ideal for the job at hand and is used extensively on a regular basis. The core idea behind an RFID module is sending an electrical signal to a card and then receiving data that the card transmits back, which is the information stored on the card. Figure 3 shows the intriguing design of an RFID card, which consists of 16 sectors. Each sector has 3 data blocks and 1 trailer block, each containing 16 bytes. Keys and access details are stored in the caravan block.
 The memory is updated whenever data is written to a card. One thousand bytes of data, sometimes called a dump, may be stored on a typical RFID card,

according on the number of sections in the card. To speed up data differentiation, RFID cards often just utilise the first four bytes of the initial information block in the first sector for identifying purposes; this is, of course, unless the whole sector is being transferred. A unique identifier, or UID, is these four bits of data. The device that reads cards will only be able to collect the UID bytes when a card is waved. Once this data has been collected, it will be sent via SPI, a communication mechanism that is native between the MFRC522 and ESP-12E.
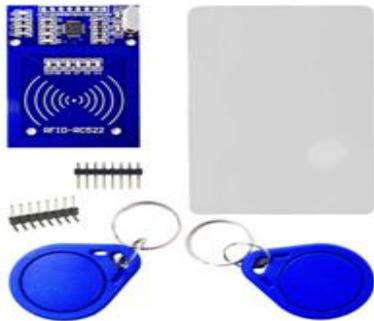

Figure 3: MRFC522 RFID Reader with RFID tags

Twenty-by-four LCD display circuit with its 16 pins, the JHD204A 20 x 4 LCD can switch between 4 bit and 8-bit modes of operation. We utilise a 4-bit mode for the LCD module, however. Here are the pinouts for the JHD204A LCD module: the ground pin is Pin 1 (VSS). It then provides an electrical voltage of +5 volts at Pin 2 (VCC). You may change the contrast through connecting the toggle pin to Pin 3 (VEE) and the other end to +5v and ground. There are two varieties of register select pins, the first of which is pin 4 (RS), which is a register select pin. the first is the data register, and the second is the command register.
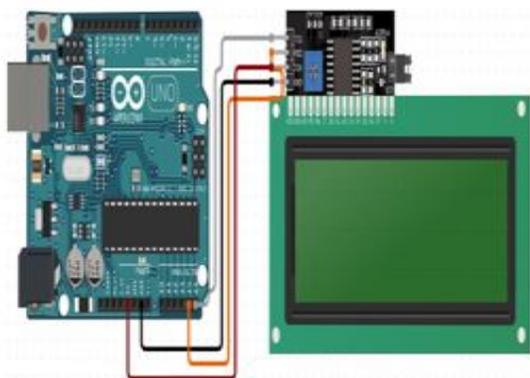

Figure 4: Interfacing LCD Module with Arduino Uno Micro Controller

The logic level at the RS pin is high when we choose the data registration pin and low when we choose the command register pin. In order for it to recognise data, we must first raise RS before sending it data across the data lines. The same logic applies: when the RS pin is low, we may choose the command by connecting data lines. The read/write operation is provided via Pin 5, labelled R/W. The read operation is initiated when the logic is high, and the write operation is initiated when the logic is low. Next, we have pin 6 (E), which is used to toggle the module's signal strength from high to low. The data pins, which extend from pin 7 (DB0) to pin 14 (DB7), are where commands and data are input. Digital pins 11, 12, 13, and 14 of the LCD modules are connected to the digital pins on the Arduino Uno microcontroller.

C. Buzzer

A buzzer is essentially a piezoelectric device that is powered by an electrical circuit that oscillates. It gets its power from a piezoelectric audio amplifier and is sent via an electrical connection. The primary function is to signal the pressing of a button. Here, the data pin connected to the microcontroller on the Arduino Uno board is used to signal the buzzer. This is now linked to the buzzer's positive terminal.
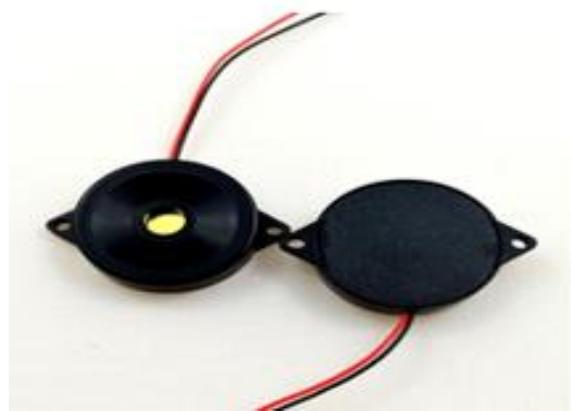

Figure 5: Piezoelectric Buzzer

D. Relay Module

Switches that are powered by electricity are called relays. These electrical switches are used in industrial equipment, residential appliances, and horns, among other places, and are controlled by other switches, such as computers in power train control modules. Single or dual switches, as well as 4-pin, 5-pin, & 6-pin

configurations are all possible with relays. Various parts of the vehicle rely on relays. You may find relays in a wide range of sizes, ratings, and uses like switches for remote controls.
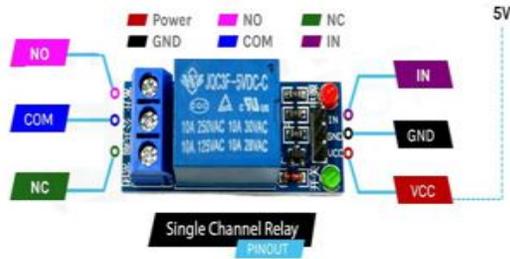

Figure 6: Single Channel Relay Module

E. Basics on Relay Handling

To maintain the original performance, be careful not to drop or hit the relay. The relay is constructed in a way that prevents the casing from detaching during normal operation. It is not recommended to remove the casing in order to keep the original performance. Taking the case off a relay renders its properties unguaranteed.

The relay works best in a typical room with room temperature and humidity, and very little dust, sulphur dioxide, hydrogen sulphide, or organic gas. To prevent contact failure, it is advised to refrain from using resins containing silicon in close proximity to the relay. (The same holds true for relays that are plastic sealed.) When working with polarised relays, be sure to observe the right coil polarity (+, -). The rated voltage must be impressed into the coil for correct operation. If your coil is DC, use rectangular waves; if it's AC, use sine waves. Keep the coil shocked voltage below the maximum permissible level. Never use switching voltages or currents that are higher than the specified values.

F. Electric Solenoid Lock

A one-channel relay driver module is all that's needed to connect this magnetic lock to a microcontroller, Arduino, or even a raspberry pi. An electromagnet, or solenoids are essentially large coils of copper wire wound around a metal slug called an armature. The slug is drawn towards the coil's centre when it is energised. Because of this, the solenoid may be pulled from only one end. This particular solenoid is sturdy and well-made; it has an excellent mounting bracket and a slug that has a slanted cut. Designed for standard cabinet, safe, or door use, it is essentially an electronic

lock. Typically, the door cannot be opened due to the lock being activated and the solenoid slug being in the way. At this point in time, it is not drawing any electricity. The slug retracts, allowing the door to be opened, if 9-12 Volts DC is supplied.
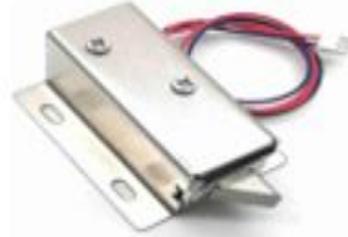

Figure 7: Electric Solenoid Lock Features

G. Features

An ultra-compact electric lock of the highest quality that is rustproof, long-lasting, secure, and easy to use. A suction mechanism that firmly draws in the iron, sealing the door. Installation in the electronic controlled system of the breakout door or fire door is possible. The electromagnetic lock is based on the idea of electric magnetism and creates a strong magnetic field when a current pass through silicon.
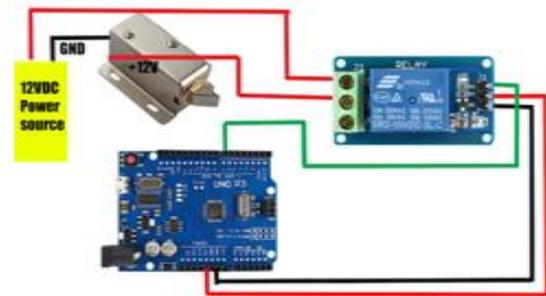

Figure 8: Interfacing Relay, Electric Solenoid Lock with Arduino Uno Microcontroller
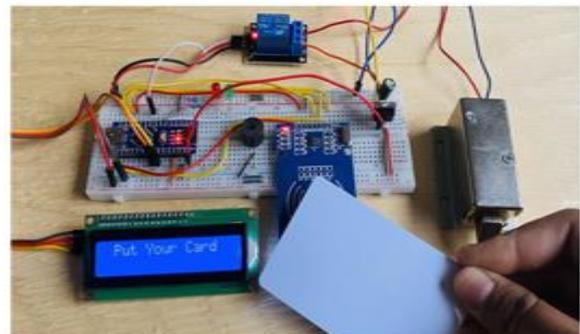
III. RESULT ANALYSIS

Figure 9: Hardware Kit Image

IV. CONCLUSION

An RFID-GSM based door lock system is detailed in this study. We covered the software and circuit designs for the proposed device, as well as the steps to get the simulation result. The GSM module, code generation procedure, and RFID system simulations were all fruitful, and the results were shown and debated on plates. Developing a system to guarantee complete security is obviously impossible, but enhancing the current framework is crucial. The only way to do this is to identify the critical danger area and assess the risks involved.

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