

IoT Enhanced Smart Door Locking System with security

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ABSTRACT

Smart door locking systems have become more sophisticated as technology has advanced. Though an automatic password-based door lock system provides a more secure method of locking and unlocking the system, because of the ongoing Covid situation, it is extremely dangerous to touch the keypads, which are frequently used by different people. Hence, In this project we use RFID tags and Arduino. The RFID card reader detects and validates the user's access. When the card is brought close to the reader, it recognizes the radio frequency of the card and thus verifies its authenticity. Key along with beeping sound, LCD display and LED blinking. We have also connected a sensor, which will be very useful during the night times for operating the door. In addition to this, face recognition technique and SMS alerting system can also be implemented in this project for enhanced security. This system is extremely valuable because to its low cost of construction, advanced capability, and simple interface. A fire alarm can be added to this system. We don't usually have fire alarms at home, therefore this device can serve as a lock and a fire alarm. Mainly, this project is designed and implemented to enhance security with ease of convenience. This system can be used in main doors, private rooms, and lockers in our home or even hotel rooms, banks, classrooms, use any other location as a secondary lock for added security.

Keywords — RFID tags & reader, Arduino uno, LCD display, IR sensor, Buzzer.

I. INTRODUCTION

Security— means safety, as well as the measures taken to be safe or protected. Home security has become a major worry. Homes are now more vulnerable to a variety of hazards, the most common of which is burglary. As a result, it is necessary to have home security. This project aims at giving intelligent door lock system using RFID technology with additional features for user convenience. The Internet of Things (IoT) is

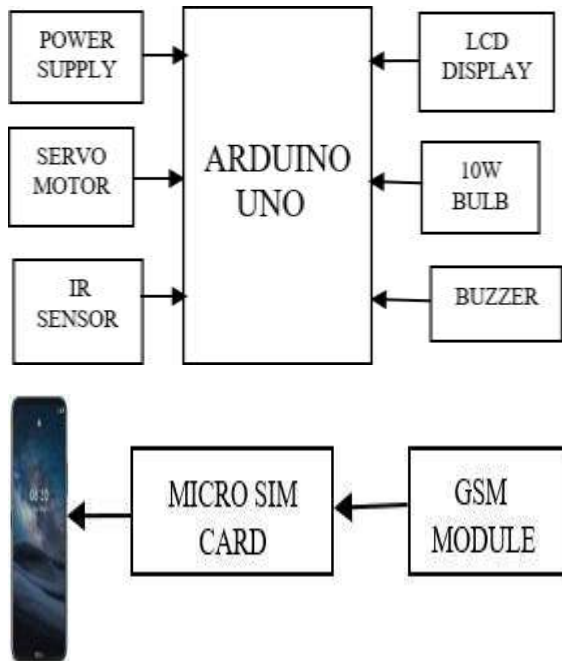
becoming increasingly popular in many major cities, with numerous revolutionary implications. As a result, the concept of a smart door lock has been proposed. Our approach makes use of RFID technology to give a solution for safe entry to an area while maintaining a user record. This RFID Door Lock is simple to make at home and put in any door. The door lock is simply an electrically operated door lock that opens when a voltage (usually 9v) is applied to it.

II. PROPOSED SYSTEM

Smart door locking systems have evolved in sophistication as technology has progressed. There are a number of different types of automatic access control systems including keypad-based password access system, Fingerprint access system, and so on, all of which are extremely dangerous during a pandemic. Despite the fact that it provides a more secure method of locking and unlocking the door, frequent contact with the same surface touched by different persons is obviously a threat during this situation. Also, Bluetooth-compatible door lock technology is accessible only for a short range of distance.

The Proposed system will provide a safe and secure manner to operate the door, independent of the existing pandemic situation. To overcome the user contacting with the surface, RFID tags were employed in this project which are unique for different persons. In this project, the GSM module connected enables the owner to monitor the operation of the door via SMS irrespective of the distance. The major advantage in our project is the IR sensor and the LDR which automatically turns on the light when someone arrives; it works efficiently in lowering the energy consumption and provides user convenience during night times. This project also acts as an intruder alerting system by giving sound from continuously blinking light on a buzzer, and alert via SMS. Moreover, the tactile button used here is useful for unlocking the door from inside the home without even operating the door

manually. This service also means that the customer does not have to worry about whether the door is locked or not, giving them a piece of mind.



.Fig. 1: Block Diagram.

1. Arduino Uno

Arduino.cc has developed the Arduino UNO, an open-source microcontroller based on the ATmega328P microprocessor. 14 digital input/output pins and 6 analogue I/O pins are available on the board. The Arduino IDE and a type B USB cable are required to program this. The USB cable or an external 9-volt battery can be used to power the device. Arduino boards can control a motor, light a lamp, and so on.



Fig.2 ARDUINO UNO.

2. GSM

The most widely used standard for mobile phone systems on the planet is GSM (Global System for Mobile Communications: initially from Group Special Mobile). The GSM Association, the standard's main industry trade group of mobile carriers and manufacturers, claims that the standard is used by 80% of the global mobile market. Over 1.5 billion people use GSM in over 212 nations and territories. GSM is classified as a second-generation (2G) mobile system since both the signaling and speaking channels are digital, as opposed to its preceding technologies. This also makes it easier to include data communication applications into the system on a large scale.

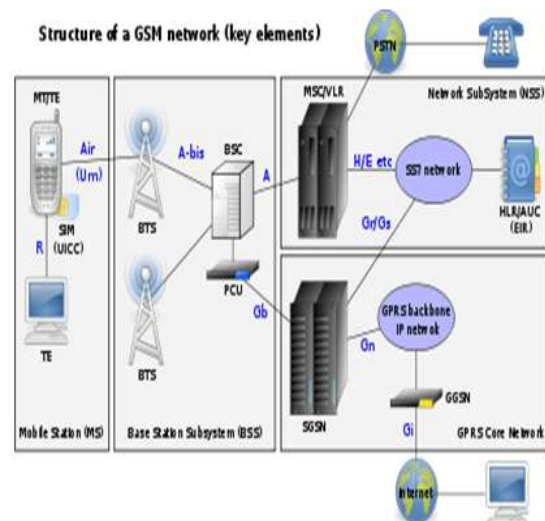


Fig.3 Structure of a GSM Network.

GSM was also the first to deploy a low-cost version of the short message service (SMS), popularly known as text messaging, which has since been adopted by various mobile standards. The quality also includes a global emergency telephone number function. GSM could also be a cellular network, implying that mobile phones connect to it by locating cells in the immediate area. In a GSM network, there are five different cell sizes: macro, micro, pico, femto, and umbrella cells. Depending on the implementation environment, each cell's coverage area varies.

3. GSM Network's architecture

Station Subsystem at the Bottom (the base stations and their controller). The Network and Switching Subsystem (a network component that functions almost as a hard and fast network). The core network is also known as that. The GPRS CoreNetwork is a network that allows users to send and receive messages across (the optional part which allows packet-based Internet connections). The network's operations network (OSS) is used to keep it running.

4. RFID-READER

RFID (Radio Frequency Identification) identifies, and tracks tags attached to items using electromagnetic waves. RFID scanner recognizes location and identification of tagged items RFID tags are small object that contain a chip and an antenna for wireless identification of the object. The RFID technology is adding speed, accuracy, efficiency and security. The RFID Tag reader operates at 125 kHz and outputs serial and Wiegand26 data. To pick the output format, there is an on-board switch.

SPECIFICATIONS:

- DB9 connector for easy connection to a computer serial terminal, or onboard connectors for direct connection to the microcontroller.
- An onboard switch allows you to choose between Serial and Wiegand26 output formats.
- 7V to 15V DC supply voltage
- DC 4.5V to 5V operating voltage
- 125 KHz is the operating frequency.
- Distance between the reader and the object to be read: 10 cm
- Card detection is signaled by an onboard buzzer and LED.

5. RFID-TAG

Clamshell card RFID tag. Compatible with 125Khz EM4001. Compatible with RKI-1512 and RKI-1513 RFID reader modules. 8-10 cm is the range.

SPECIFICATIONS:

- The read frequency is 125kHz.
- Compatible with EM4001 64-bit RFID tags.
- TTL and RS232 output at 9600bps
- Output for magnetic stripe simulation
- Reading range of 10 cm.



Fig.4 RFID READER AND TAGS.

6. IR SENSOR

An infrared sensor is a light-emitting electrical gadget that detects objects in its environment. An infrared sensor detects motion while measuring the heat of an item. The emitter in an infrared sensor is simply an infrared LED, and the detector is an infrared photodiode. Three media used for IR sensor are vacuum, atmosphere and optical fibers.

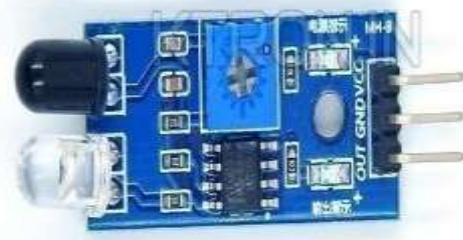


FIG.5 IR SENSOR

7. LCD DISPLAY

A flat panel display is made of liquid crystal liquid (LCD). It is an optical device that uses the light modulating properties of liquid crystals to be electronically modulated. LCD displays are significantly thinner than cathode ray tube displays. LCD displays consume less energy than LED and

gas displays. LCD televisions, computer monitors, and instrument panels are among the most common applications.



Fig.6 LCD DISPLAY

8. SERVO MOTOR

A servo motor is a rotary actuator that can control angular or linear position, velocity, and acceleration precisely. When powered by electricity, it rotates from 0 to 180 degrees. It consists of a suitable motor coupled to a position feedback sensor. It is outfitted with sophisticated internal circuitry that provides high torque, holding power, and faster updates in response to external forces.



Fig.7 SERVO MOTOR

III. RESULTS

The working model of the proposed Automated Door Lock System with Security was successfully designed and implemented. The user must already have a registered RFID tag. A servo motor powers a door as well as the locking system. The servo motor functions as an actuator, opening and closing the door in real time. The RFID Reader recognizes the tag in real time and opens and closes

the door automatically after a certain time period. Mainly, this project is designed and implemented to enhance security with ease of convenience.

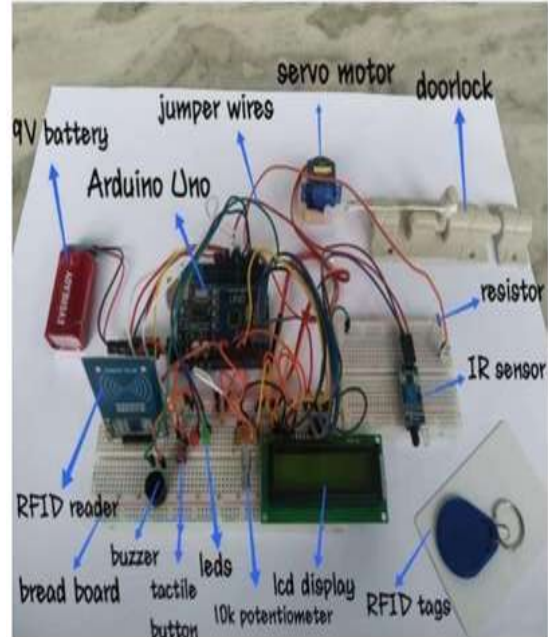


Fig.8 HARDWARE SETUP

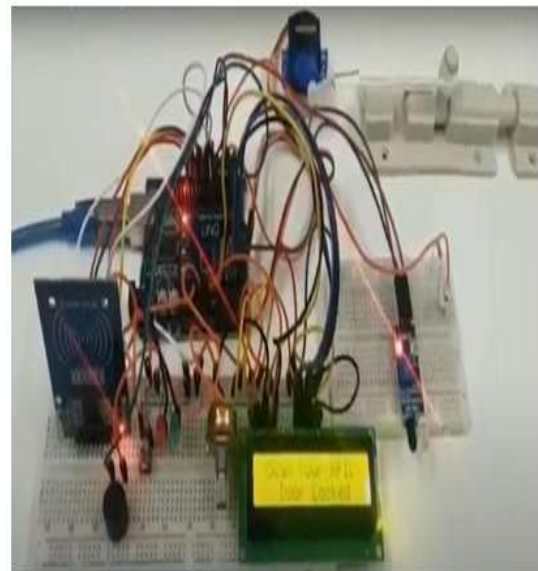


Fig.9 OUTPUT

IV. CONCLUSIONS

The use of the Arduino microcontroller in this project allows design simplicity, therefore, the project can be achieved in a shorter time than other technologies previously employed. Data may be properly and quickly recorded with RFID. It's a low-cost, versatile, and simple-to-install solution that doesn't require any planning, wiring, or construction. And this door lock system is also very secure and saves the information of people

coming and going. This system is extremely valuable because to its low cost of construction, advanced capability, and simple interface. Mainly, this project is designed and implemented to enhance security with ease of convenience and enabling the owner of the property carefree. An autonomous access control system based on Arduino and RFID was created and worked as expected. The system can be deployed at the entrance to a secure environment to prevent unwanted entry.

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