International Journal of Research in Engineering and Science (IJRES)
ISSN (Online): 2320-9364, ISSN (Print): 2320-9356
www.ijres.org Volume 11 Issue 3 ǁ March 2023 ǁ PP. 325-331

Smart Lock System Using RFID with Light Automation

[*1]P. Manohar, [2]P. Saddam, [3]P. Navya Jyothi, [4]E. Sai Latha, [5]K. Subash, [6]C. Ranadheep Reddy

[*1]*P. Manohar Assistant Professor of EEE Department, SRIT-ATP*
[2]P. Saddam *student of EEE Department SRIT-ATP*
[3]P. Navya Jyothi *student of EEE Department SRIT-ATP*
[4]E. Sai Latha *student of EEE Department SRIT-ATP*
[5]K. Subash *student of EEE Department SRIT-ATP*
[6]C. Ranadheep Reddy*student of EEE Department SRIT-ATP*

Abstract
As the world is moving into smart technologies it is necessary to update our security system in a smart way. A smart home is a house or building equipped with a specially structured cable that allows residents to control remotely or driver a series of automated home electronic devices by simply entering a single command. So as of now we have so many lock systems like carrying the key and setting the password for opening the door. In the above case if we lost our key, we need break our lock and one more thing is we need cautious about the thefts.
In order to overcome the drawbacks of old locking system for the smart home we are introducing the Arduino Solenoid Lock Door using RFID. This lock system is controlled by Arduino Uno Microcontroller centrally. Microcontrollers detects the output of Radio Frequency Identification (RFID) and microcontroller will give a response when it detects the output from the sensors. A response given by the microcontroller will control the Solenoid. Along with locking system, using sensors will provide light automation by detecting change in motion of the body. Number of sensors used depends on the requirement to turn ON lights in different rooms The door will open if the data/password of RFID will be matched. The door will not open without RF card it will only open by RF card, thus it is the only key to open the door which means highly secured.

Date of Submission: 05-03-2023 Date of acceptance: 18-03-2023

I. INTRODUCTION

A solenoid lock works on the electronic-mechanical locking mechanism, when the power is applied, DC creates a magnetic field that moves the slug inside and keeps the door in the unlocked position.RFID, Radio Frequency Identification is a fundamental and inexpensive technology that enables wireless data transmission. Security systems willalso beintegrated with motion sensors to detect the presence of strangers in house. sensors used IR or ultrasonic sensors.Whereas in proposed system, will implement the door security system using RFID to open the door.Security system also integrated with automating light systems which helps in room lighting. The system will automatically turn on lights whenever a stranger passes through it, whose movement detected by IR sensor.

II. Smart Lock System Using RFID with Light Automation

The common way of door lock system is using locks followed by keys. In technological aspect, Keypad secured locks are existed. This system involves more physical appearance and not effective. Also, there is a disadvantage in using Keypad protected locks because if any person observes entering password sneakily insecurity may arise. Thus, just by using RFID technology without Keypad protected lock and by giving access only to RFID cards or tags will increase effectiveness with less physical appearance.

2.1Proposed Methodology

- To overcome the drawbacks of previous lock systems and increase the effectiveness of the system to lock and unlock. RF card is used to authenticate the RFID which instantly execute the operation.
- ARDUINO microcontroller will control the entire operation with energy backup system.
- Moreover, the IR sensor used to turn on the lighting system of the home by detecting presence of human being.

2.2 Block Diagram:

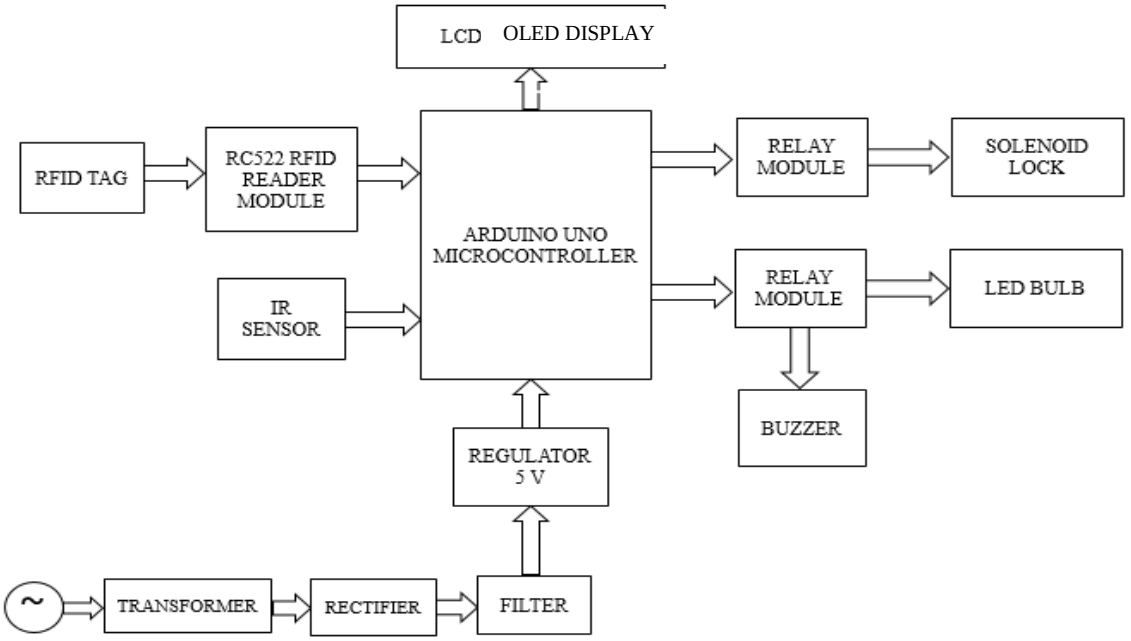

Fig:1 Block diagram of smart lock system using RFID with light automation

This is the method we followed to keep the security high, where all the components connected to Arduino uno microcontroller, it will operate the entire operation and control from centrally. The code is developed and written as per the output requirement. So, some cards were given access by reading the cards near RFID module and includingthat object data into code performs data match and information is sent to Arduino uno microcontroller checks whether it is included in the code or not, if it matches it will give access to that card. The message like Access Granted will be shown on the OLED display.

Entire system is provided with power supply for working of electronic devices. However, when access granted the relay module connected to solenoid lock from Arduino uno gets high and helps in working of solenoid lock. Another relay module connected to LED which will turn ON only when IR sensor connected to Arduino uno gets high by detection of a stranger, input is given from IR sensor to get relay module high. IR sensors is used based on requirement that how many lights we want to turn ON. This method is very useful in conservating energy due to use of lights in the presence of persons only. Finally, if a wrong card is placed to open lock buzzer will beep the sound that we can alert instantly, if we lost our RFID card it can be blocked and object data can be removed from the code.

III. Schematic Design of Proposed work

This schematic design represents the exact hardware pin to pin connections to bring out the system work as expected This prototype can be used for the security locking purpose.It can be used for home door locking, bank lockers, hotels and apartments.

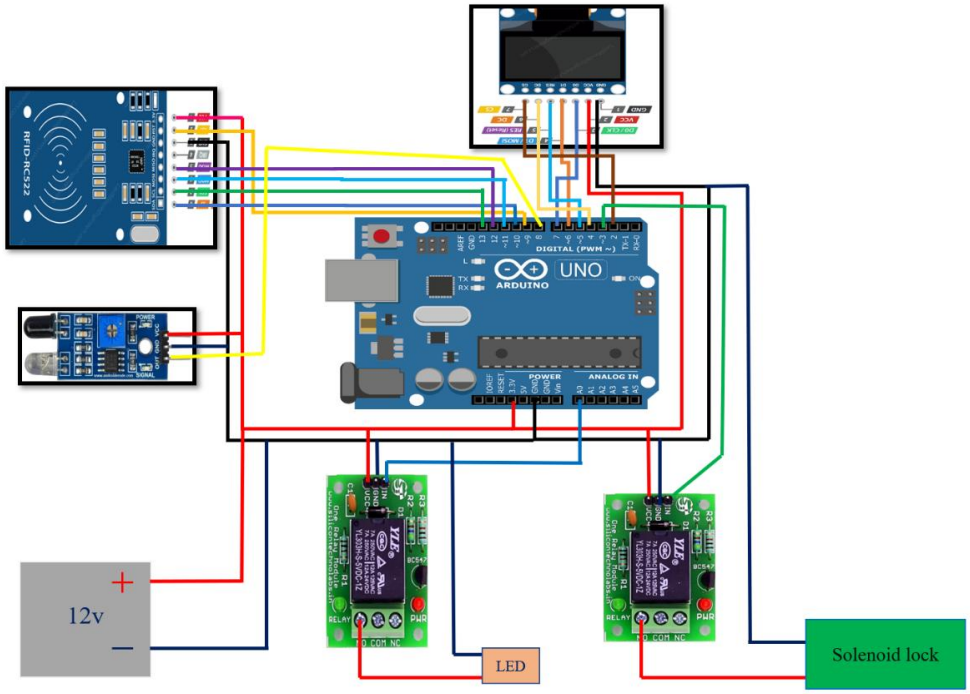

Fig:2 Schematic Implementation

IV. DESCRIPTION OF HARDWARE

4.1Arduino Uno

Arduino consists of both a physical programmable circuit board (often referred to as a microcontroller) and a piece of software, or IDE (Integrated Development Environment) that runs on your computer, used to write,and upload computer code to the physical board. Arduino Uno is the most popular and widely used development board. It is powered by an ATMega328P microcontroller. All components are connected to this Arduino to make every electronic device work on required operation and in time interval

Fig:3 Arduino Uno Microcontroller

4.2 RFID Reader

Radio Frequency Identification (RFID) refers to a wireless system comprised of two components: tags and readers. The reader is a device that has one or more antennas that emit radio waves and receive signals back from the RFID tag. The RFID reader is a network-connected device that can be portable or permanently attached. It uses radio waves to transmit signals that activate the tag. Once activated, the tag sends a wave back to the antenna, where it is translated into data. The transponder is in the RFID tag itself. These signals transferred to Arduino uno which controls the operation of locking mechanism.

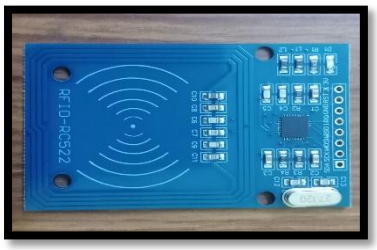

Fig:4 RFID Reader Module

4.3 Solenoid Lock

The 12V DC solenoid lock is used for locking sell-machine, storage shelf, file cabinet etc. The solenoid 12V lock works as the circuits disconnects, and it will unlock as the instant power-on.The solenoid lock features an anti-theft and shockproof design, the lock is better than other kinds of locks.The solenoid door lock provides a low-cost solution with a very high locking force of at least 1.600 N.A solenoid is a small electromagnet that pushes or pulls a plunger that can operate a function. In this case, it holds the strike opening closed or allows the strike opening to swing open, thus allowing the door's lock latch to open without the lock latch being retracted.

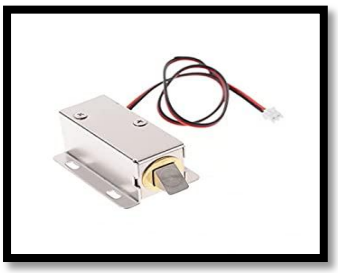

Fig:5 Solenoid Lock

4.4 Buzzer

Buzzer also known as a sounder, audio alarm or audio indicator, a buzzer is a basic audio device that generates a sound from an incoming electrical signal. Buzzers come in two primary forms piezo buzzers and magnetic buzzers. The purpose of using this buzzer to make sound when RFID card is mismatched that we can alert.

Fig:6 Buzzer

4.5 OLED Display

OLEDs are used to create digital displays in the devices. We used this display in this prototype to display the access granted or denied when RFID tags or cards placed near reader module. This is helpful to know that whether the card we used is correct or wrong. The display is connected to Arduino uno which sends the signal data to display either placed correct card or wrong card.

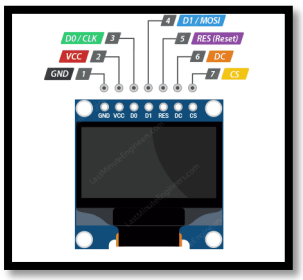

Fig:7 OLED Display

4.6 Relay Module

Relay is a switch which controls (open and close) circuits electromechanically. The main operation of this device is to make or break contact with the help of a signal without any human involvement in order to switch it ON or OFF. It is mainly used to control a high-powered circuit using a low power signal. However, at the required operation we make it high to perform necessary task which means to make circuit for unlock and for LED glow based on input from the Arduino uno

Fig:8 Relay Module

4.7 IR sensor

To conservate energy this IR sensor is important because it acts as input to lighting system to turn lights automatically due to presence of a person it activates and sends data to Arduino which makes relay module high which is connected to LED bulb. The IR sensor or infrared sensor is one kind of electronic component, used to detect specific characteristics in its surroundings through emitting or detecting IR radiation. These sensors can also be used to detect or measure the heat of a target and its motion. In many electronic devices, the IR sensor circuit is a very essential module. This kind of sensor is like human's visionary senses to detect obstacles.

Fig:9 IR sensor

V. RESULT

After the schematic design implementation, the device was tested for expected outcomes. This lock system is controlled by Arduino Uno Microcontroller centrally. Microcontroller detects the output of Radio Frequency Identification (RFID) and microcontroller will give a response when it detects the output from the sensors. A response given by the microcontroller will control the Solenoid. Along with locking system, using sensors will provide light automation by detecting change in motion of the body. Number of sensors used depends on the requirement to turn ON lights in different rooms The door will open if the data/password of RFID will be matched. The door will not open without RFID card it will only open by RFID card, thus it is the only key to open the door which means highly secured.

Firstly, the door unlocking system is tested by placing RFID cards near RFID reader. We perform several test results by taking the cards reading them and some them registered into Arduino uno microcontroller memory. Test is done using 4 RFID cards and 1 RFID tag, in that 2 RFID cards and 1 RFID tag were Registered in microcontroller memory rest of 2 RFID cards were unregistered. The results from the test obtained as below shown in the table.

TABLE 1: RFID Cards or Tag and Door unlock Response Test Results

Card or Tag Number	Response				
	1	2	3	4	5
Card 1	✓	✓	✓	✓	✓
Card 2	✓	✓	✓	✓	✓
Tag1	✓	✓	✓	✓	✓
Card 3	x	x	x	x	x
Card 4	x	x	x	x	x

✓ . Access Granted and Door opens

X . Access denied and No response

TABLE 2: Detection Distance Range of RFID Card or Tags Test Results

Tag or Cards	Distance Range of Tag or Cards Detection				
	1 cm	2 cm	3 cm	4 cm	5 cm
Card 1	✓	✓	✓	✓	x
Card 2	✓	✓	✓	✓	x
Tag1	✓	✓	✓	✓	x
Card 3	✓	✓	✓	✓	x
Card 4	✓	✓	✓	✓	x

This results show that only registered tag or cards in the microcontroller memory will only have the access, unregistered cards have no response towards unlocking the door and will be rejected. Next table shows the test results about the range detection of RFID cards or tags and the allowed range of detection is up to 4 cm more than this range RFID reader is not able detect the card data.

Secondly, the lighting system test results were checked and obtained, using 3 sensors and 3 LEDs. Assuming three rooms provided by this sensor based lighting system one sensor is placed at near door of hall, when door opens, person enters sensor detects motion send signals to Arduino uno which further sends input to relay module to make it high. The remaining two sensors placed in the rest of rooms when persons enter into it lights will automatically turn ON.

TABLE 3: LEDs Glow and IR Sensor Input Test Results

No	IR 1	IR 2	IR 3	LED 1	LED 2	LED 3
	High	High	High	On	On	On
	High	High	Low	On	On	Off
	High	Low	Low	On	Off	Off
	Low	High	High	Off	On	On
	Low	Low	High	Off	Off	On
	Low	Low	Low	Off	Off	Off
	High	Low	High	On	Off	On
	Low	High	Low	Off	On	Off

Finally, the results obtained as shown in above tables were brought from the device by the schematic implementation. The hardware implantation represents as in below figure.

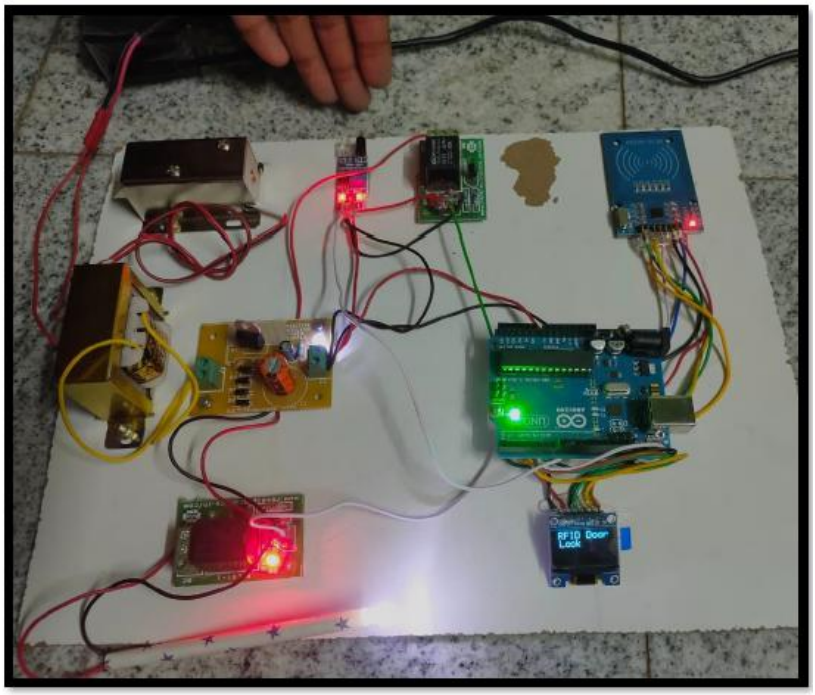

Fig:10 Smart lock System with Light Automation output

VI. CONCLUSION

In this study, we have implemented a smart security system contains door lock system using passive RFID. A centralized system is being deployed for controlling and transaction operations. The door locking system functions in real time as when the user put the tag in contact with the reader, the door open and the check-in information is stored in central server along with basic information of the user. We utilized RFID technology to provide solution for secure access of a space while keeping record of the user. The use of the Arduino UNO microcontroller in this project allows design simplicity, therefore, the project can be achieved in a shorter time than other technologies previously employed. And this door lock system is also very secure and saves the information of RFID Cards or Tags that registered in microcontroller memory except registered cards there is no access to other cards. Including a light automation system is an integration of sensors, controls and designed to perform lighting functions with minimal or no human intervention. Adapting an automation system will produce substantial benefits on profit, energy conservation, production rate, safety, and quality.

REFERENCES

[1]. T.S.Gunawan, I.Rahamathul, H.Yaldi, M.Karthiwi, and N,Ismail, "Prototype Design ofSmart Home System Using Internet Of Things", *Indones*. J. Electr. Eng. *Comput*. *Sci*., vol. 7, no.1, pp.107-115,2017.

[2]. T.P. Jacob, K. N. K Kumar, and H.Natraj,"Security Enhancement Using Motion Detection , "IRACST –*InternationalJ.Comput Sci. Inf. Technol. Secur*., vol.7 , no. 2 , pp.2249-9555, 2017.

[3]. L. Kamelia,S. R. Alfin Noorhassan, M. Sanjaya, and W.S. Edi Mulyana , "Door- Automation System Using Bluetooth-Based Android For Mobile Phone,"*ARPN J. Eng. Appl. Sci*., vol.9, no.10 ,2014.

[4]. Deepali Javale; Mohd Mohsin; ShreerangNandanwar; Mayur Shingate, "Home Automation and Security System Using Android ADK", Electron. *Commun. Comput. Tecnol*., vol. 3, no.2, pp.382-385,2013.