Radio Frequency Identification System and IoT based Tech Genix Lock

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Abstract
In this paper a Door lock system using RFID and IOT Technologies. Using smart phone with Blynk App the Admin or owner can remotely monitor, control (ON & OFF the access) and can get Blynk notifications from the door lock when someone try to access it or if any suspicious activity happens (someone try to break the it). The registered User will receive Gmail's when he tries to unlock the door.
Other features are the admin or owner can remotely unlock and lock the door from any place, and he can disable the switch which is used for getting out from the room, for blocking the unknown persons who went with theft RFID card, it is done by seeing the notifications send to the user when door is unlocked with his card through Admin. For authorized person the lock will be opened and closed automatically after a predetermined delay. If it is an unauthorized person tries it alerts the admin and neighbors through a Blynk notification and buzzer sound. Thus, once implemented, the system will prove An Effective security with minimum cost and increase in comfort for system users and also more efficient compared to existing cost ineffective systems.

Key-words: Node MCU ESP8266 WIFI Module, RFID MF-RC522Module (Radio Frequency Identification System) Module, Blynk Application, IOT Technology.

1. Introduction

Security is the most common criteria for each and every one nowadays as the technology in this market continuously developing day by day, the door locks are keep getting more stronger and smarter than the existing door locks, along with the developing world people are looking for most safer door locks and non-contact type smart locks are becoming most popular choice for people nowadays.

From decades, people are moving towards automation which has given rise to "Internet of Things" i.e., everyday objects have network connectivity, allowing them to send and receive data [1]. This technology will provide smart access to connect door lock remotely with us via a smart phone with Blynk application [2]. So that admin can control and monitor door lock from anywhere in this world. Exploiting Bluetooth on Android Mobile Devices for Home Security Bluetooth Technology on smart Phone for door lock security. Admin cannot disable access to the theft card, and They were short ranged up to 100 meters with a basic android App.

A Digital Security System with Door Lock System Using RFID Technology. It unlocked the door after validating the user data [3]. The user information was stored in the Node MCU via programming. It RFID reader which reads the data from the user RFID tag, and control the Door lock. It will check for the user authentication in data base before unlocking the door.

This system can be employed for personal lockers, stores, laboratories and work places. Face Recognition Based on Auto-Switching Magnetic Door Lock System Using [4]. Was used the images of users would be stored in database for user authentication before unlocking the door. this system takes long time to recognize authentic the face, sometimes it may fail in the authentication of almost similar faces. Biometric identification-based door lock [5]. However, this system is more accurate than the Face Recognition system so, there will be no mis authentication figure prints were captured automatically in this system. it takes long time to respond when figure is has dirt, cost of the system is high.

1.1. Analysis of various Systems

After analyzing all the systems, there are many technologies in the market, which is giving a protection but there are certain disadvantages like.

- High cost
- In accuracy

- Medium level of security
- Slow speed of operation
- Limited range of control
- Many systems don't have remote monitoring. and control.

The comparison between different types of security systems that are available in the market are given in the below table figure-1

Figure 1

SL NO	DISCRIPTION	FEATURES									
		SECURITY	SPEED	ACCURACY	MAINTENANCE	LIFE CYCLE	LIVE MONITORING	MOBILE CONTROL	ALERT NOTIFICATION	USER COMFORT	SYSTEM COST
1	GESTURE CONTROLLED	L	M	L	L	M	NO	NO	NO	H	L
2	BLUETOOTH	M	H	H	M	H	NO	NO	NO	L	L
3	WI-FI	M	H	H	M	H	NO	YES	YES	H	M
4	RFID	M	H	H	L	H	NO	NO	NO	H	M
5	PASSWORD	L	M	H	M	M	NO	NO	NO	M	L
6	OTP BASED	H	L	H	M	H	NO	NO	NO	M	L
7	FINGER PRINT	M	M	H	H	M	NO	NO	NO	M	H
8	FACE RECOGNITION	L	M	L	H	L	NO	NO	NO	M	H
9	VOICE CONTROLLED	L	M	L	L	H	NO	NO	NO	H	L
10	IRIS SCAN	H	H	H	H	H	NO	NO	NO	L	H
11	FINGER + PASSWORD	M	M	H	H	L	NO	NO	NO	L	H
12	FACE + PASSWORD	M	M	M	H	L	NO	NO	NO	L	H
13	RFID + PASSWORD	M	M	H	H	M	NO	NO	NO	M	M
14	RFID + IOT	H	H	H	L	H	YES	YES	YES	H/M	L

It proposed to overcome all these demerits that found in existing systems, by implementing a door lock with RFID and IOT technologies. This system is fast, accurate, highly secure, there is no limited range of control, cost of the system is low.

2. BLYNK App

It is an open and free app designed for the IOT. Blynk App (Server) allows you to connect and control the hardware with your smartphone remotely. It is also able to display the data measured by the various sensors. It also sends the Blynk notifications and mails as per your requirement. The user can create any types of interfaces for their projects as per their requirement using various widgets available in the app. There are many types of Blynk Libraries for supporting all the types of hardware platforms. It consists of three Tabs.
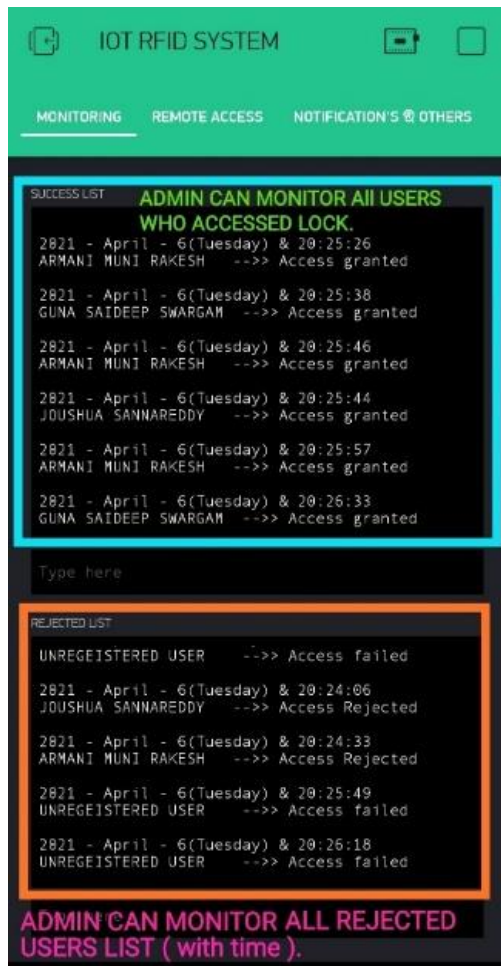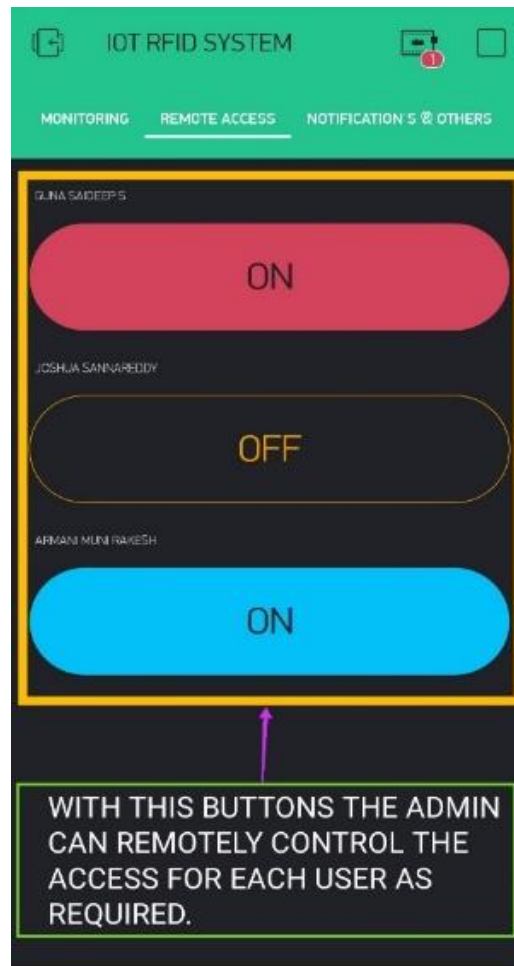
Figure 2.1   Figure 2.2

2.1. Monitoring

This tab consists of two sections one for displaying the users who successful unlocked the door and other section for the users who failed to unlocked the door. With this the Admin(owner) can lively monitor the users who is trying to access the lock with exact timing facility. It is shown in the figure-2.1

2.2. Remote Access

This tab consists of three switches each switch is registered for one specific user. So that, the admin (owner) can remotely control (on and off) the access for individual users as required. It is shown in the figure-2.2.

Figure 2.3
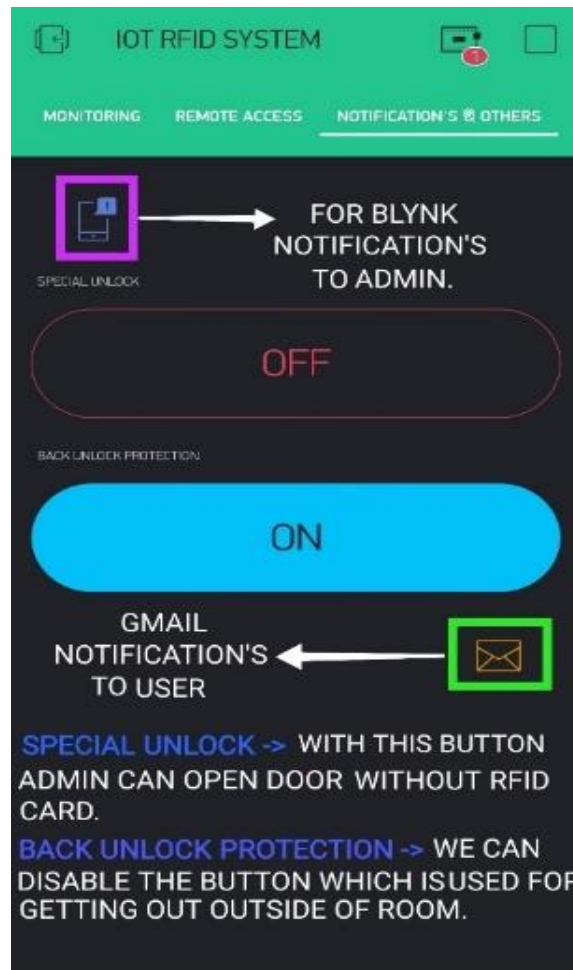
2.3. Notifications and Others

Blynk notification is used to send Blynk Notifications each time when user. try to unlock the door.

Special unlock button was added for the admin to open the door lock without an RFID card in some critical situation and also for the better comfort of admin when he wants to unlock the door.

Back unlock protection switch is for disabling the permission for getting out of the room. This can be used when someone went inside the house with theft card and that card user came to know after seeing the mail that he opened the lock.

Gmail notification this is added for sending the various mails to the user when he tried to unlock the door. With this user can know that he or someone else trying to open the door. It is shown in the figure-2.3.

3. Proposed Methodology

3.1. Over all Block Diagram

This is the System basic structural layout of the proposed system. It shows the various connections among the hardware, and the input output dependencies.

Figure 3.1
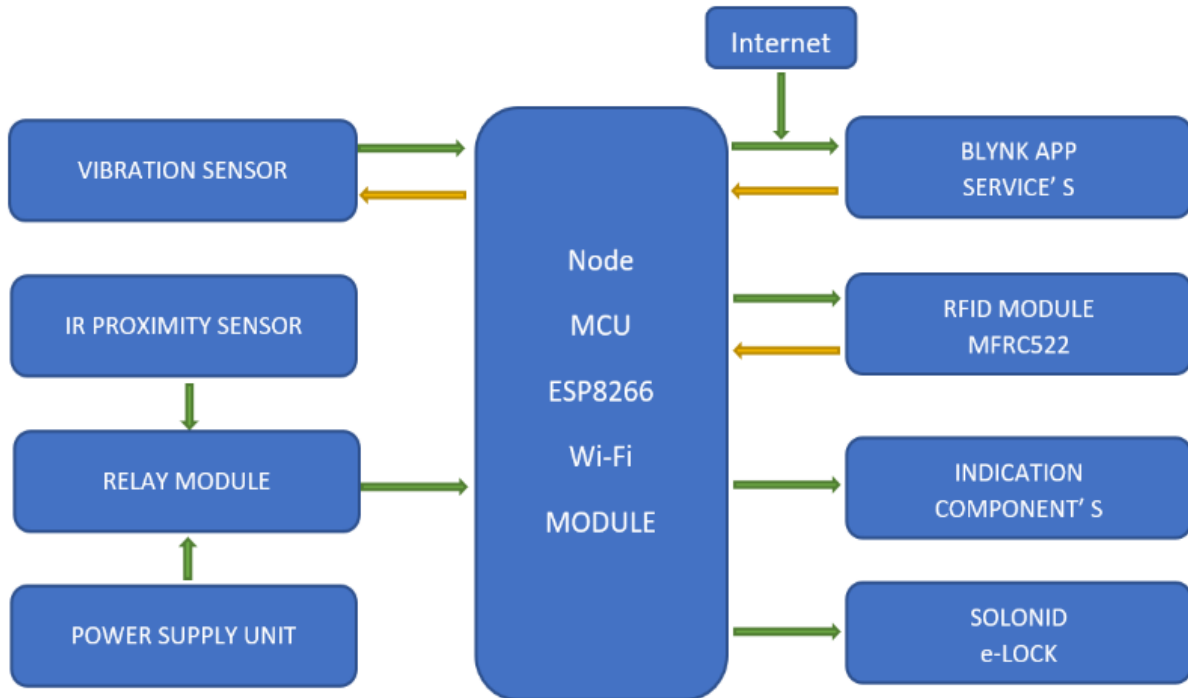
The basic hardware consists of Node MCU ESP8266 WIFI Module, RFID MF-RC522 Module, IR proximity Sensor, Vibration Sensor, Relay Module, voltage regulator, Blynk Application electronic lock and Buzzer etc.

3.2. System Flow Analysis

It gives the pictorial flow of the working of the proposed system, various functions and their moment of usage. When IR proximity sensor detects the person near the door it will switch on the node MCU circuit by through relay. With this the total circuit don't want to work all time .so that user can save little amount of power and also the life time of circuit will increase. When the circuit is ON, The RFID module is ready to reads the data from the RFID tag.

Figure 3.2
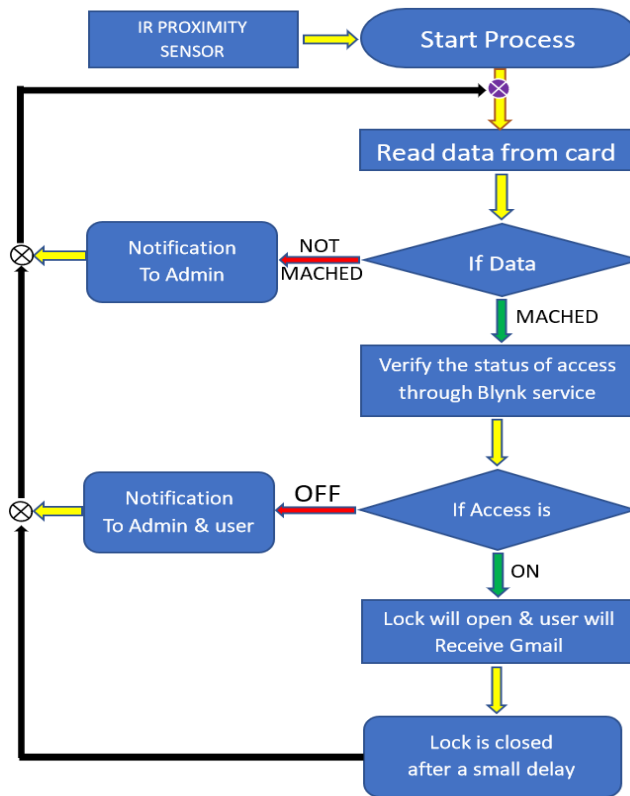
When the RFID tag is placed near the RFID module. The RFID module reads data from the card and it will check whether the card is registered or unregistered by comparing this data with the programmed data.

CASE 1

If the RFID card is unregistered the admin will receive a notification from Blynk services, that some unregistered user is try to access to open the door lock, the red color led light will glow, Buzzer activate, And lock will not open.

CASE 2

if the RFID card is registered then it will go for the second stage of verification by checking the status of RFID card in Blynk server, When the access button in the app is ON, it means the admin has given access to the user. If the button is OFF, it means the admin has disabled access to the user. Admin can give access or disable access as he required.

CASE 2.1

if the admin has disabled the permission to that user, then the red color led light will glow, Buzzer activate, And lock will not open. Now the admin will receive a notification from Blynk services that particular user is trying to access the lock. And user will receive mail notification that request your admin for access.

CASE 2.2

If the admin has enabled the permission to that user, then the green color led light will glow, and lock will be opened and closed automatically after a Predetermined delay. Now the admin will receive a notification from Blynk services that particular user opened the door lock. And user will receive a welcome mail notification.

CASE 3

If the system is not connected to internet, it will reject the request from user.

CASE 3.1

If the system just goes offline Blynk server will send a Blynk notification to the admin that your system went offline after a pre-determined time and Node MCU process the request as per the previous status of the user in Blynk server.

CASE 4

If Admin ON special unlock button in Blynk App for opening the lock, the lock will be opened without any RFID Card verification. When he OFF the special unlock button in Blynk App the lock will be closed.

CASE 5

If Admin ON Back Unlock Protection, the push button which is placed backside of the door will be disabled. Now the people inside the room cannot go outside of the room.

CASE 6

If someone try to break the door the vibration sensor will active and it send notifications, some suspicious activity happening, and the will buzzer activate to alert neighbor people.

Admin can lively monitor all these activities through his mobile in the monitoring tab of Blynk application.

The notifications send to user will help him to conform that he is accessing the lock. If some unknown user accessed the lock with his card now, Admin can disable the access to that particular card and the button switch used to get out of the room.

Other features are the admin or owner can remotely unlock and lock the door from any place in the world.
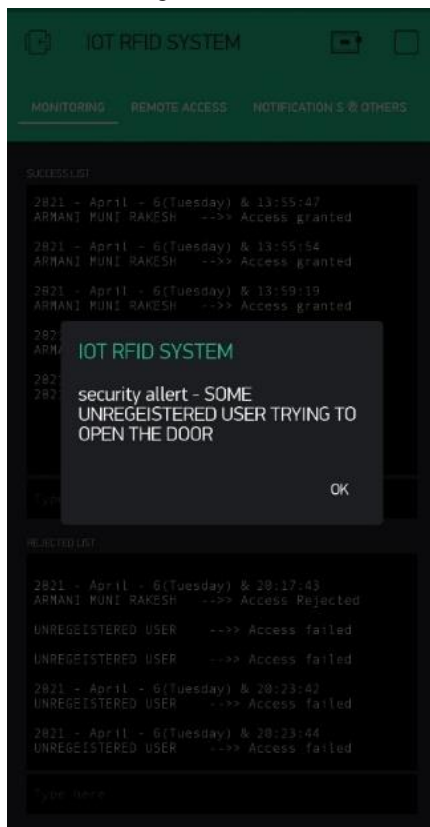
4. Results and Discussions
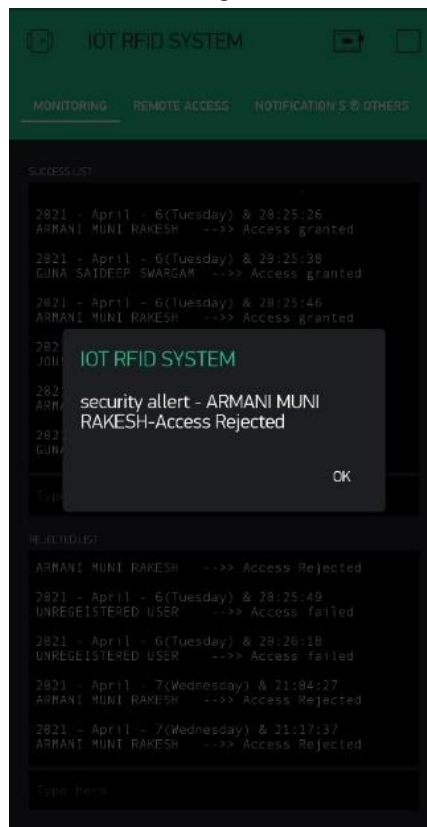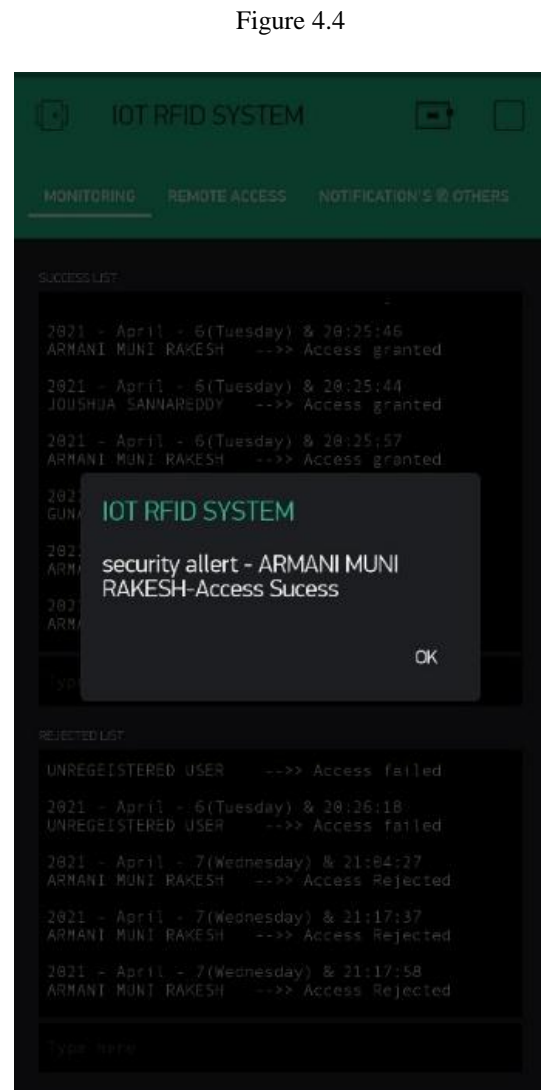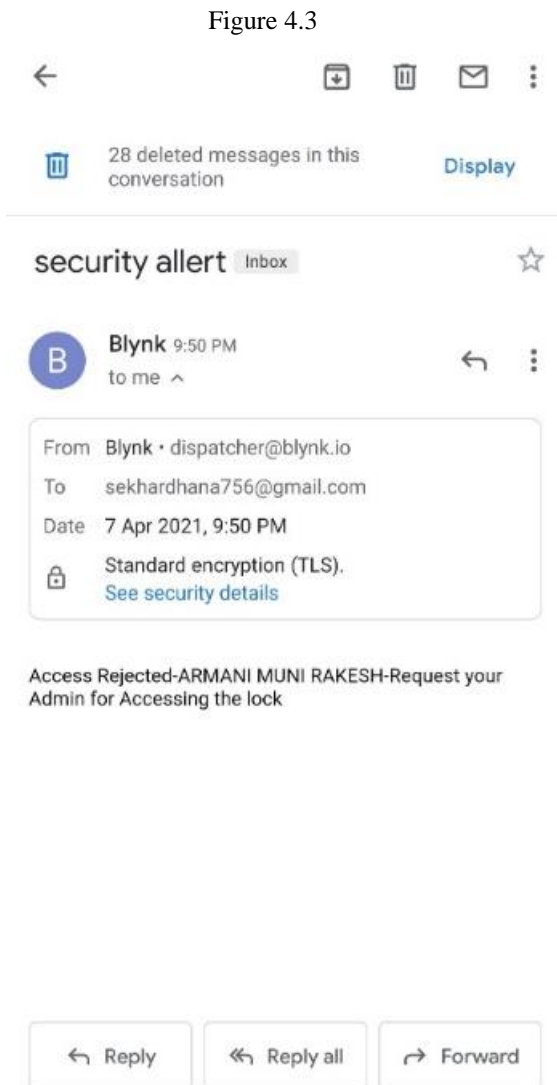

Figure-4.1   Figure-4.2

Figure-4.1 It is a Blynk notification to the admin when unauthorized person tries to unlock the door.

Figure – 4.2 It is a Blynk notification to the admin when Authorized person try to unlock the door without Admin permission.

Figure – 4.4 It is a Blynk notification to the admin when Authorized person Successfully unlock the door with Admin permission.

Figure - 4.3 It is a Gmail notification to the Authorized person (user) when he tries to unlock the door without Admin permission.

Figure 4.3   Figure 4.4

Figure-4.5 It is a Gmail notification to the authorized person(user) when he Successfully unlock the door with Admin permission.
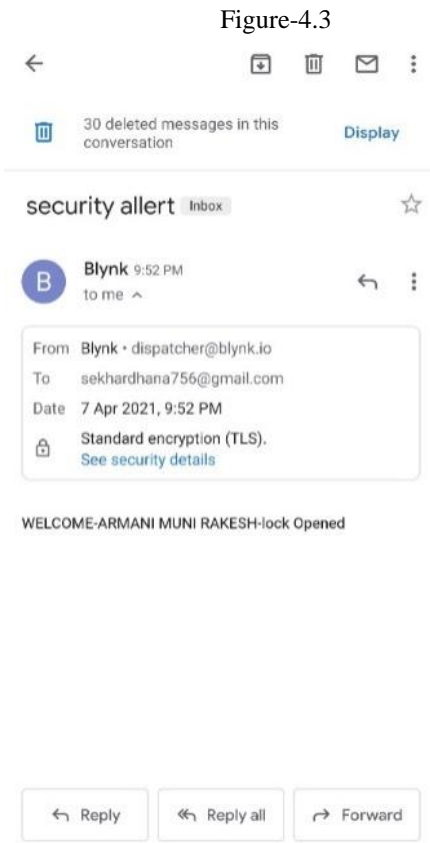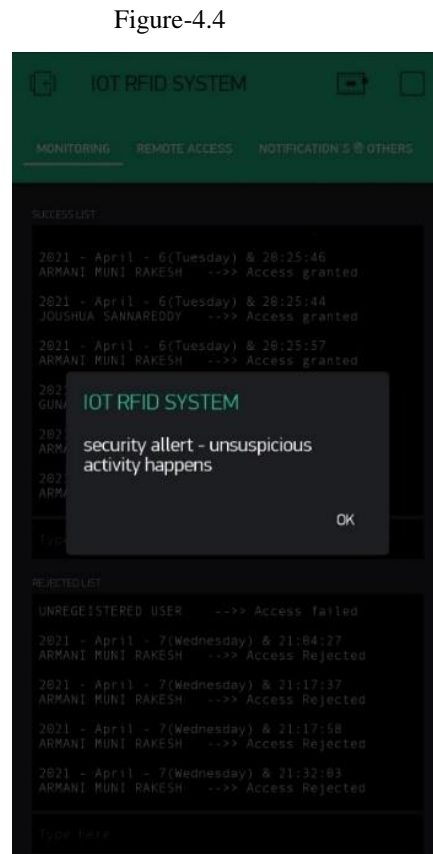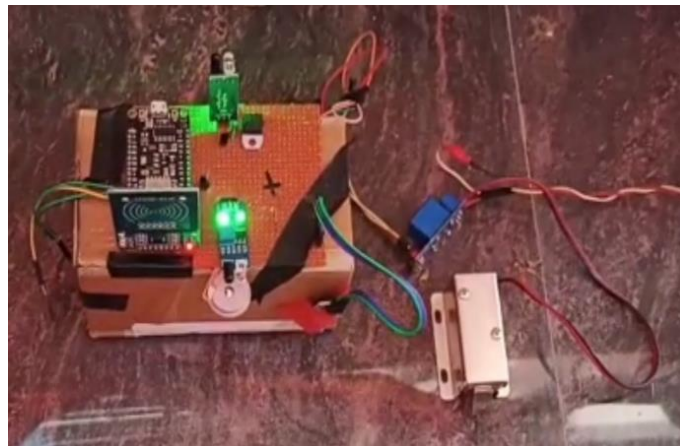
Figure-4.3
Figure-4.4

Figure-4.6 it is an alert notification, if someone try to break or knock the door very strongly then the vibration sensor will active and it send Blynk notifications to the Admin.

Implementation Photograph!

It is the photo graph of tested prototype.

Figure 4.7

It shows the overall representation of the proposed system, and relative position of all the components and its connections to one another.

5. Conclusion

The research study can be used to design the Door Unlock System using IOT & RFID Technologies. With the help of this proposed system, admin can remotely monitor, control & get notifications from the door lock from anywhere in the world through his mobile. This system is fast, accurate, highly secure, non-contact type, there is no limited range of control, cost of the system is low with increase in comfort for users.

6. Application and Future Scope

This system can be employed for Home, Personal lockers, laboratories, Stores, Shopping Centers, Server Rooms, Office Buildings, Banks, Industries, Hotels & Apartments etc.

It can be paired with intelligent virtual assistant like google assistants, Siri and Alexa etc. for better control and security.

For additional security face Recognition or biometric features can be added.

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