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Advanced door lock

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Abstract: *Now a days almost of the gadgets are connecting to internet even the household things which are not electrical they too are implemented with sensors and microcontroller boards and are connected to the internet so that they can be controlled smartly and can be accessed remotely. In the same way this research paper describes the implementation of internet to the door lock so that it should be remotely accessible and various artificially intelligent functions of the device would be able to show various information such as lock/unlock status, which family member arrived at the house time of locking and unlocking etc.*

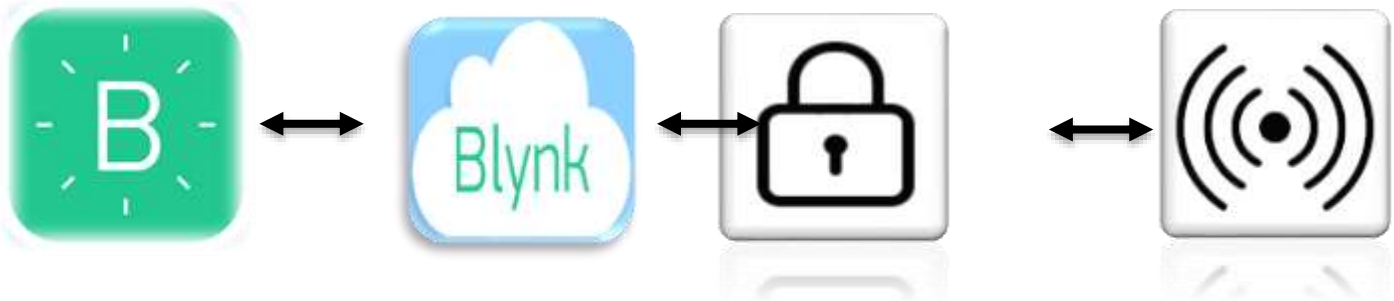
Key Word: *Security; IOT; AI; Door Lock; Automation; Blynk; Internet*

I. INTRODUCTION

The door lock of the house is very crucial part of the security system however we may build the lock as robust as possible but what if the lock will be smart as well, so it would perform its basic task of preventing unwanted person to enter the house and at the same time provide advanced features which would make the lock artificially intelligent, information providing and much more secure. This research paper describes the prototype of the same lock which utilizes the capability of a microcontroller board and the infinite potential of the Internet for the sake of remote accessibility. The door lock can be controlled with the help of a physical RFID card (by various members of the family, or different roommates of the a flat) and the owner of the house will have the capability to lock or unlock the door of the house directly from his smartphone and even with the help of a computer or any device which connects to the internet and can provide a browser for surfing the internet.

II. PROPOSED WORK

This is an Advanced door lock which can be unlocked in two ways, either by the use of RFID card while being close to the door or remotely via internet with the help of a smartphone in which Blynk app is installed. This is just a demonstration of the working of the door lock however our final module will look like a small setup box which will be containing all the components inside it.
We have chosen the Internet as the medium because internet is now a days in everyone's hand and is enough capable of exchanging necessary information from the system such as actions provided from the application to the door lock and notifications provided from the door lock to the smartphone. The basic block diagram of the system is shown below.



Blynk App | Blynk Cloud web server | Door Lock | RFID(reader/writer)

Above block diagram contains blynk app which is present on the android phone which can communicate with the Blynk cloud over the internet and the blynk cloud can further communicate with the Node MCU present inside of the door lock.
The owner of the house will have the Blynk app installed on his phone and when the house owner will press unlock button on his phone the door lock will be unlocked for three seconds we have also provided Lockdown mode and notification system.

III.COMPONENTS NEEDED & IMPLEMENTATION

This project needs the following components:

Node MCU: It's a ESP 8266 chip microcontroller board comes with built in wifi chip and is known for its ability to connect to the web servers. This device is standalone enough for the connectivity of the system to the internet and also for processing the input and providing information as output. An image of the Node MCU is shown in below Fig.1 below.

Fig.1. Node MCU

RFID reader/Writer(also RFID tags/cards): RFID stands for Radio Frequency Identification. It is a system which comprises of two things an RFID reader/writer and an RFID cards or tags. Tags or cards can be written with some set of data with the combination of numerals and alphabets which acts as the security code, and this code or data is read by an RFID reader device and then the code is checked by the program that if it's the desired code or not. RFID (reader/writer), tag and card are show in Fig.2 below.

Fig.2. RFID (reader/writer) with a tag and a card

Servo Motor: A servo motor is a small motor which has a shaft which can rotate from 0 to 180 degree acting as unlocking mechanism for the door lock. A servo motor is rotated with the help of program which writes the value of angles to be rotated for the servo motor through which we can define the angle of shaft which suits well for unlocking of the door lock. An image of the servo motor is shown in Fig.3 below.

Fig.3. Servo Motor

Buzzer: A buzzer is a small output device which can produce beep sound. This beep sound is created in different pattern with the help of programming which is used to identify whether the door is unlocked or not. Buzzer is shown below in Fig.4 below.

Fig.4. Buzzer

Li-PO Battery: Li-Po stands for lithium polymer, lithium polymer batteries are very efficient in terms of driving current them, charging them and in terms of their capacity as well. In this project we have used a 3.7 v 1s Li-Po battery for uninterrupted power supply for the door lock. Li-Po battery is show in Fig.5 below.

Fig.5. 3.7v 1s Li-Po battery

Arduino IDE: Arduino IDE is used to code the Node MCU board.

Blynk App: Blynk is a platform which provides application and web dashboard to control various microcontroller boards via various mediums, such as over USB, wifi and over the internet (which provides remote connectivity) as well. The Blynk platform also provides a web server of its own which is used to communicate with the microcontroller board over the internet. In this project we have used the wifi connection and the Blynk app's server to control the Advanced door lock.

Implementation: The Node MCU is connected to the servo motor, buzzer and RFID(reader/writer) as shown in the circuit diagram in figure 6.And its implementation is shown in figure 7 which mimics the wall of a house and door present on the wall of a house.

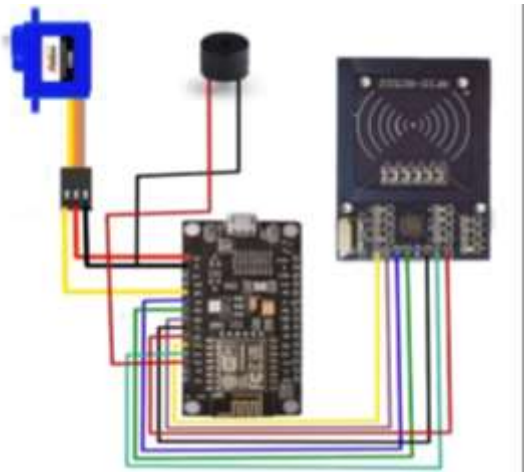
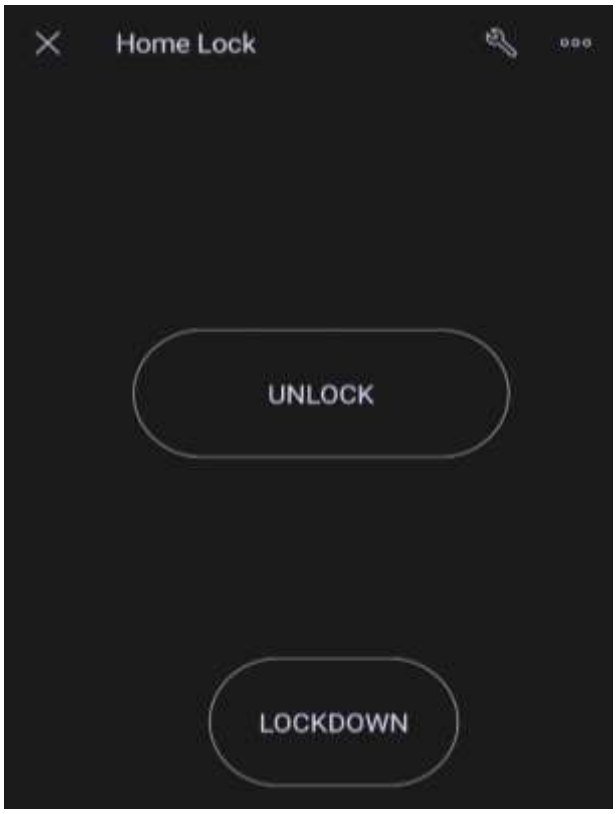


Fig.6. Circuit Diagram

Fig.7. Implementation

When Node MCU is powered on it supplies required voltages to RFID(reader/writer) and servo motor, and Node MCU gets immediately connected to the Blynk cloud web server through the home wifi whose password was already put inside of the code of Node MCU. The servo motor is connected with a string kind of thing to the door lock which is attached to the door lock. A Li-Po battery is also connected for the emergency situation such as electricity cut-off.

Following figure 8 shows the user interface of the android app present on the android phone.



UNLOCK button is for unlocking the door.

LOCKDOWN button is for disabling the RFID unlocking.

IV.RESULT

When Unlock button is pressed on the Blynk app it unlocks the door for three seconds while making three beep tones and then locks it back automatically ensuring that door remains locked forever.
When an RFID card to which access is granted is put in front of the door then also it unlocks the door for three seconds while making three beep tones and it sends a notification to the Blynk app present on the owner's smartphone telling the name of the person reached home.
When an RFID card to which access is not granted the door lock gives a long beep sound and keeps the door locked, a warning notification arrives on the phone (as someone unknown is trying to enter the house) so that owner can put the Lock on LOCKDOWN mode.
When the LOCKDOWN button is pressed on the Blynk app it disables the ability to unlock the door via an RFID card.
It is helpful even in situations such as if one of my family member lost his RFID card so he will call the owner and owner will put the lock on LOCKDOWN.

V. DISCUSSION

It can be seen that how efficiently all the functions of the lock are working and can be unlocked in three ways, one by RFID card, another by Blynk App and even with the help of Blynk Dashboard on any web browser from any phone or computer having active internet connection in them.

This Advanced Door Lock also comes with AI features which automatically tells the owner of the house that which person unlocked the door at what time and also if someone unknown is trying to unlock the house than it gives a warning notification.

It can be this lock can be the future of the IOT based door lock system its security, accessibility and advanced features just makes it a great product for the current technological world. It simply kills the hassle of carrying heavy keys which even takes a lot of time to rotate and unlock the traditional lock while this lock can be unlocked simply by touch of a card and even with the help of a smartphone.

VI.FUTURE SCOPE

This door lock can be improved by creating the web server of our own and our own application in which we can give several other features which would be dedicated to the Advanced Door Lock only
We can provide a camera which will take a picture when someone will unlock the door of the house and will send it to the owner of the house so that it can be confirmed that the door is unlocked by the member of our family and not by some other third party people.

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For mobile application we used the blynk app www how to work with this app we refered https://.blynk.cc/getting-started/