



The Digital Locking and Unlocking System Based on Android for Smart Phone

Prof. Pratima Patel
IT Department, RCOEM
Nagpur, Maharashtra, India

Prof. Samir Ajani
CSE Department, RCOEM
Nagpur, Maharashtra, India

Abstract: *Smart digital automated system plays a major role which helps in reducing a work by using some Technologies to control the various residence's automation systems. The most popular controllers are basically connected to a Windows based PC. In our research we presented a part of smart phone locking and unlocking technology which uses Wi-Fi technology in a mobile device, so it will more easy and efficient to use. It also based on Android platform which are free open source software. In this paper, a system called digital locking/unlocking automation system using Wi-Fi-based Android Smartphone is proposed and implemented The proposed work is to send a signal to receiver from a Tablet or mobile devices by using Wi-Fi system. This allows the user to lock and unlock a any system or appliances from inside or outside a house with a Wi-Fi range available. The main purpose of the work is, if the door is not locked , the user from near by Wi-Fi range can lock the door from his/her smart phone, which will saves person energy & save time. First the introduction of various locking system has presented ,then followed by there is literature survey of some different locking system, then the design of hardware and software is presented followed by conclusion and future scope of the proposed system*

Keywords: *Wi-F, mobile, automation s system, unlock, lock, receiver.*

I. INTRODUCTION

We are now headed into the second decade of 21th century and we are now witnessing more and more digital devices all around us in our daily life. They indeed influence in our routine living and we cannot even imagine one single day without using them. Mobile phone, PC, TV, audio/video player, air conditioner, fridge, oven, and so on are sample of tens of digital devices we have took them for granted as part of our lives. What more digital devices would come to our home at the end of current decade? Ease of access and use, is the main purpose of many remote controllers we now use for our devices. Their number is getting bigger and bigger each day, as a new device becomes remotely controllable. Speakers, air conditioners, light curtains, garage door, TVs and players are already being remote controlled. Now that every single part of our homes can be controlled remotely, why can't we move toward remotely controlling our homes all in one place? Smart House is not a new term for science society but is still far more away from people's vision and audition. This is because although recent various works has been done in designing the general overview of the possible remote access approaches for controlling devices, or in cases simulating the Smart House itself , and designing the main server, the design and implementation of a off-the-shelf Smart House remote control application has been limited to simply the computer applications and just in cases mobile and web applications development. Nowadays people spent a noticeable amount of time in transportation, without having access to their PCs or having hard time accessing their laptops; instead, they are constantly using their cell-phones/PDAs. Because of this, we designed and implemented a mobile application that can be connected to a server where other access routes such as web application and local windows application can also meet there. Nowadays technologies become wider and more new features exist to make human life better. These help people to communicate with each other easier than before. People can communicate by many ways. For this new era, people are most using the wireless technology system to communicate with each other. Wireless technology is known that the communication system is not used the wire. This technology and services have undergone a huge development since the first cellular and cordless telephone systems were introduced in 1980s. The first generation of cellular phone was based on analog FM technology. This generation only has voice service only. Second generation cellular phone next were introduced in the early 1990. This generation use the digital modulation and have an improvement on spectral efficiency as well as voice quality. However this second generation still uses the same features as first generation technologies. We have studied about the known devices that are widely used for security purposes viz. pass code, smartcard and the Bluetooth locking system. But the drawbacks in these devices led to the need of an advanced and more secure locking system using the latest technology i.e. using the Wi-Fi and the android technology, so called as "The Wi-Fi Locking System" that is our proposed system. It is more advanced, user friendly and also provides more security than the so far known technologies. To develop an android application that interfaces with the security system using direct Wi-Fi technology. Controlling the door locking system using WI-FI technology. To share easy and secured access with family members. To make it effortless to lock and unlock our door lock. To get simple installation system.

II. LITERATURE SURVEY

So far we have studied about the known devices that are widely used for security purposes. A few of various security devices are used are pass code smart card, bluetooth locking system.

Pass code: Design and Implementation of a Digital Code Lock, Annie P. Oommen, Rahul A P, Pranav V, Ponni S, Renjith Nadeshan[1] Password door locking system (figure) consists of a numeric board build on the lock itself. The main advantage of this type of lock is that it is extremely user friendly & disadvantage of this lock is that anyone can crack the set password after multiple combinations and attempts.



Fig 1. Security system lock consisting Pass code

Smart card: Design analysis of a security lock system using pass-code and smartcard, Omijeh Boand, G.O. Ajabuego[3].The smart-card locking system uses a smart card which is scanned by the locking device to unlock the lock. The advantage of this device is that it is quite easy to operate.The disadvantage of this kind of lock is that once a card is lost, it becomes difficult to operate the door lo



Fig 3 Security system consisting a Smart card

Bluetooth locking system: Smart homes for a better living using Bluetooth communication based on atmega microcontroller, Monika Rana1, Ramandeep Singh[2].Bluetooth locking system is based on Bluetooth technology consisting of a Bluetooth device. The advantage of Bluetooth is that it is easy to access our door lock without any password once it gets paired with the device. Mostly we need to carry an additional device, but the greatest disadvantage here is that there is no security as any Bluetooth can easily get connected to it.



Fig 3 Security system consisting a Bluetooth

The drawbacks in the discussed devices led to the need of an advanced and more secure locking system using the latest technology i.e. using the Wi-Fi and the android technology, so called as “The Wi-Fi Locking System” that is our proposed system. It is more advanced, user friendly and also provides more security than the so far known technologies. A short view of the proposed system is given below:

Wi-Fi Locking System: The Wi-Fi locking system is based on Wi-Fi technology which consists of a Wi-Fi device which is completely a wireless device. It provides more security than Bluetooth technology or any other device. It is basically designed for the smart phones that are widely used today in day-to-day life.

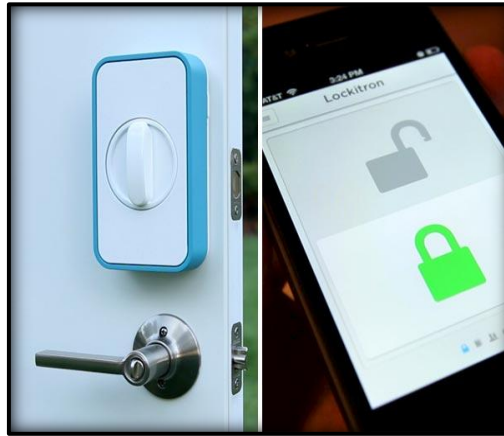


Fig 2.4 Security system consisting a Wi-Fi

III. PROPOSED SYSTEM METHODOLOGY

The flowchart shows complete system process. Start is the most initial entity .When Wi-Fi is switched ON it searches the Wi-Fi connections available. On searching Wi-Fi devices it sets pairing resulting control over locking and unlocking process. On every case fail the control goes back to previous step.

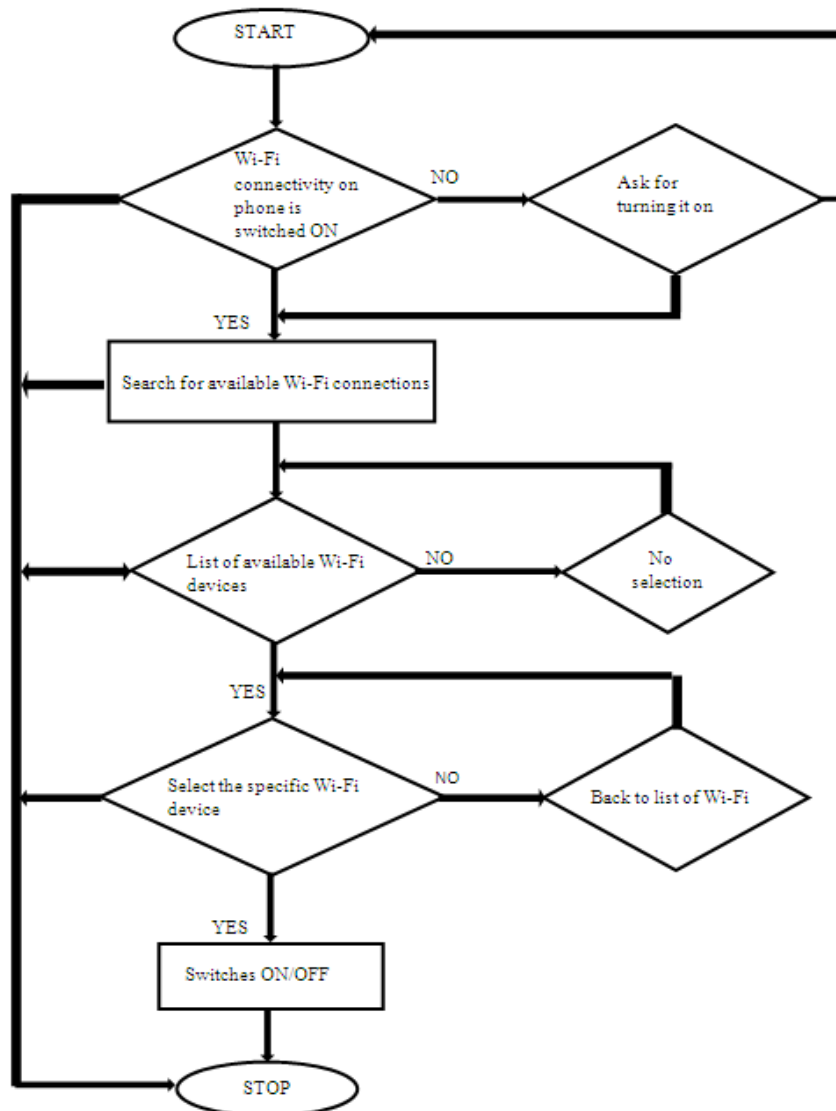


Fig.4 Flow Chart of Complete System

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IV. FLOWCHART OF RECEIVER

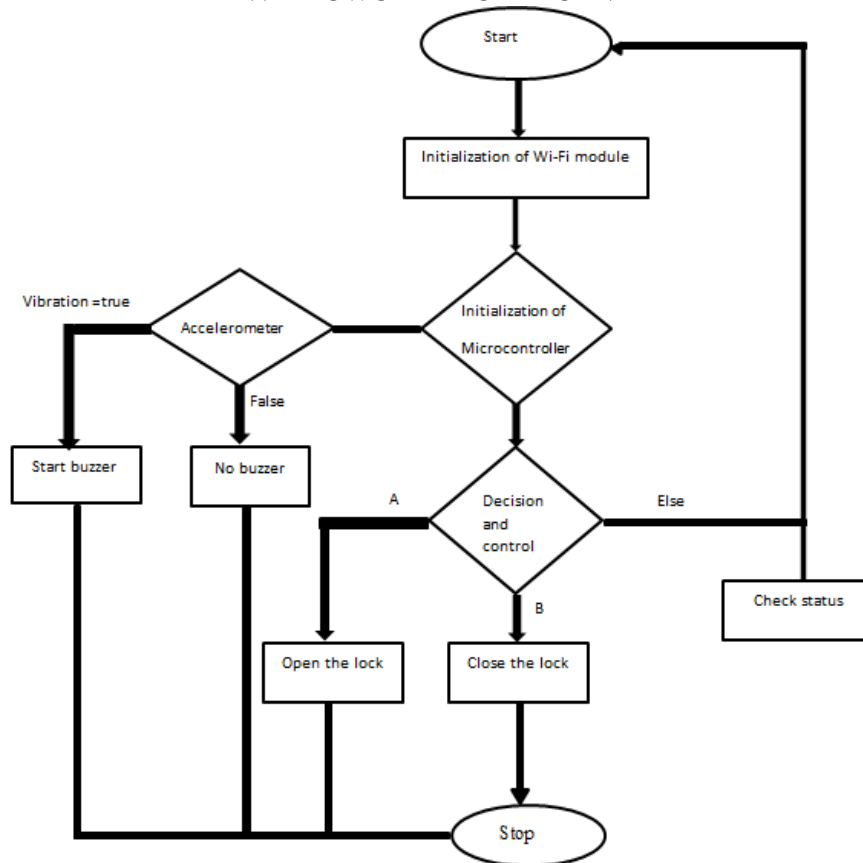


Fig. 5 Flowchart of receiver

On initialization of Wi-Fi module, microcontroller is initialized, onto which accelerometer controls buzzer in respond to vibration. Initialization of microcontroller controls the locking and unlocking process. On error in middle of any process status is checked. And completion of process is shown by stop entity.

V. DATA FLOW DIAGRAM (DFD)

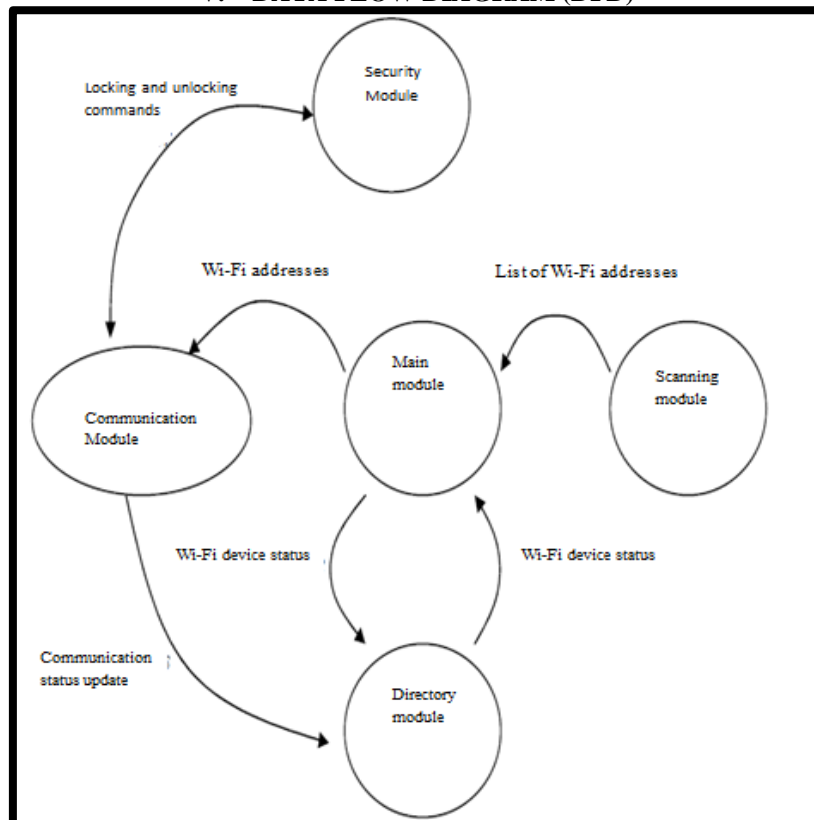


Fig 6 DFD of system

Complete system can be broken into the following modules: Directory module shows the connectivity between Wi-Fi device and mobile phone. Scanning module will discover surrounding Wi-Fi devices. Communication module provides Wi-Fi communication to mobile phones. Security module will send the command messages. Main module will use all the other modules working together to provide the access.

VI. DESIGN OF RECEIVER

A. Embedded C

Embedded C is a set of language extensions for the C programming language by the C Standards Committee to address commonality issues that exist between C extensions for different embedded systems. Historically, embedded C programming requires nonstandard extensions to the C language in order to support exotic features such as fixed – point arithmetic, multiple distinct memory banks, and basic I/O operations. In 2008, the C standards Committee extended the C language to address these issues by providing the common standard for all implementations to adhere to. It includes a no. of features not available in normal C, such as, fixed – point arithmetic, name address spaces and basic I/O hardware addressing. Embedded C use most of the syntax and semantics of standard C, ex., main () function, variable definition, data type declaration, conditional statements (if, switch. Case), loops (while, for), functions, arrays and stings, structures and union, bit operation, macros, etc. During infancy years of microprocessor based system, programs were developed using assemblers and fused into the EPROMS. There used to be no mechanism to find what the program was doing. LEDs, switches, etc. were used to check correct execution of the program .Some ‘very fortunate’ developer had in circuit stimulators (ICEs), but they were too costly and were not quite reliable as well .As time progressed, use of microprocessor – specific assembly – only as the programming languages reduced and embedded systems moved on to C as the embedded programming language of choice.

B. Block Diagram of Receiver

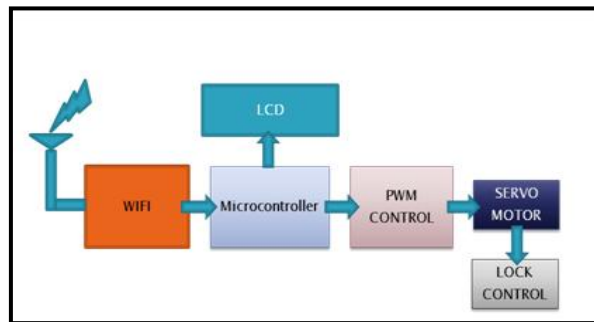


Fig 7 Block diagram of receiver

Receiver in this block diagram is Wi-Fi which receives transmission from smart phone, which is transmitter of this system. The transmission received by the Wi-Fi is regarding the locking and unlocking of door through password. Wi-Fi device receives the command only after getting paired. It forwards the commands to the microcontroller. Microcontroller is programmed to give input/output peripherals to the LCD and to pulse width modulation (pwm). LCD glows as per the commands, for example it glows “status open” for opening door and “status closed” for closing door and “stop” for termination of command. On the other hand pwm which is the technique for getting analog results with digital means passes commands in form of signals to the servo motor. Servo motor which gives angular precision with the help of servo mechanism, controls the process. Door is locked and unlocked as per the given commands to the servo motor.

C. Circuit Diagram of Receiver

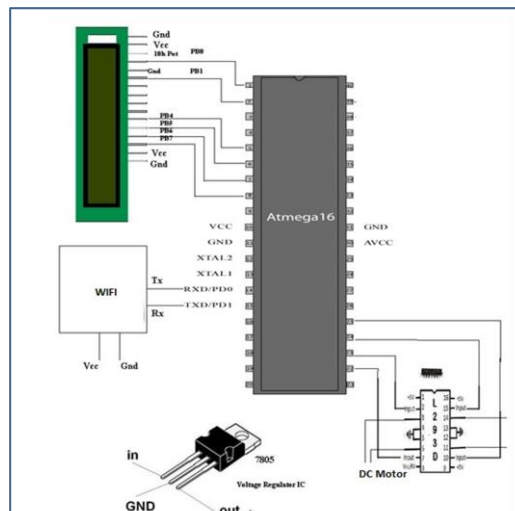


Fig 8 Circuit diagram of receiver

At mega 16 has four ports namely Port A, Port B, Port C and Port D. The LCD screen is connected to the Port B of the microcontroller which will display the status of the locking and unlocking activities. Wi-Fi is connected to Port D which will receive the pairing signals from the transmitter. The servo motor L293D is the lock which is connected to Port D of the microcontroller which will function according to the received inputs

D. PCB Artist Circuit

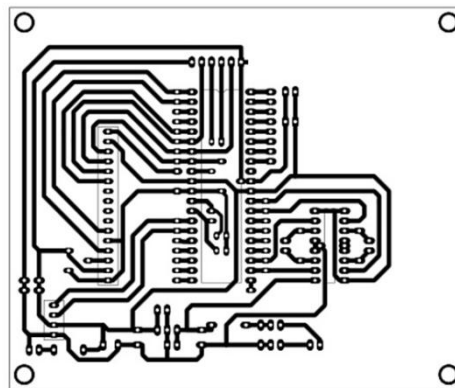


Fig 9. PCB circuit

PCB artist is the software used here to design the circuit of the receiver. The connections are same as that in the circuit diagram of the receiver. The components are fixed and soldered on the PCB board, the circuit design being already imprinted and thus the connections are made. The figure thus shows the flow of commands and the circuit design of the receiver.

VII. DESIGN AND IMPLEMENTATION OF APPLICATION

A. Android Programming

Android is an open source and Linux-based Operating System for mobile devices such as smart phones and tablet computers. Android was developed by the *Open Handset Alliance*, led by Google, and other companies. Android offers a unified approach to application development for mobile devices which means developers need only develop for Android, and their applications should be able to run on different devices powered by Android. The first beta version of the Android Software Development Kit (SDK) was released by Google in 2007 where as the first commercial version, Android 1.0, was released in September 2008. On June 27, 2012, at the Google I/O conference, Google announced the next Android version, 4.1 Jelly Bean. Jelly Bean is an incremental update, with the primary aim of improving the user interface, both in terms of functionality and performance. The source code for Android is available under free and open source software licenses. Google publishes most of the code under the Apache License version 2.0 and the rest, Linux kernel changes, under the GNU General Public License version 2. Android applications are usually developed in the Java language using the Android Software Development Kit. Once developed, Android applications can be packaged easily and sold out either through a store such as Google Player the Amazon App store. Android powers hundreds of millions of mobile devices in more than 190 countries around the world. It's the largest installed base of any mobile platform and growing fast. Every day more than 1 million new Android devices are activated worldwide.

B. Design of Application

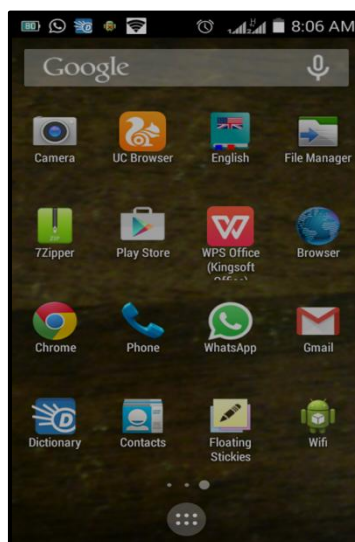


Fig 10. Android App

The figure 6.13 above consists of an android app. App name is "Wi-Fi". This application is used to control our locking system. The app asks the user to create an account, signing in, search for Wi-Fi connections available, to connect to the Wi-Fi that is installed in our system and also consists of lock and unlock buttons for opening and closing of door latch/trigger.

Home Screen of Application:

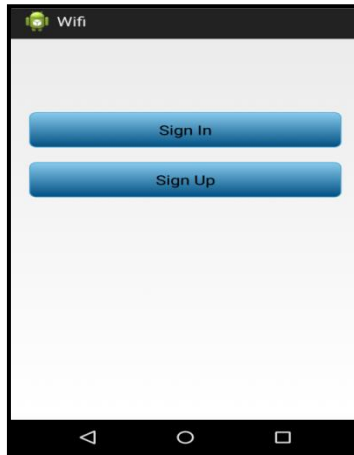


Fig 11. Home screen

The home screen appears after we open the installed application on our respective smart phones. The options of 'sign in' and 'sign up' appear on the screen.

Creating an Account/Signing Up In the Application:

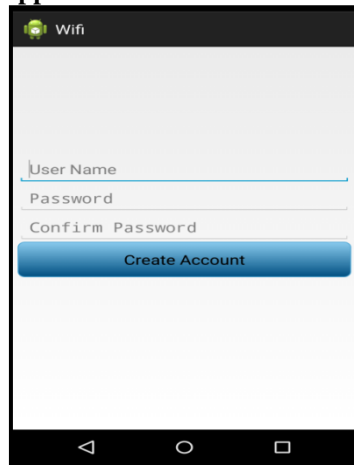


Fig 12. Signing up

The application asks a username to be created and a corresponding password. The password once confirmed, the account is thus created.

Log In/Signing In the Android Application:

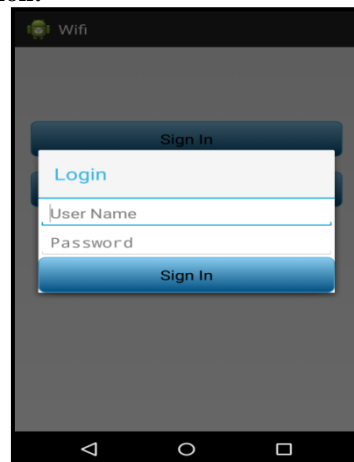


Fig 13. Log in

The Login screen appears in the application once an account has been created. The username and password need to be entered. Click on 'sign in' to login account.

User's Screen

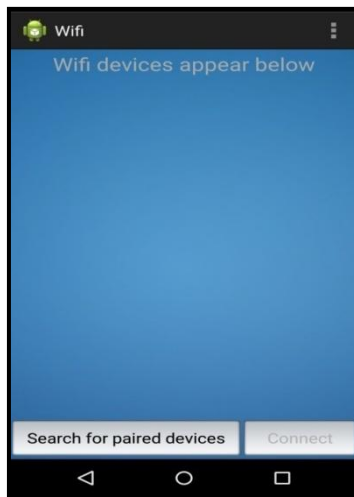


Fig 14 User's screen

The User's screen appears as above after one has logged in the application. The available Wi-Fi devices are searched within the particular range.

Wi-Fi Device Search:

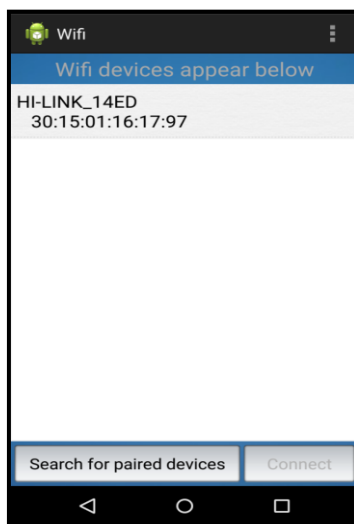


Fig15. Search Wi-Fi device

The searched devices that are available appear on the screen. Thus pairing with the Wi-Fi lock device is done by the user.

Transmitter and Receiver Showing Lock State:

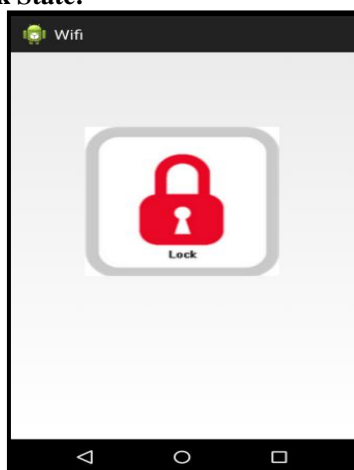




Fig 16. Locked state

The devices once paired, the 'lock' icon appears. By clicking on it the servo motor that acts as the latch moves forward. Thus the locking action is completed.

Transmitter and Receiver Showing 'Unlock' State:

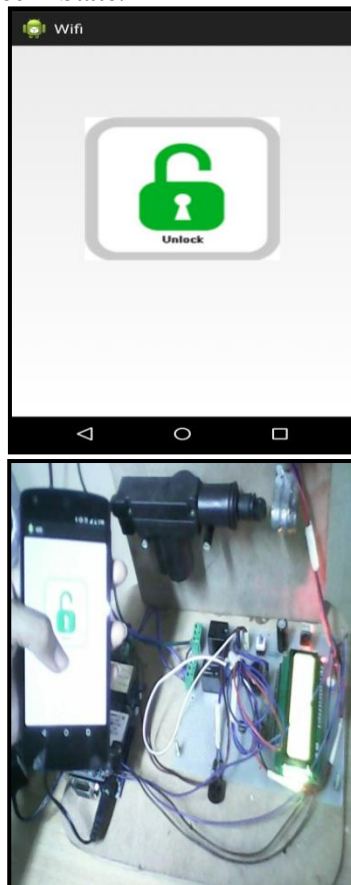


Fig 17. Unlocked state

The device once locked, the 'unlock' icon appears. By clicking on it the servo motor that acts as the latch moves backward. Thus the unlocking action is completed.

VIII. CONCLUSION

Emphasizing security as a crucial part in today's hacking world, up gradations are done for locking devices. Making use of recent and advanced technologies has given a new dimension to the stated purpose. The most trending Smartphone technology is being brought in use for one more purpose apart from the one always being used. Besides entertainment and information utility aspect of Smartphone devices, they can also serve the purpose of unlocking the door. Wi-Fi technology will be adding an additional feature to the proposed module. The price of [chipsets](#) for Wi-Fi continues to drop, making it an economical option included in even more devices. Computers and many other devices, including smart phones and PDAs, can be connected to the wireless Wi-Fi device. Having least limitations and more superior level of safety attribute makes it more reliable. It provides an overall satisfaction to the user.

IX. FUTURE SCOPE

A rechargeable battery can be provided which can give power backup of 3-4hrs in case of power failure. GSM and GPS system can be used in case someone tries to hack the lock password/ cause any physical damage. The GPS and GSM system would track the thief's location & also our location, thus sending us an alert message regarding the attack on our smart-lock. It can also be implemented using cloud computing where user can control the lock irrespective of his location.. Use of camera can also be done for surveillance. For further security, finger scanner, face recognisor etc can be used. To avoid opening of door every time, voice conversation can also be done with the person on the other side of the door .This system can also be installed with an fire alarm. Usually at home we don't have fire alarms, so this system can work as both - lock and fire alarm.This system can be used in hotels, banks, motels, or any other place as an alternative lock for additional security.

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