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Close Proximity Wireless Door lock Control System using Android and Raspberry Pi

Akshay Dindur [1], Mohammed Bilal Kolakar[2], Manjunath Ingale[3], Shreedhar Kadkol[4], Bahubali .M. Akiwate[5]
Student[1, 2, 3, 4], Assistant Professor[5]
Department of Computer Science and Engineering
K. L. E. College of Engineering and Technology, Chikodi, Karnataka, India

Abstract:
A Smartphone has variety of uses and becomes one of the most important devices nowadays. This paper describes the design and operation of a door locking using Smartphone through Wireless Fidelity (Wi-Fi) technology. Programmed using Android, the Smartphone can lock and unlock the door within Wi-Fi range. Android application is designed using Eclipse and Raspberry Pi is used as the main controller of the design. This design is able to work within maximum range of 40 meters and 150 meters. Smartphone activated door lock using Wi-Fi has been designed, implemented and tested successfully.

Keywords: Smartphone, door lock, Wi-Fi, android, smart door, and Raspberry Pi.

I. INTRODUCTION

Nowadays, the capability of Smartphone's is astonishing. A Smartphone is capable to handle applications that can perform a wide variety of functions. The purpose of this project is to simplify the tasks of locking and unlocking the door and to increase the security of the door locking system. The Wi-Fi module and PIC are placed inside the home, apartment or building which is next to the door. The design will be managed through the Android application in the Smartphone to unlock and lock the door automatically. The proposed design is also user friendly, where there is a reset button inside house to allow user to exit the door during emergency situation. Recently, a lot of resea2rchers have developed a technology based home security and automation. The authors in [1] have developed application for controlling access cabinet using Microsoft SQL Server Management Studio for managing the database of the users. This design requires a server which is costly but useful in office area where a controlling system is needed to control people accessing the cabinet. In [2-3], the authors discussed the ongoing project using Bluetooth technology to control the access of the door locking using Android and Arduino. By using Bluetooth, the door locking system only can be accessed within shorter range compared to Wi-Fi technology. Today, technology has become an integrated part of people's lives. It has, and continues to influence many aspects of daily life and has allowed better social interaction, ease of transportation, the ability to indulge in entertainment and media and has helped in the development in medicine. The creation of many devices such as mobile phones and computers have caused many people to rely on technology to communicate with their friends, store information such as pictures, movies, documents, and music . The Wi-Fi has become a common interface that many devices use in order to simplify the daily life of many people. The Wi-Fi has given people the ability to search for information, store their own information in the cloud while also giving them better ways of managing information. From the time of its introduction, the amount of people that use mobile phones and the Wi-Fi to communicate with other people has increased dramatically to become one of the major means of communication. Smartphone's have allowed people to connect to the Wi-Fi without the need for a computer, while still offering the same functionality but through different means. With the introduction of better hardware and better software, Smartphone's have become powerful devices and have become an important part of people's daily lives. A major aspect is how the Smartphone is able to connect and communicate with other devices. For example, Smartphone's can be used as a mouse for a computer, or it can connect to the speakers of cars allowing consumers to play their own music. There are many applications of this sort. A field that is recently gaining popularity is home automation which can also use Smartphone's as information or functionality hubs.

II. EXISTING SYSTEM

The Java based technology produces a secure solution. However the system requires an intrusive and expensive wired installation and use of high end personal computers [1]. Earlier system was depending on telephone line using phone based remote controller [2]. The remote controlling and monitoring of a house using internet requires a laptop or a computer which is large in size and heavy to carry around all day long. So an alternate can be mobile phones with operating system on it for remote controlling and monitoring of a house .The system uses the wireless technology for communication between the devices. The embedded Bluetooth technology, they form a network in which appliances can communicate with each other. There are certain issues involved in the design of a home automation system. The system should be scalable, so that new device can easily be integrated into it [3][4].There are two divisions of security system; commercial and home security system. Since commercial security system usually needed too much cost to meet the expenditure of ordinary family, So as to cost down the expenditure DIY home security system developed and interfaced with Bluetooth modules [5]. In literature researches, suggest a number of security systems based on new technologies like Ubiquitous Sensor Network, Field Programmable Gate Array, Digital Signal Processor, and Microcontroller [6].The wireless technology has some remarkable benefits comparing with non-wireless technology. For example, it makes the installation and maintenance easier. Bluetooth [7], ZigBee [8], 802.11[9], and wireless USB [10] are the most popular technologies in the field

of home wireless network. Internet of Things is technology to improve home security and network of physical objects, devices, buildings, vehicles and other items embedded sensors and network connectivity that enables using with electronics, software these objects to collect and exchange data and the physical world could be connected to the internet by sensors [11]. The key difference between Wireless sensor network and GSM is its wide covering area which facilitates very long distance communication. The Raspberry pi board drives the relay circuit to control fan and light and capture the image using camera and also this system consist of GSM modem to send message along with the link of the image[12].The PIR and Vibration sensor are attached and that is connected to the Arduino microcontroller and the password coder is fixed at the door, if known person comes they will type the password and get inside the house[13]. Robot has temperature sensor where if the temperature increases there will be buzzer indication alerting the owners of the house and it is on and left in the house [14].

III. PROPOSED SYSTEM

The user is to provide data for storage over the cloud. In this the user has the option to encrypt the Data if he wishes to before uploading the same. This adds another layer of security to the user's data. After this point the user can upload the Encrypted data to the Cloud. While doing the same, the user provides the value of Confidentiality, Integrity and Availability. When user sends request along with username to access the data to cloud provider, the cloud provider first checks the user mobile number, it then generates the OTP and sends it to the Users Mobile. Now the user needs to enter the OTP received for authentication, and after authentication access to the data will be provided.

IV. ARCHITECTURAL DESIGN

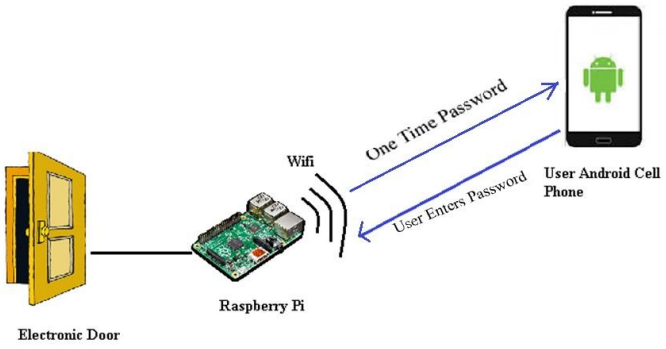

Figure.1. Architecture Diagram.

File content splitting: - This module used for splitting the content of file. It takes the file as it's input. By using the user defined function it split the content of file in several parts is the output of this module. File split uses the open function is to open the file and file is divide into several parts using floor function. It also needs number of parts to be dividing as specified in program.

File storing:-This module used for store the split content of file randomly in different places. It takes the input from the 'File content splitting module' the content are split in several parts module store it randomly in different places in the cloud storage.

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File security:-This module generates the accessing key for the user and sends to user. The generated key is used in the login of the user. Key confirms the user authentication.

File merge & download:-This module merges all spitted data of specific file. And it provide authentication when retrieve file. It using hash function and key for it. Only authenticate user download the merged files. The objective is to provide data security of cloud and their authentication techniques. The cloud data security method uses the symmetric encryption and asymmetric encryption algorithms with their strong authentication techniques. The use of relevant algorithm deals with the level of data safety in cloud because data security in cloud computing is a serious issue as the data centres are located worldwide. Authentication is the most essential procedure to ensure the cloud data in a secured manner. However, strong user authentication is the main requirement for cloud computing that reduces the unauthorized user access of data on cloud. Data security is a more important issue of cloud computing. The survey is completely based upon the estimation for the cloud data security and authentication resolution. Almost, the inventors use the symmetric and asymmetric encryption algorithms with other authentication methods. Symmetric algorithms are AES and asymmetric algorithm are Daffier-Hellman and ELGamal. The Authentication techniques are one time password. So a hybrid technique which is a combination of these encryption techniques and authentication method gives a more excellent and strong security on cloud data.

USE CASE REALIZATIONS

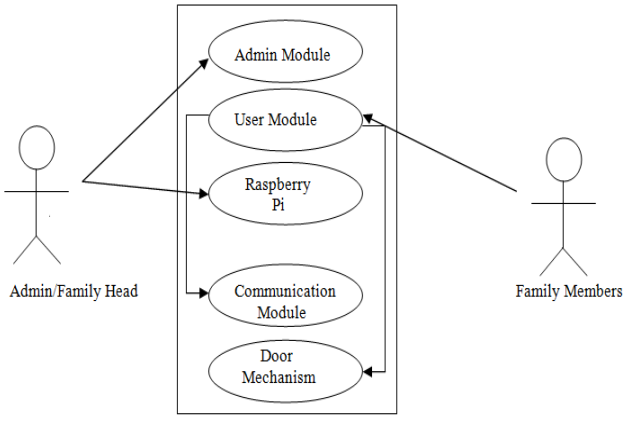

Figure.2. Use case Diagram

- Use case diagrams are used to visualize, specify, construct, and document the behaviour
- Of the system, during requirement capture and analysis.
- A use case is a contract of an interaction between the system and an actor.
- Provide a way of developers, domain experts and end-users to communication.
- Serve as basis for testing.
- Use case diagrams contain use cases, actors, and their relationships use case.
- Use cases specify desired behaviour.
- A use cases is a description of a set of sequences of Actions, including variants a system performs to yield an observable result of value to an actor.

- Each sequence represents an interaction of actors with the system.

This use case realization contains 3 parts User, Framework and Admin. In the first part user can register his information in framework page. After registering admin can verify the user profile. After verification user can login into the system. Then system shows successful registration notification. If user can enter successfully then he can upload his document or download the document.

Advantages:

- Provide authentication-user name and password with MAC address is used for authentication .
- Data Security-is provided with AES encryption with Wi-Fi WPA2 password.
- Restrict direct access of files-android application ensures only necessary resources are used.
- The detection of masquerade activity-OTP and MAC address verification with limit of maximum user attempts prevent such scenarios.
- Data confidentiality-there is limit which data is accessed by user and which is by administrator.
- Efficiency-is achieved as Wi-Fi transmission is fast with HTTP protocol.
- Control door-lock, lights, Fan, home appliances, etc.

Scope: It introduces new cloud security management framework. The system uses the hashing function & key management to provide the security and authentication to target data. Cloud computing supports distributed service oriented architecture, multi-users and multi-domain administrative infrastructure, it is more prone to security threats and vulnerabilities. At present, a major concern in cloud adoption is its security and Privacy. Cloud computing nowadays is the precondition and essential part of the computing globe using whole day developing in its usages and popularity.

V. RESULT

The system has interface from user through Android application , the data is interacted between Raspberry Pi and Android is secured by Wi-Fi password and user ID with password. The authentication is done through OTP and MAC address .The communication between these devices is secured with AES encryption .Finally the user can control the devices with click of button while administrator can add another user, reset maximum user attempts and delete users.

VI. CONCLUSION

Throughout the project many problems arose that could not be solved during the designated time period. Two major issues relate to the ability to detect whether the door is locked/unlocked. These issues arise either when using a key or using the turning knob. Such an action is independent of the motor, therefore the system is unable to recognize that the door is unlocked if done with a key. Another case would be that the maximum rotation of the locking pin, where the time interval specified may not be enough to lock/unlock the door using the motor. These issues could be solved with the use a sensor, but as mentioned earlier, this was not possible throughout the project. Since the Raspberry Pi was used to control the motor directly, some theoretical problems were not answered as well. These theoretical problems relate to using the Raspberry Pi as a central unit and having it communicate with the door wirelessly. There are many available technologies that could be used for the control of the door lock wirelessly, but they pose more questions. How many home appliances can use them? How much cost would they add to the entire system? What is their transmission radius? Are they secure? With more time and resources, it is possible to solve the problems encountered throughout this project turning the prototype into an actual product. The final conclusion would be that the prototype is functional, yet requires more work to complete all the functionalities that would be required of a commercial product. The team truly believes that home automation is the next big step in the lives of consumers. The technology is available, most homes have a Wi-Fi service, most consumers have Smartphone. What is left is creating a unified home automation system where the home appliances are all connected allowing the homeowner to control every aspect of their functions.

VII. ACKNOWLEDGEMENT

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IX. AUTHORS

Shreedhar Kadkol

Mohammed Bilal Kolkar

Manjunath Ingale

Akshay Dindur

Bahubali Akiwate