Study on Access Control and Management Using NFC

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Abstract: NFC (Near Field Communication) is widely used to ease our day to day tasks like data transfer, payment, accessing work place or home, etc. In this paper, we will study an access control system for a door lock i.e. a keyless entry by focusing on NFC together with Arduino UNO a NFC reader and NFC tags.The door lock will consist of an NFC reader which will authenticate the user. The user has an NFC card programmed in such a manner that when taken 10 centimetres close to the door, an indication that the user is authorized will be generated. That is a green led and if the user is not authorized then a red led or an error would be generated. The door would stay open for a precisetime ifauthenticated and one could enter the room. This is how we will Implement NFC in door lock.We hopethat this will lead to asimplify the life by using this increasinglyubiquitous technology.

Index Terms: Arduino UNO, NFC tags, NFC reader, door lock.

1. Introduction

In this paper, it is described that we can now manage user access and unlock the door by simply walking up to it with these Wi-Fi, Bluetooth and NFC enabled devices. Technologies like Bluetooth and Wi-Fi seem similar to NFC as all three allow wireless communication and data exchange between digital devices which support near field communication.

However, Bluetooth and Wi-Fi focus on radio transmissions and near field communication uses the electromagnetic radio fields [4].

In today's fast-growing technology world, most of mobile devices are equipped with wireless modules, which can be used to solve the problems with keys. Almost all of them are equipped with Bluetooth and infrared, latest ones also have NFC on board. The aim is to create a keyless entry system which senses when there is an NFC tag present and unlocks the door. The main goal of this paper is to study a NFC door lock system where an administrator or owner of an apartment or building can unlock the door without using conventional keys, in a way which is effortless and not at all time consuming. Thus, the person can manage and send "digital keys" to other persons in order to allow them to access an apartment, building or specific room in a building by using their NFC smartcard. In order to understand NFC Door Lock is a system we need to achieve these goals:

- Connect the Arduino UNO circuit board to a network,
- Configure the NFC reader,
- Connect the NFC reader to the Arduino board,
- Write Arduino code for authenticating users,
- Connect sensors (led and buzzer) to indicate the access provided.

All of these sub goals have to be achieved and the different elements of the system have to work together properly.

2. Literature Survey

In today's world, we always carry all sorts of keys (house keys, garage keys, office keys, car keys) and/or pass cards. Furthermore, we keep all of them in our pockets or wallets; they occupy a lot of space and weigh a lot. In addition to this, we carry gadgets (smart phones, tablets, smart watches, etc.) which are essential in today's life. After thinking all this, an idea came up of replacing usual keys by NFC card to use for opening/closing and locking/unlocking doors [3]. Smartphones have already been used as payment smart cards. Most of the modern mobile devices are equipped with NFC module and by using such devices, it is possible to get rid of carrying heavy metal keys. People often forget keys at home and they are relatively small and easy to lose. Instead of carrying all these keys, authors of this research paper present a study on NFC-enabled Access

Control and Management System, which by the help of NFC technology makes possible for people to use only one single key.

To emulate a smart card and the data exchange between the mobile device and NFC-reader, ISO 7816-4 smart card standard is used. Compared to other short-range technologies, NFC has the following advantages:

- Slow speed and short range – This allows NFC to consume as little power as possible so it can be left on at all times and not affect the phone's battery by that much (vs. Bluetooth);
- Hassle-free approach to connections – With NFC, bringing the two devices within range is enough to facilitate the communication between the two (vs. Bluetooth);
- Free-line of sight – No direct line of sight is required to establishes connection (vs. Infrared) [3]

Each NFC devices can work in three modes:

- NFC card emulation: This enables NFC-enabled devices such as smartphones to act like a key, in order to allow users to perform transactions such as payment or ticketing.
- NFC reader/writer: The information stored on NFC tags embedded in labels or smart posters are read by these NFC readers.
- NFC peer-to-peer: Two NFC-enabled devices communicate with each other to exchange information in an adhoc fashion [4].

NFC has many applications like data transformation from mobile-to-mobile, mobile-to-laptop, authentication and access control, etc.

3.   Problem Definition

Recently, lot of researches have been devoted to a technology-based home security and automation. With the rapid development in the fields of communication/networks and other related wireless technologies such as RFID (Radio Frequency Identification), UWB (Ultra Wide Band), Zigbee, NFC (Near Field Communication) and Bluetooth enable us to develop various kinds of wireless systems via handsets or smartphones [2]. Research use handset and actuator for remote operation of various electrical devices at home. We are all using smartphones in our lives and keyless entry is just another way we can use our phones to make our lives easier, convenient but also secure to develop the smart door lock there are some sub-problems we need to solve.

First, we need to study two basic technologies: NFC technology (as used in smartphones) and a network attached door lock. We will combine these technologies to develop the smart door lock. Based upon our study of NFC we must create a system that uses NFC tags to respond to the NFC reader when it is queried. Given the NFC communication between the reader and the tag the system attached door lock will determine whether the door should be unlocked or not. While we have some basic experience with microcontrollers and some knowledge of computer communication systems, we did not yet have any knowledge of NFC technology. Combining these different technologies in one paper should take our knowledge to the next level. Our first step in doing this is to connect a microcontroller to the Internet, and then connect a NFC reader to this microcontroller.
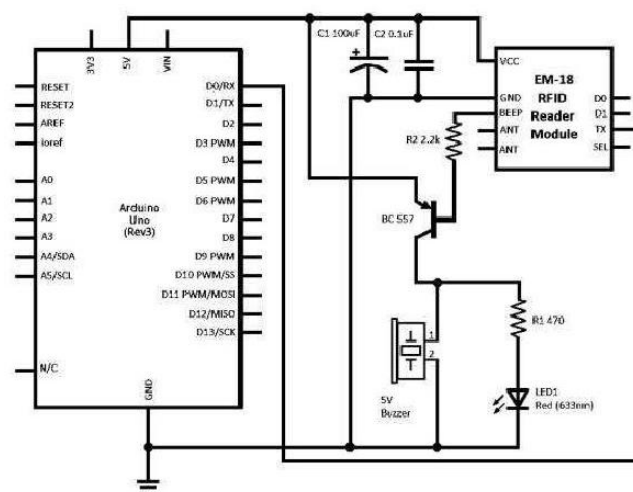
4.   Methodology

4.1 Circuit Diagram

Fig 1: Circuit diagram

Arduino Uno is an open source platform based on microcontroller ATmega328 and it provides an environment for developing software for the board. It can be used for various number of paper. EM-18 RFID reader is vastly used RFID reader to read 125KHz tags. It features low cost, low power consumption, small form factor and easy to use. It provides both UART and Wiegand26 output formats. It can be directly interfaced with microcontrollers using UART and with PC using an RS232 converter. The module radiates 125KHz through its coils and when a 125KHz passive RFID tag is brought into this field it will get energized from this field. These passive RFID tags usually consist of CMOS IC EM4102 which can get enough power for its working from the field generated by the reader. The EM-18 RFID Reader has ATmega16 microcontroller. In this paper, we will use the serial interface of EM-18 RFID Reader to interface the reader with the USART of microcontroller in asynchronous mode. When the RFID reader reads any RFID tag, the ATmega16 microcontroller will read the 12-byte data transmitted from RFID reader.

4.2 Working

We will use Arduino UNO, RFID EM 18 NFC tags. NFC tags can be read and written, by an NFC device. They typically contain data between 96 and 8,192 bytes and are read-only in normal use, but sometimes rewritable. Applications like debit or credit card information, loyalty program data, Personal Identification Numbers (PINs), contacts, etc include secure personal data storage [1]. Every tag consists of a unique tag number. When the tag is brought near to the reader tag number will be read only if RFID reader is connected to computer. A software called "Hiperterminal" reads tag no i.e. UID. The tag details will then be copied and saved for programing purpose. Now connect the Arduino to the computer and a program for power, granting or denying access(Blue LED, Green LED, Red LED respectively) and the door lock will be burnt on the Arduino UNO using the Arduino software. A time limit of 5 seconds for which the door will remain open when access is granted is set.
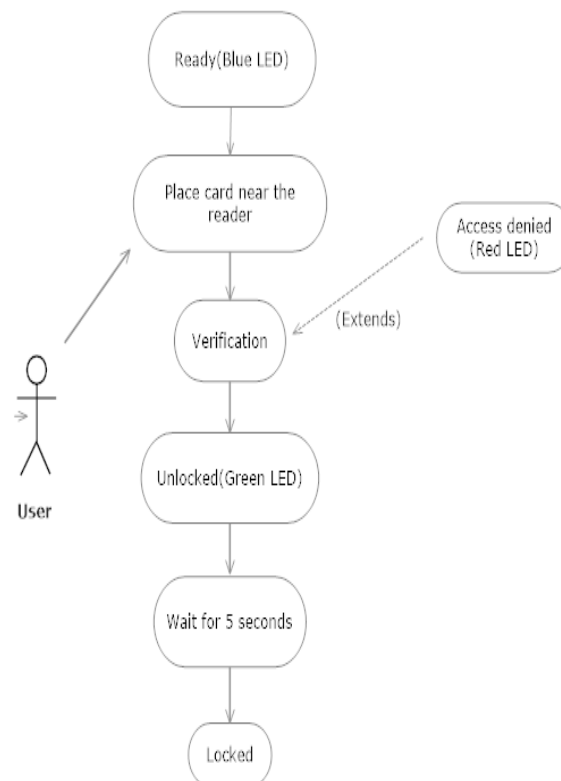

Fig 2: Use case diagram for verification process

In the above figure 2, the system is ready to go when the blue led is glowing, when the user places the card on the reader, verification process takes place if the card is invalid then the access is denied and red led glows, if its valid then the green led glows and access is granted and the door remains open for 5 seconds and then its locked again.

5. Conclusion and Future Scope

This the study on access control and management system using NFC (Near Field Communication) using RFID (Radio Frequency Identification) technology. The presented information about the technology used, hardware requirements, software implementation, and other components and also provided diagrams representing the work flow of the system. Furthermore, we also discussed about the security measures taken and the concerns regarding the system. NFC is becoming one of the most important advances in wireless communication technologies hence using the future technology will lead to an evolved system. This technology can be proved to be very efficient and can be used with many day to day aspects of life. These trends indicate both the increasing popularity and great potential for increased use of NFC in today's society.

The proposed system brings you one step closer to the concept of home automation with security time-efficiency and effortlessness. Since in today's world security comes as necessity and comfort comes as a luxury, our aim will be in making them go hand in hand and provide easier and more secure ways for system automation and also other such systems using NFC as it has a huge potential to simplify our everyday tasks, ranging from paying for items to accessing our office or home. The extent of advancement in this type of wireless communication in accessing our office or home is limitless.

6. Refrences

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