

Train Ticketing and Business-Detail Sharing Using Near Field Communication

Priyal Raut, Vanthana Sachdev, Chirag Shah, Raj Visharia

Abstract— With increasing popularity of smart-phones, economically available technology and use of cell-phones for day-to-day activities like using them as a simple alarm clock to controlling appliances at home with implementing the GSM technology, smart-phones are an integral part of almost every human beings life. Moving towards the future, we intend to use the existing devices in a more effective way like the purchase and verification of train tickets, paying our canteen and sharing our business cards just by bringing the phone in close proximity with the tag. All these tasks can be implemented using the NFC technology which gives a whole new perspective on wireless communication. NFC (Near Field Communication) is a technology that uses RFID (radio frequency identification) which is a wireless non-contact use of radio-frequency electromagnetic fields to transfer data to identify and track tags attached to objects. Communication is initiated by tapping the device or bringing two similar devices in close proximity with each other. In this paper, we highlight the working and two applications of NFC in day-to-day life, that is its use for Train Ticketing and for sharing of Business Cards.

Index Terms— NFC, RFID, passive, tag, reader (Smart-phone), backscatter modulation, wireless

1 INTRODUCTION

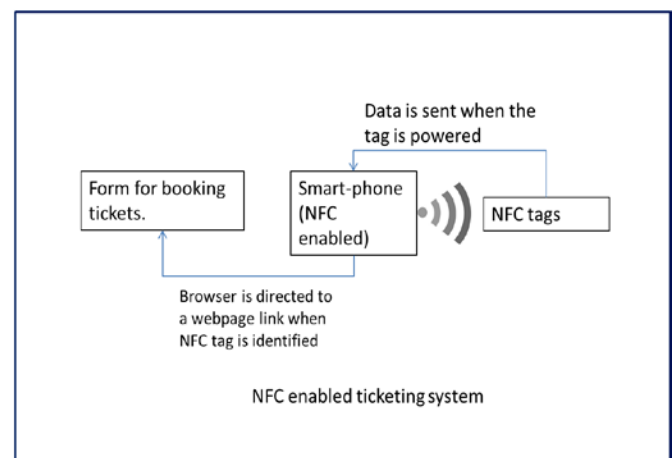
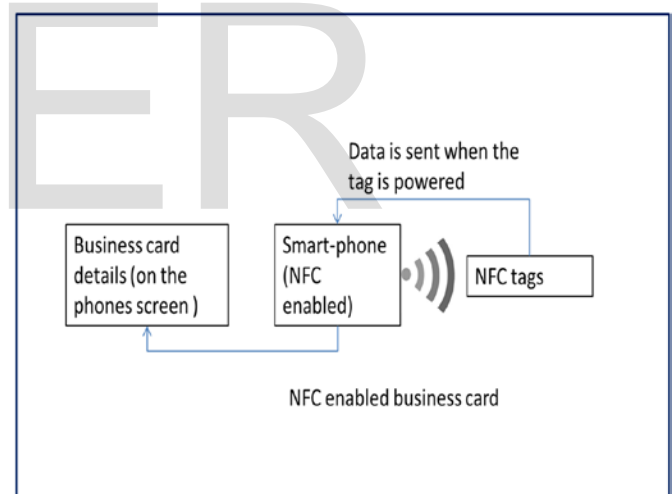
NFC is a short-range, wireless communication technology that makes use of magnetic field induction to transfer data between electronic devices in close proximity. It is based on the RFID technology with certain improvements and drawbacks. It provides a medium for secure data transfer. This is validated via pre defined protocols. Users can perform safe transactions and also access and transfer digital content back and forth between two NFC enabled devices.

This enables users to perform intuitive, safe, contactless transactions, access digital content and connect electronic devices simply by touching or bringing devices into close proximity. NFC operates in the standard unlicensed 13.56 MHz frequency band over a distance of 1cm or less. Currently it offers data transfer rates of 106kbit/s, 212kbit/s and 424kbit/s, and higher rates are expected in the future. For two devices to communicate using NFC, one device must have an NFC reader/writer and one must have an NFC tag. The tag is essentially an integrated circuit containing data, connected to an antenna, that can be read and written by the reader.

There are two modes of operation covered by the NFC protocol: active and passive. In active mode, both devices generate their own radio field to transmit data. In passive mode, only one device generates a radio field, while the other uses load modulation to transfer data. One of the applications focuses on sharing business contact details using NFC. The entrepreneur stores his contact details in an NFC tag which can be transferred to an NFC enabled smart-phone. The advantages of using this method over the traditional exchange of business cards is that it cuts the effort of printing large numbers of copies thus saving a substantial amount of paper. A physical copy of business card can be easily misplaced as against the permanent storage of the information in our phone memory. The other application is used to make the purchase of tickets and boarding a train an easier task. The commuter has to tap on the NFC tag placed near the purchase window and then select/fill in the travel details in the form which flashes on the screen on the smart-phone. Next the commuter needs to do is tap his/her phone with the NFC tags placed near the

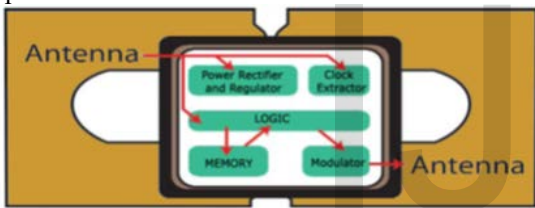
check-in point.

2 BLOCK DIAGRAM



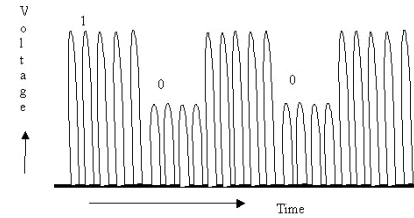
3 WORKING

The general working of the NFC communication has been explained as follows. Initially, the reader (phone) generates a radio frequency sine wave which is used to transmit energy to the tag and to retrieve data from the tag. When the NFC in the phone is activated, it generates periodic sine wave signal of centre frequency of 13.56 MHz. If an NFC tag is present in this range of the magnetic flux generated by the sine wave, the tag gets energized by the magnetic flux and thus creates a counter frequency or changes the frequency properties of the original phone signal. In this way, the reader (phone) can detect a tag in its vicinity. The RFID system here follows very short range communication thus coined as a close couple system. The range of this close couple system is between 0 and 1 cm which implies that the tag has to more or less be pressed against the reader device (or in some cases, the tag can even be placed in the reader itself). A large amount of energy can be extracted from the magnetic field by the tag (passive in nature) which is the main reason a close couple system is implemented. Hence, more energy is available for signal processing in the tag without the need of an external power supply for the tag. Close coupling is also preferred for systems with high security requirements.



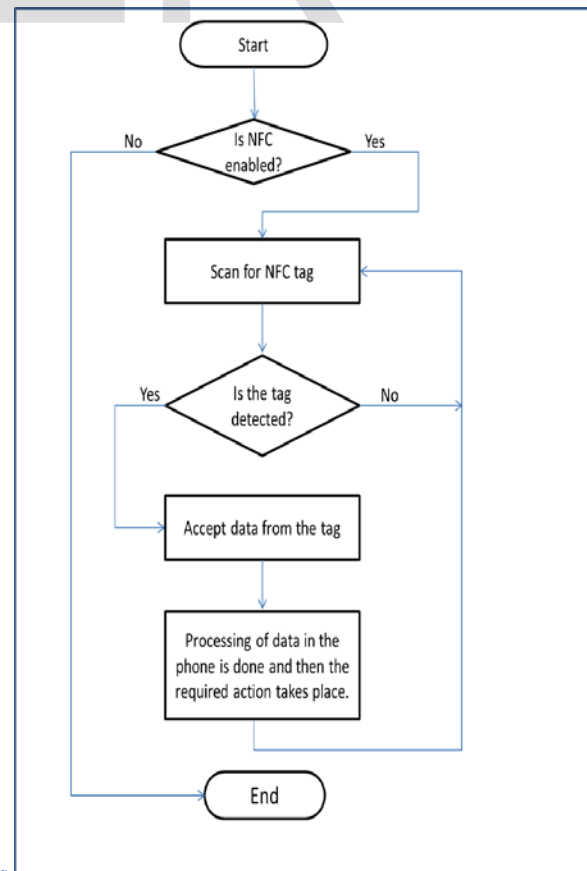
The transfer of data in NFC occurs with the aid of signal modulation. Modulation is basically the process of modifying the characteristics of the carrier wave signal like amplitude, frequency and phase, so that it conveys appropriate information. The carrier wave frequency for NFC is 13.56 MHz. It is modulated according to a stream of data pulses (1's and '0's). The clock frequency of the data stream is much lesser than the carrier wave frequency. Thus the carrier wave properties (amplitude/frequency/phase) are modified. These modifications are detected by the phone and are decoded, after which the decoded information is sent to higher levels for further processing. The carrier wave induces a small alternating current (AC) in the antenna. Inside the integrated circuit (tag), the power rectifier and regulator converts the AC to stable DC which is used to power the chip. The logic, memory and modulator sections of the tag's IC chip is synchronised with the reader due to the pulses generated by the Clock Extractor section of the IC which separates the clock pulses from the carrier wave. To determine the response required (if any), the Logic Section separates the '1's and '0's from the carrier wave and compares the data stream with its internal program. If the data stream is deemed valid by the Logic Section, it accesses the Memory Section for the chip's unique identification data as

well as any of the user data stored in it. Using the clock extractor pulses, the Logic Section encodes the data which becomes the input to the Modulator section. The modulator electronically adjusts the reflectivity of the antenna at the rate of the data stream, thus mixing the data stream with the carrier wave. This electronic adjustment of the antenna in order to reflect RF is known as Backscatter. Backscatter is an effective RF carrier modulation technique in which the tag coil (load) is shunted according to the bit pattern received. Shunting causes a momentary dampening of the carrier wave. This modulates the carrier amplitude as shown in the figure.



The reader detects the modulations in the wave and recovers the concerned data. In the figure, the encoded binary digits modulate the carrier RF signal. A '1' is represented by the higher level of carrier wave whereas a '0' is represented by the lower level. The reader then demodulates the received signal and recovers the data in its encoded form. This data is then supplied to the decoder in the device (phone) and information is further processed and finally used to initiate the required application.

4 FLOWCHART



5 IMPLEMENTATION

Train Ticketing:

The use of NFC in the purchase and verification of train tickets makes ticketing and boarding of trains a faster process.

Here the close couple system is used in the reader/writer mode. The NFC application in the reader should be enabled. Once enabled, the device will scan for the presence of the tag in its vicinity.

The detected tag will be automatically powered by the field radiated by the reader.

The link to the form is stored in the tag (144 Byte memory). The link can be written in tag using the app Tagstand Writer. When the tag is placed within 1cm of the reader, the link opens up in the phone displaying the form which is to be filled accordingly by the commuter.

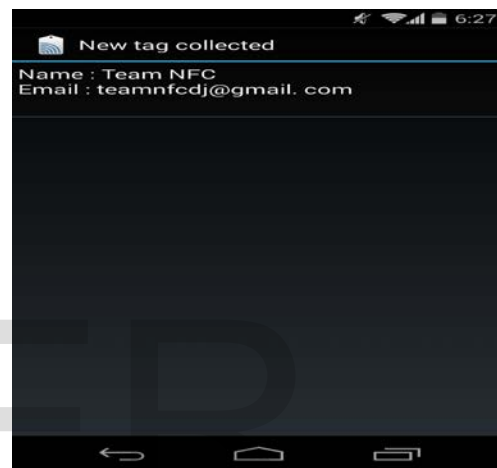
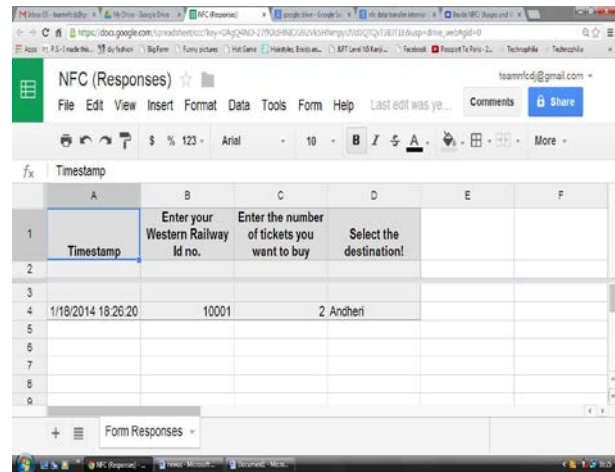
Once the needful is done, the form is submitted and the ticket is purchased. The amount can be debited from an existing account and the total so accumulated so paid off at the end of the month. Once the transaction is complete the commuter gets the confirmation.

Business card:

Initially the NFC tag is loaded with the contact details of the entrepreneur (by the entrepreneur) by using an application called Tagstand Reader/Tagstand Writer. This data is encoded into the NFC tag.

When an individual will want the entrepreneur's contact information, she/he will place their smart phone or any NFC enabled device against the entrepreneur's tag. Care should be taken that the phone is within 1cm range of the tag.

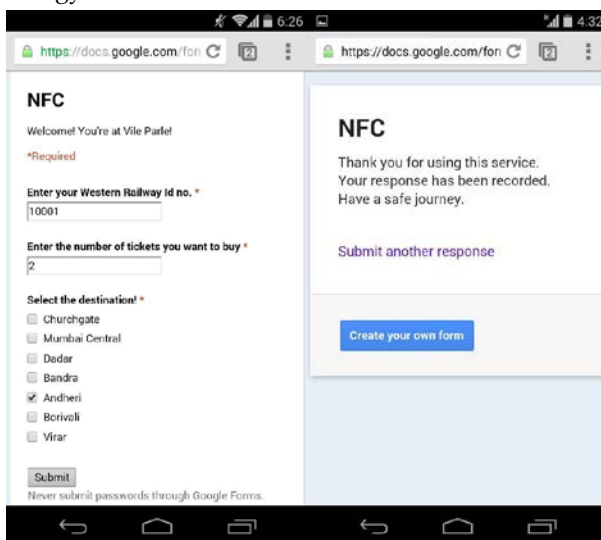
As soon as the phone detects the tag, the tag is automatically energized and the contained information is transferred to the phone. Thus an individual gets the business details of a person quickly and efficiently through the use of NFC technology.



6 CONCLUSION

Thus the NFC (Near Field Communication) technology can be effectively used to perform everyday tasks without much of a human effort. If implemented on a large-scale, it is sure to save human time and energy and can ensure smooth functioning of daily activities. The concept of ticketing can be further expanded and thus, implemented in places such as restaurants. Instead of manually accepting the food order, the customer can tap against the NFC tag linking to a checkbox form, through which she/he can order desired food items. Similarly, the concept of business card can be also used in places such as a gadget showroom. Here every displayed product can have a tag containing its information. The customer can simply tap her/his phone against the concerned tag and retrieve the information, thus saving the effort of manual enquiry. In this way, time taken for the actual performance of a task can be instantly reduced to a few seconds. Further, NFC technology can be expanded for a wide range of applications like security access coding, smart label reading, mobile payment, peer to peer data transfer and marketing using NFC smart posters.

In this way, NFC can be used to access and pay for physical and digital services anytime and anywhere.



7 ACKNOWLEDGEMENT

We would like to thank the respected principal Dr. Hari Vasudevan of D. J. Sanghvi College of Engineering and Head of Department of Electronics and Telecommunication, Dr. Amit Deshmukh for giving us facilities and providing a propitious environment for working in the college. We would also like to thank S.V.K.M. for encouraging us in such co-curricular activities.

8 REFERENCES

- [1] www.ascendia.ro
- [2] www.developer.nokia.in
- [3] Wikipedia
- [4] Youtube.com

IJSER