

Design of NFC Based Vehicle Parking System Using Smartphone

P. Farida¹, Dr. D. Vishnuvardhan²

IIM.TECH (DECS) Asst. Professor
JNTUA College of Engineering JNTU College of Engineering
Pulivendula Pulivendula

Abstract: Number of vehicles is increased in now a day. As increase in vehicles, 80% people are finding hard to park their vehicle. This paper presents information about a secure and an intelligent vehicle parking system which is suitable for large parking lots by using the NFC (Near Field Communication) technology. It consists of tag built architecture in NFC which is used to solve most of the current parking issues. User can park the vehicle, and the parking place is identified by using NFC based Smartphone. User has to show the mobile near the NFC tag which is stacked on a parking place. Then the mobile will share the NFC information with the server using WIFI technology and the parking information is updated in the server with the help of mobile id. Here we are using DC gate motors to secure our vehicle. Whenever user needs to park the vehicle in required slot then the gate is opened and wait until the vehicle is parked after parking of the vehicle then gate is closed automatically.

Keywords: NFC (Near field communication) technology, WIFI technology, DC motors, NFC tag

1. Introduction

As there is a lot of development of in social and economic, large number of vehicles is growing everywhere in India. So large parking area is predictable in future development. This makes owner hard to find and park the vehicle. Number of vehicle is stolen when they are parked. In order to overcome the above mentioned problems, for current parking issues we need to develop an intelligent and a secure parking system which is more important in daily life.

In software companies, shopping malls and many other large parking areas it is difficult to find the parking space. When the vendor returns back to parking space they find that the vehicle may be easily lost. In the existing vehicle locating uses RFID locating technology and image abstraction technology and NFC using Dijkstra algorithm, the above mentioned technology have disadvantages that it may damage of bad weather condition and also more expansive, high complexity, needs the help guide and has complicated operation. Design of Near Communication (NFC) technology and Wireless Fidelity (WIFI) technology, a new erection is specified in this paper, which specifics locating and quick reverse lookup of vehicles. Reverse lookup for vehicle is finished through NFC tag, by using this vehicle can be quickly find in the parking area.

2. NFC Technology

Near Field Communication (NFC) technology is a high frequency non-contact and short-range wireless communication technology, it uses twin identification and linking. It is a single chip in which Contiguity card reader,

Induction mode and one to one functionality are integrated in that chip, it communicates at the distance of 10-20cm (theoretically 40cm), and has operating frequency of 13.56MHz (which is similar to the operating frequency of

RFID). The transmission rate of NFC is 106Kbits/sec; 212Kbits/sec and 424Kbits/sec data can be elevated to 848Kbits/sec or may be raised in future. It establishes the communication among two devices as mobile phones and POS machines, information can be exchange by means of gratified access and other communication access.

Read and Write are the two terminals of NFC device in NFC communication; these can be used as an originator device or a target device. These can be achieved in three modes of process: (1) active mode, it is a reader type of functions. When NFC terminal as reader, it originates to make the RF field to recognize and read the another NFC devices; (2) passive mode, is that the card imitation capabilities, NFC terminal can be designed as a card, whenever the reader emits the RF field it gives response to that reader, this mode is a low power consumer; (3) bidirectional mode, it is peer to peer communication function mode, it is simple to understand the communication among the two readers. The two readers emit RF field to yield the initiative to create the peer to peer communication then it becomes easy to exchange the data or SMS information among the two NFC aided devices. In this notion, functions as active mode as well as in bidirectional mode. Active mode and bidirectional mode communication in NFC is shown in the below figures.

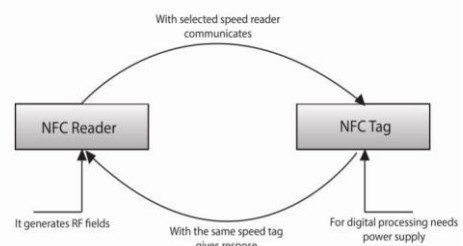


Figure 1: Active communication

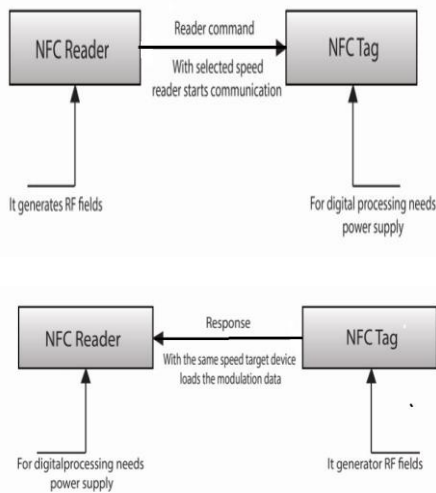


Figure 2: Bidirectional communication mode

3. System Description and Modelling

The general function on large parking space and reverse exploration of vehicle on using NFC technology is shown in the below figure

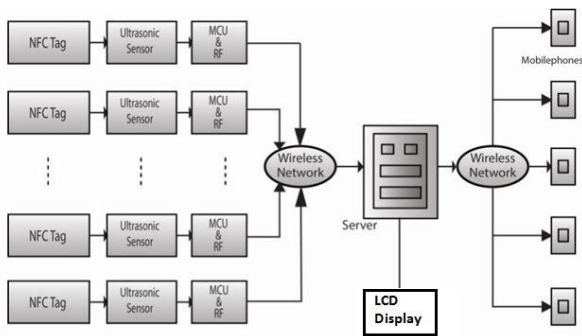


Figure 3: Block diagram of Parking lot

This system contains of vehicle detection structure and reverse exploration structure and these two parts are connected through WIFI technology.

Parking Space Detection

Parking space detection section contains as follows:

- 1) Parking space detection section: it consists of ultrasonic which are used to detect the movement of the vehicle, it has high accuracy and low error rate which is suitable for large parking area.
- 2) Parking report transmission section: it consists of small chip in which RF module, Microcontroller, WIFI module are integrated in chip.

Data processing section consists of PC, database to store the parking information and LED display to show either the parking space is empty or not.

Reverse Exploration Components:

Reverse Exploration system consists of two segments:

- 1) (1)Parking Information Section: it consists of

- 2) NFC tags and stickers or labels, the information in the label can be reused for 10,000 times and the information in the label can be secured for 10 years.
- 3) (2)Reverse lookup fatal section: it consists of NFC reader and PC, NFC reader gets communicates with PC through wireless communication.

Algorithm for the search of parking place can be shown below:

- 1) When car enters into the parking area ultrasonic sensors detect the movement of the vehicle.
- 2) When the owner initiates the NFC in mobile phone then the reader is activated.
- 3) The information is passed to the PC through wireless communication
- 4) It checks the database, and sends the information to the NFC reader.
- 5) Then the parking information is stored in the mobile phone.



Figure 4: Before the vehicle is placed

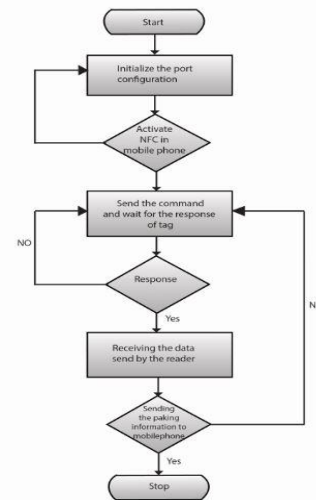


Figure 5: Flow chart

4. System Simulation and Realization

When vehicle enters into the parking area user simply open the NFC in the mobile phone and select the reader mode, wait until the parking information get dumped inside the label. After then they may park and can leave.

Whenever vehicle is parked in a parking area, the ultrasonic sensor detects the vehicle and the detection signal information is send to the small chip and then form the chip to the PC and the data is stored in the database this information is send to LCD display, it shows that the parking space is full or occupied.

In the parking area a NFC tag is fixed at each parking space where the tags stores the about parking space and the connection between tag and the parking space is one to one communication.

When the vehicle returns back to parking area to find the vehicle, select two way communication type in NFC mobile phone, send the saved information in the mobile phone to PC it sends the information of the vehicle by showing electronic map. By this user can easily find the vehicle as soon as possible.



Figure 6: When the slot is booked

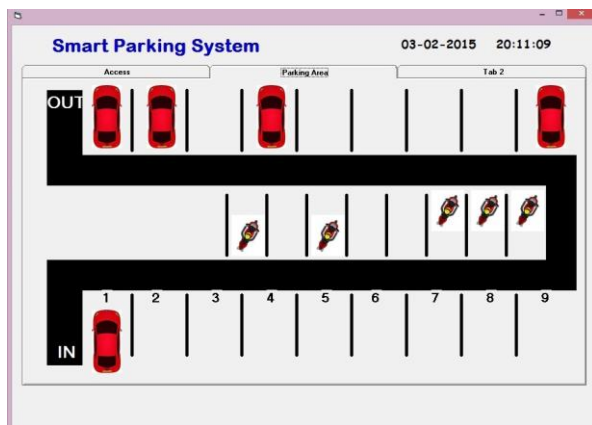


Figure 7: After the car is placed

5. Extension

By using the Dijkstra algorithm, there should be a guide for security of the vehicle and also to show the shortest path to find the vehicle and which increases in cost and complexity. To reduce the cost and decrease the complexity of operations NFC tag and the stickers are used for easy parking and reverse searching of vehicles. For the purpose of security we are using DC motors to reduce the theft occurred in parking area.

6. Conclusion

In this paper new system is used for parking of vehicle and reverse exploration of the vehicle using wireless communication for the completion of parking exposure and also reverse exploration of vehicle uses software to place and relocate the vehicle. This makes the owner to quick search of their vehicle, which increases in efficiency. Parking and reverse exploration of vehicle based on NFC (Near Field Communication) technology which tends to intelligent vehicle parking system will develop in future.

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Authors Profile



Dr. D. Vishnu Vardhan, working as assistant Professor in the Department of ECE, at JNTU college of Engineering Pulivendula. He has thirteen years of research and teaching experience in various domains.



P. Farida, M.Tech in Digital Electronics and Communications Systems. She is a research scholar in JNTU college of Engineering, Pulivendula. She's interested areas are Wireless Communication, and Digital Communication