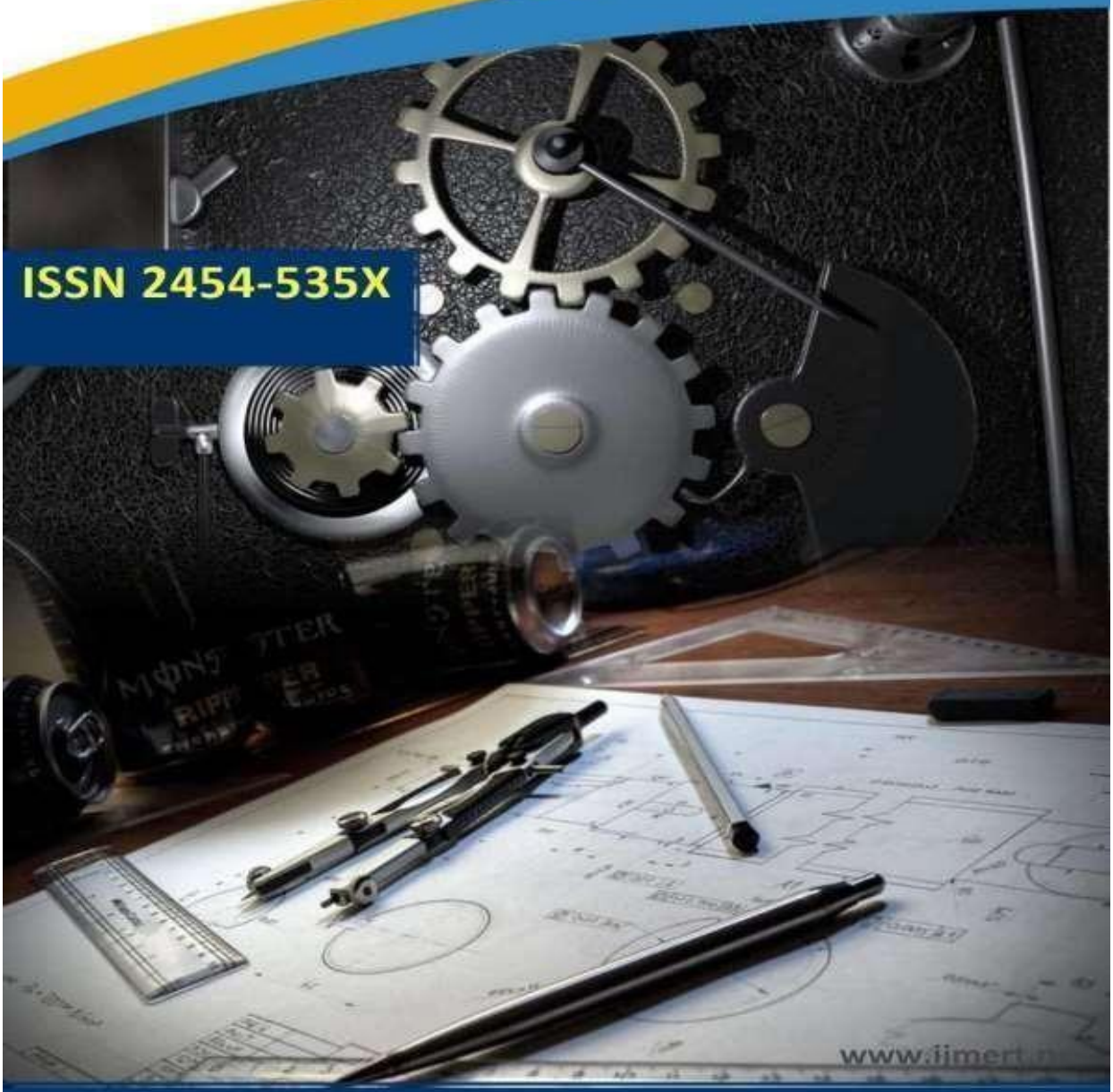
International Journal of Mechanical Engineering Research and Technology

ISSN 2454-535X



Email ID: info.ijmert@gmail.com or editor@ijmert.net

Int. J. Mech. Eng. Res. & Tech 2017

International Journal of Mechanical Engineering Research and Technology

ISSN 2454 – 5X

http://www.ijmert.com

Vol. 16 Issue 2, Apr 2024

AI ENABLED CAR PARKING USING OPEN CV

1.DR.L. MALLIGA,2. E. RACHANA, 3.G.SAI SUPRIYA,4. D. AKHILA

1.ASSOCIATE PROFESSOR, 2,3&4.UG SCHOLAR

DEPARTMENT OF ECE, MALLA REDDY ENGINEERING COLLEGE FOR WOMEN, HYDERABAD

OBJECTVIE

In recent years, the population of the world has increased, the complexity of transportation has dramatically increased. Consequently, there is mountain traffic increase in vehicle movement, the work of mountain movement of various institutions

PROBLEM STATEMENT

Now a day vehicle parking is an important issue and the need is increasing day by day. In India we are still using manual vehicle parking system and that is why we are struggling with the waste of time and fuel problem, when we need to park our car, we need to park our car, which requires a good amount of lighting. Another issue is the chaos that occurs when parking because there is no special system. Anyone can park anywhere that sometimes causes damage to vehicles while going out or in the parking lot. Security is also an issue. To solve these problems we are introducing new car parking system.

ABSTRACT:

Innovative Smart Car Parking System (iSCAPS) integrated with e-Valet technology is proposed in this paper. The e-Valet function works just like how a valet parking would function. It ensures parking lot availability for the incoming customer. Beforehand, the smart phone is installed with the android apps to fully enjoy the functions of iSCAPS. By using the mobile apps, customer may reserve parking lot in advance, to enable the customer to park at a later time. Instead of using the conventional “Season Pass” or ticket, iSCAPS uses the Near Field Communication (NFC) function of smart

International Journal of Mechanical Engineering Research and Technology
ISSN 2454 – 5X
http://www.ijmert.com
Vol. 16 Issue 2, Apr 2024

phone as parking ticket. With the mobile apps, communication will occur when the smart phone is placed near the NFC reader. Therefore, customer only needs to tap the smart phone on the designated reader to enter the car park and tap again on the way out to complete payment. microcontroller is used as the brain of the system and control the input output of the system. Furthermore, vehicle searching function is included, which helps customers to locate their vehicle when forgotten. With the proposed iSCAPS the usage of RFID (Radio Frequency Identification) cards and paper tickets will be eliminated resulting lower cost, more convenience and eco-friendly

INTRODUCTION

The parking industry has always been around ever since the amount of automobile increases on the road. All sorts of parking system are available for Malaysian drivers. To simply name a few the commonly seen parking systems are the meters parking system, ticket parking system, seasonal pass parking system [1] and etc. As the years goes by, the parking industry proves to be ever challenging with each coming year. As the demand for car park increases, the designs of car parks are getting more compact and complicated. Due to the high building and maintenance cost, complicated planning and construction of Mechanical car park, the multi-level car park are still in use even when better technology has been invented for more than 80 years [2]. Malaysia has not yet chosen to install such sophisticated car park system in commercial places parking lots. The best solution in the near future is to optimize multi-level parking, by improving existing conveniences. The common problem faced by drivers is unable to get a parking lot when they arrive at a car park. This may be caused by all sorts of factors, such as the driver being late, peak hour driving, car park renovation and etc. Therefore, the e-Valet function is designed to avoid these obstacles and improve the drivers parking experience. Just like how an ordinary valet service works, the e-Valet system will ensure the driver has a car park and solves reduces the parking lot issue. To ensure parking lot availability, the driver only needs to book a parking lot with the iSCAPS mobile apps in advance. With the current Ticket Parking System [3] used with the multi-level parking system,

International Journal of Mechanical Engineering Research and Technology
ISSN 2454 – 5X
http://www.ijmert.com
Vol. 16 Issue 2, Apr 2024

customers will be given a temporary ticket that had a bar code imprinted on it. When the customer wishes to leave the building, he or she needs to pay the debt at the auto pay station before leaving the car park. When payment is cleared, the customer shall retrieve the vehicle at the location parked earlier and drives to the exit. At the exit, the ticket (marked paid) needs to be feed to the machine with and the lever will be raised allowing the vehicle to leave towards the next destination. The alternative is a frequently visiting customer uses a seasonal pass (a RFID card [4] that is given by the company) that is usually paid in a monthly basis or prepaid method. Instead of getting a ticket at the entrance and feeding the ticket back to the machine at the exit, the driver only need to tap the seasonal pass at the RFID at the entrance and exit to enter the car park and leave Some multi-level car park already set up sensors at each parking lot and displays the number of available car parks at the direction the customer is driving towards. This undoubtedly gives drivers a better sense of direction of where to look for a car park. However, drivers still spend time rounding at the floor for looking the available car park that was displayed Initially car parking were totally manual. External person had to guide the user for parking the car in the available free parking slot. As it was manual, it had many errors in the bill generation process. Later a system was developed in which an external person guided the user to the available free parking slot but electronic boom barriers were used to control the entry and exit of the cars. Later a system, iSCAPS, was proposed in which the concept of e-valet was used in which user can reserve the parking slot using an android application through smart phone. Instead of using conventional monthly pass or ticket, this system uses NFC(Near Field Communication). In this system, at entrance and exit sensors are used to detect the arriving car. LCD displays are used to show the number of available free parking slots at the entrance. Using these sensors accurate bill generation can be done as these sensors automatically senses the entry and exit time. **RELATED WORK** Vacant car parking detection have the first issue about how to obtain well exposed images for inference: For this a plane based Bayesian Hierarchical Framework (BHF) is proposed. Second issue

International Journal of Mechanical Engineering Research and Technology
ISSN 2454 – 5X
http://www.ijmert.com
Vol. 16 Issue 2, Apr 2024

is about how to improve the performance of vacant parking space detection and how to speed up the system for practical applications [1]. The method of combining background subtraction and vertex-edge features are followed. It uses color features and corner features, through training SVM classifier to get the result [2]. ICampus parking allocation using patterns suggests algorithms such as Pattern search (PS) and Pattern search warn(PSwarn) for solving the paring detection problem[3].Cloud-based parking uses three components as Cloud Tier,OSGi Web Servers Tier, Mobile Applications Tier but don not solve ground level issues [4].The temporal clustering and anomaly detection deals with the various algorithms and their use for clustering parking spaces[5]. Smart car parking systems with guidance and damage notification gives route to allocated parking slot and inform in case of any damage to car[6].An innovative system for car parking work separately for entrance, parking allocation and exit phenomenon[7]. The Advanced License Plate Recognition System, consists of two section: Radio frequency Identification (RFID) based detection and license plate recognition by using Open Computer Vision(CV). RFID is an automatic secure and convenient identifier which identifies the objects automatically. Automatic license plate recognition(ALPR) is used to obtain the license number of the vehicles written on the license plate and it possesses various applications but also many challenges[8].Parking availability based on sensor-enabled network uses the data and select some key parameters to form three feature sets to use as the input for the parking availability prediction models that we derive. The algorithms used for modeling the occupancy rate and for prediction are: 1)Regression Tree 2)Support Vector 3)Neural Networks[9]. The entering and leaving from the parking lot is commanded by an Android based application. On allocation of free slot, the car will further trace its path to free parking spot

LITERATURE REVIEW:

In "An Intelligent Car Park Management System based on Wireless Sensor Networks" Wireless sensor networks (WSNs) have attracted increasing attentions from both academic and industrial communities. It can be deployed in various kinds of environments to monitor and collect

International Journal of Mechanical Engineering Research and Technology
ISSN 2454 – 5X
http://www.ijmert.com
Vol. 16 Issue 2, Apr 2024

information. In this paper, we describe a WSN-based intelligent car parking system. In the system, low-cost wireless sensors are deployed into a car park field, with each parking lot equipped with one sensor node, which detects and monitors the occupation of the parking lot. The status of the parking field detected by sensor nodes is reported periodically to a database via the deployed wireless sensor network and its gateway. The database can be accessed by the upper layer management system to perform various management functions, such as finding vacant parking lots, auto-toll, security management, and statistic report. We have implemented a prototype of the system using crossbow motes. The system evaluation demonstrates the effectiveness of our design and implementation of the car parking system. In recent years, wireless sensor networks have attracted a great amount of attention [1]. A wireless sensor network consists of a large number of low-cost sensor nodes which can be self-organized to establish an ad hoc network via the wireless communication module equipped on the nodes. Each sensor node is also equipped with various kinds of sensors, computation units, and storage devices. These functional parts enable sensor nodes to be easily and rapidly deployed to cooperatively collect, process, and transmit information. WSNs have a great potential to be used in future pervasive computing systems as they can be embedded into our daily living environment and provide sensory data for localization and surveillance. Taking the advantages of sensing and wireless communication, wireless sensor networks have already found many civil and military applications, such as smart home[2], intelligent buildings[3], health-care[4], wild environmental monitoring[5], battle surveillance[1], etc. In this paper, we describe the design and implementation of an intelligent car park management system based on low-cost wireless sensor networks. With the approaching of the automobile epoch, the demand on intelligent parking service is expected to grow rapidly in the near future. This emerging service will provide automatic management and high security measures, as well as convenience to the customers. A few existing studies focused on the applications of car parking system using sensor technologies [6][7]. The system in [6][7]

International Journal of Mechanical Engineering Research and Technology
ISSN 2454 – 5X

http://www.ijmert.com
Vol. 16 Issue 2, Apr 2024

adopts cameras to collect the information in car parking field. However, video sensors have two disadvantages; one is that a video sensor is energetically expensive, and the other is that a video sensor can generate a very large amount of data which can be very difficult to transmit in a wireless network. These greatly limit the application of video sensors. In our WSN-based car part management system, the nodes are equipped with light, sound and acoustic sensors. Wireless sensor nodes are deployed to the parking lots to monitor and detect the occupation status of the parking lots, and to cooperatively process and transmit the information to a management system. By using the management system, the managers and administrators will be able to get the information about the parking field, including statistics and real-time information.

In “"A vision-based parking lot management system” Goals of parking lot management system include counting the number of parked vehicles, monitoring the changes of the parked vehicles over the time, and identifying the stalls available. To decrease the cost of the production, an integrated vision-based system is a good choice. In this paper, we propose a vision-based parking management system to manage an outdoor parking lot by four cameras set up at loft of buildings around it, sending information, including real-time display, to database of ITS center via internet. This system enables drivers to find parking spaces available or monitoring the parking lot where they parked their cars easily by wireless communication device. To increase accuracy, in the beginning, color manage is done to all input images, maintaining color consistency. Then, an adaptive parking lot background model is generated. The adequate color of each parking space is found out using statistical method in color image sequences captured by a camera, and foreground is extracted based on color information. The result will be further modified by shadow detection based on luminance analysis. Vision-based parking management system can manage large area by just several cameras. Adjusting position of the camera can easily make this system suitable for most cases. Besides, this system is endurable and is easy-installed because of its simple equipment

International Journal of Mechanical Engineering Research and Technology
ISSN 2454 – 5X

http://www.ijmert.com
Vol. 16 Issue 2, Apr 2024

In "A Summary Review of Wireless Sensors and Sensor Networks for Structural Health Monitoring" In recent years, there has been an increasing interest in the adoption of emerging sensing technologies for instrumentation within a variety of structural systems. Wireless sensors and sensor networks are emerging as sensing paradigms that the structural engineering field has begun to consider as substitutes for traditional tethered monitoring systems. A benefit of wireless structural monitoring systems is that they are inexpensive to install because extensive wiring is no longer required between sensors and the data acquisition system. Researchers are discovering that wireless sensors are an exciting technology that should not be viewed as simply a substitute for traditional tethered monitoring systems. Rather, wireless sensors can play greater roles in the processing of structural response data; this feature can be utilized to screen data for signs of structural damage. Also, wireless sensors have limitations that require novel system architectures and modes of operation. This paper is intended to serve as a summary review of the collective experience the structural engineering community has gained from the use of wireless sensors and sensor networks for monitoring structural performance and health

In "Traffic surveillance with wireless magnetic sensors" Wireless magnetic sensor networks offer an attractive, low-cost alternative to inductive loops, video and radar for traffic surveillance on freeways, at intersections and in parking lots. The network comprises 5" diameter sensor nodes (SN) glued on the pavement where vehicles are to be detected. The SNs send their data via radio to the "access point" (AP) on the side of the road. The AP forwards sensor data to the Traffic Management Center via GPRS or to the roadside controller. Because such networks can be deployed in a very short time, they can also be used (and reused) for temporary traffic measurement. Vehicles are detected by measuring the change in the Earth's magnetic field caused by the presence of a vehicle near the sensor. Two sensor nodes placed a few feet apart can estimate speed. A vehicle's magnetic 'signature' can be processed for classification and re-identification. The paper describes the algorithms and presents experimental results

International Journal of Mechanical Engineering Research and Technology
ISSN 2454 – 5X

http://www.ijmert.com
Vol. 16 Issue 2, Apr 2024

comparing the accuracy of such a wireless sensor network with loop detectors and video.

EXISTING SYSTEM:

With the current Ticket Parking System used with the multi-level parking system, customers will be given a temporary ticket that had a bar code imprinted on it. When the customer wishes to leave the building, he or she needs to pay the debt at the auto pay station before leaving the car park. When payment is cleared, the customer shall retrieve the vehicle at the location parked earlier and drives to the exit. At the exit, the ticket (marked paid) needs to be feed to the machine

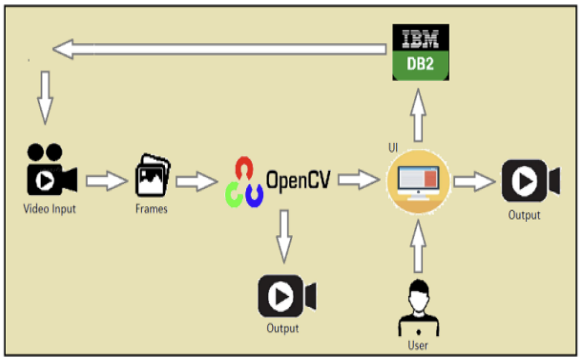
with and the lever will be raised allowing the vehicle to leave towards the next destination.

PROPOSED SYSTEM:

The alternative is a frequently visiting customer uses a seasonal pass (a RFID card that is given by the company) that is usually paid in a monthly basis or prepaid method. Instead of getting a ticket at the entrance and feeding the ticket back to the machine at the exit, the driver only need to tap the seasonal pass at the RFID at the entrance and exit to enter the car park and leave. Some multi-level car park already set up sensors at each parking lot and displays the number of available car parks at the direction the customer is driving towards. This undoubtedly gives drivers a better sense of direction of where to look for a car park. However, drivers still spend time rounding at the floor for looking the available car park that was displayed

IMPLEMENTATION

BLOCK DIAGRAM



The methodology for implementing the proposed AI-enabled car parking system using OpenCV follows a systematic and phased approach. Initially, a comprehensive requirement analysis is conducted, involving stakeholders to gather specific needs and challenges in urban parking management. This analysis informs the selection and

International Journal of Mechanical Engineering Research and Technology
ISSN 2454 – 5X

http://www.ijmert.com
Vol. 16 Issue 2, Apr 2024

integration of crucial components, including AI algorithms and OpenCV, ensuring a holistic understanding of the technological and operational requirements. The system architecture is meticulously designed to seamlessly incorporate these components, emphasizing adaptability and scalability to urban dynamics. Implementation involves the development of AI algorithms for real-time analysis of parking spaces and the integration of OpenCV for computer vision capabilities. Usability testing is incorporated to refine the user interface and enhance user experience. Sustainability considerations are woven into the methodology, ensuring the system aligns with environmentally conscious practices. The development process includes rigorous testing, encompassing functionality, security, and reliability, with a particular emphasis on real-world scenarios. A pilot deployment with select users is conducted to gather practical insights and user feedback, enabling iterative improvements. Ongoing monitoring and support mechanisms are integrated to address issues promptly and optimize system performance continually. The methodology, in essence, ensures a robust development process that aligns with industry requirements, leverages cutting-edge technologies, and delivers a transformative AI-enabled parking solution for urban environments.

CONCLUSION:

As a conclusion, iSCAPS is an Innovative Smart Car Parking System with a latest NFC (Near Field Communication) technology. iSCAPS is the one of most advanced car park systems that are used as improvements for the current car park system by using ticketless method with an extended feature such as NFC, NFC Kiosk, sensor in lot system, assigned a lot and online reservation. NFC system in Iscaps car park requires customers to use mobile phones or NFC cards as one of the payment methods. This technology will bring convenience and further enhance eco-friendly aspects. At the same time, iSCAPS also functions as a reminder system to remind customers of their vehicle location by using their mobile phone tag or NFC card to NFC kiosk. To make it even more convenient, online reservation is provided to customers that prefer online booking prior to their visit to the shopping mall. As a result, iSCAPS has brought more convenience to

International Journal of Mechanical Engineering Research and Technology
ISSN 2454 – 5X

http://www.ijmert.com
Vol. 16 Issue 2, Apr 2024

customer with using shorted time to park the car and reduce the congested in car park. The car park also will generate more revenue for the company by less man power requirement in the system.

ADVANTAGES:

i. As every NFC tag has a unique ID, the system cannot be deceived by a forged ID.

ii. Parking space width and depth (and distances between parking spaces) are drastically reduced since no allowance need be made for driving the car into the parking space or for the opening of car doors (for drivers and passengers).

iii. No driving lanes or ramps are needed to drive the car to/from the entrance/exit to a parking space.

iv. The parked cars and their contents are more secure since there is no public access to parked cars.

v. Minor parking lot damage such as scrapes and dents are eliminated. vi. Driving around in search of a parking space is eliminated, thereby saving time and reducing fuel consumption and thus the engine emissions.

LIMITATIONS: The user needs to carry NFC enabled smart phone otherwise a NFC tag need to provided to the user which becomes an additional liability to the parking system.

i.The initial cost of setup is high.

ii.Since there is a single entry and exit point there will be traffic congestion if several cars arrive simultaneously.

FUTURE SCOPE: While working on the evolution of the system and exploring the ways in which the system can be designed, we come to know few new features that could be added through little alterations in the system. Following are few things that can be done with modifications. i. NFC parking meter can be integrated in the system which can be used to make payments using NFC enabled smart phone. The payment is done through a credit or debit card associated with the mobile phone number. ii. Multiple entry and exit points can be constructed to reduce the traffic congestion thereby saving time.

REFERENCE

[1] "An Intelligent Car Park Management System based on Wireless Sensor Networks," V.W. S. Tang, Y. Zheng, and J. Cao, Proceedings of the 1st International

International Journal of Mechanical Engineering Research and Technology
ISSN 2454 – 5X

http://www.ijmert.com
Vol. 16 Issue 2, Apr 2024

Symposium on Pervasive Computing and Applications, Aug 2006.

[2] "A vision-based parking lot management system" Sheng-Fuu Lin, Yung-Yao Chen, 2006 IEEE Conference on Systems, Man, and Cybernetics, Oct. 2006.

[3] Robust parking space detection considering interspace correlation In Proceedings of IEEE International Conference on Multimedia and Expo 2007.

[4] N. True Vacant parking space detection in static images University of California, San Diego, 2007.

[5] Embedded Systems with ARM-Cortex by Technophilia Systems.

[6] How Near Field Communication Works http://electronics.howstuffworks.com/near-field-communication.htm

[7] What's an NFC tag? http://electronics.howstuffworks.com/nfc-tag.htm

[8] ISO/IEC 18092 Information technology, Telecommunications and information exchange between systems, Near Field Communication, Interface and Protocol NFCIP-1 ISO - International Organization for Standardization, 2004.

[9] NFC Forum Smart Poster RTD 1.0 Smart Poster Record Type Definition Technical Specification NFC Forum, 2006.

[10] Near Field Communication and the NFC Forum: The Keys to Truly Interoperable Communications. NFC Forum, 2007.

[11] 8 Scenarios Where NFC Would Make Sense http://pocketnow.com/2013/01/02/nfc-use-cases

[12] Near Field Communication in the real world: turning the NFC promise into profitable, everyday applications, Innovision Group. year 2007.

[13] Near Field Communication White Paper. ECMA International, year 2007

[14] NFC and the NFC Forum http://www.nfc-forum.org/resources/presentations/Gerhard_Romen_N FC_Forum_Transport.pdf