A Proposed Technique in IoT Based Parking System Using Bar Code Technology

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Abstract: This paper proposed a parking technique that is IoT based parking system with barcode. The modern cities tuned themselves with new technologies. IoT is the most recent technology. Smart cities adopt IoT for the betterment. Many parking systems are deployed in the smart cities such as smart parking system with RFID (radio frequency with identification) and reservation based smart parking system. In this paper an improved version of smart parking system with bar code is proposed. The proposed parking system is cloud integrated and provides real-time map facility. The proposed parking system deploy IOT module on-site that is used to monitor and signalize the availability state of each and every parking slot in parking lot. RFID, image capturing, and bar code are the three main technologies for proposed system. Mobile application is providing to the user for user end interface. This parking system provides real-time information about the vacant or reserved parking slot. It reduces the conflicts of wrong parking. In this paper the parking system is proposed and elaborate the high-level view of the system architecture.

Keywords: Internet of things (IOT), smart city, smart parking, RFID (radio frequency with identification), reservation based smart parking system, image capturing, and bar code.

I. INTRODUCTION

Nowadays the cities become smarter and smarter with the invention of new technologies. IoT is a technology pronounced as “Internet of Things” helps a lot to fulfill human dream the smart city.[1] The thing can communicate with each other and that could be tracked, monitored or controlled by using remote computers connected through the internet. As its name depicts “Internet of Things”. The Internet is a vast global network that connects server, computer, tablet, and mobiles internationally with some predefined protocols. The Internet provides services like sending, receiving or communicating with the internet. And things are defined as the tangible objects, any action, idea or situation. Internet of Things is a network of internet network of tangible objects like computers, vehicles, handheld devices, printers, embedded with sensors software and network connectivity that helps to exchange data information between them. Things in IoT become smarter and alive by sensing, computing and communication.[2]

IoT and cloud are very compatible to each other. IoT sense the data and cloud are used to store that data. That is again processed and transfer by IOT devices. The combination of these both technologies is called “cloud of things”. Nodes could be remotely accessed, monitored and controlled by “cloud of things”. Any number of nodes could be added or removed from the cloud as cloud provides high scalability.

While building the smart city there are many needs of citizens and basic city services are always come under consideration. These services are like water, traffic, management, electricity. Cleanliness, parking facility. Traffic management and parking facility are important service aspects because as per international traffic surveys 30% of traffic caused only to find parking space. [3] This problem can be overcome by providing better IoT based smart parking system.

There are many systems are proposed for parking. Some of them are existing parking system at various places some of them are proposed only not implemented. One of them is RFID based parking system. The system is a framework that works with the RFID technology. RFID tags are with the vehicle with the user, vehicle information and user registration in an encoded manner. The working of RFID-based parking system is very basic. Every vehicle has RFID tags. While check in RFID reader read the information from the RFID tags with help of RFID antennas. If the user is already registered in particular parking lot immediate parking ticket issued and the timer begins, but the user is not registered user have to provide valid information and got a parking ticket. That user entry marked in visitors. For check out when RFID tags come into RFID reader connect the timer stopped and calculate parking fee. [4]

The second is reservation based parking system. Parking system framework consists user application and cloud system and sensors. The working of this system is quite a system. Mobile application is an interface between the user and parking server. Mobile application is available for both Android and iOS platform. The user has to sign up one time with information like username, mobile number, email id, card details and vehicle number. The user has options if he wants to enter more that one vehicle number. The user can navigate the parking slot from the mobile application and also make a parking reservation before parking. While check in when user’s vehicle touches the base the sensors activated and capture the vehicle number with the help of optical processing algorithm at server side to recognize the vehicle owner. A ticket is issued to the user with pre-reserved parking slot number or with closed parking slot number on the mobile application. With ticket generation, an event is triggered for the timer to begin and calculate parking time. Proximity sensors are present on each and every parking slot, when a vehicle parked a reserved event id triggered and indicator turns red as in reserved sign. While check out proximity sensor triggered an event to stop the timer and turn
the indicator to green as the sign of vacant slot. The system calculates the parking fee as per parking time. The parking fee is automatically deducted from the user account or from payment wallet. The barricade of the parking lot is opened after parking fee successful payment. The user gets e-slip on his mobile application as an acknowledgment [5]. In this article, an enhanced smart parking system with the bar code is proposed. The proposed system is implemented using the mobile application, cloud tier; processing unit and barcode technology. The rest of overview and design are present in the article.

II. LITERATURE REVIEW

During this research work, following study has been carried:

V. Hosseinnezhad, V. Loia, H. Arasteh, A. Tommassetti, O. Troisi and M. Shafei-khah, P. Siano (2016) [1], Explained the concept of smart city development with development in advanced metering and digital technologies. It article shed lights on inspiration and application of the smart city concept.

Schonwalder, (2010) [2], observed that IOT devices can communicate specifically with the bigger network by mean of Internet Protocol (IPV4 and IPV6). Di connectivity may refer to the circumstance whether the systems of similar characteristic or they both may be bridged together with a higher layer protocol is utilized for end to end communication. In this article author also expressed that as Internet protocol were not created for constrained devices as a primary concern and it is inefficiency as compared with specially designed protocol for example ZigBee, yet they offer greatest adaptability and reduction in complexity and cost to client.

Manveer Joshi and Dr. Bikram Pal Kaur (2015) [4], discusses the concept of Internet-of-Things. The article studies basic concept, context and special challenges of it.

Zeldin PALA and Nihat INAN [7], proposed smart parking system with Radio Frequency with Identification (RFID). RFID system consists three main components are RFID tags, RFID readers and antennas and some other technologies like a barcode scanner, smart sensor and controller. This study provides a solution for the issues that are experienced during parking by mean of RFID technology. The system also provides information about the parking lots that are situated in the city.

Abhirup Khanna and Rishi Anand(2016) [9] proposed smart parking system for the accessibility of every parking slot. The system can be easily operated by a mobile application. The user has all the information regarding the parking lot and also have information about the every parking slot in a particular parking lot. With the help of mobile application user can have reservation of parking slot when in need and payment method is also available. For storage and extraction of data, the cloud is used in this system.

Sandep Singh and Dr.Bikrampal Kaur (2015) [10] explained the term optical recognition of characters. The electronic transformation of picture typewritten or printed content into machine-encoded content from a picture i.e. text extraction. Text extraction fundamentally manages the acknowledgment of optical reorganization of character. Honorable strategy for the acknowledgment of content or character from the picture using morphological calculation.

III. OBJECTIVES OF PROPOSED SYSTEM

1. To allocated the nearest parking slot at the entry point of parking lot
2. To provide real-time information about the vacant or reserved parking slot in a parking lot.
3. To make payment more easy and secure through payment wallets.
4. To inform the user about the wrong parking and with this parking conflicts could be resolved.
5. To save paper that is used for parking tickets.
6. Components of parking system
7. Mobile application for both android and iOS platform for server and user interaction.
8. Barcode reader used to read/scan the barcode that is generated for parking.
9. image scanner is used to scan information about the vehicle. The information is vehicle number that going to store in the database.
10. Proximity sensor at each parking slot to make sure that vehicle park at right slot or not and also indicate about reserved or vacant parking slot.
11. Cloud is used to store and compute the resources of the parking system. [8]

IV. OVERVIEW AND DESIGN OF BARCODE BASED SMART PARKING SYSTEM

Mobile application: mobile application development for both platform i.e. android and iOS. Users have to one time sign up with user information. User’s national id proof is most important such as adhar card. When user enter their adhar card number in application for verification. It verified user with user details like user name, address and date of birth. With this user also have to enter mobile number and email id. After that user can add register vehicle number. It always depend upon the user he can also add multiple vehicle number in his application.

Payment wallet: a payment wallet is also installed in mobile application for parking fees. There is a limit check in application on the payment wallet. A minimum amount should be in user wallet. If user request for parking, application verify if the payment wallet amount is more than the minimum limit user will proceed for parking else user will proceed for recharge User can use their cards. The parking fee will always deduct from the payment wallet not from the user bank account directly for security purpose.

Barcode generation: with valid information and payment wallet amount user would request for parking slot, a barcode will have generated by application. Barcode will be temporary whenever user will have requested for parking a barcode will be generated. There are numbers of barcode types are available in market. Selection of barcode will always depend upon the functionality of the barcode to be used in parking system. Barcode will always scan at the entry point of parking.

Image capture: on the entry of parking slot, the image scanners are present to scan the number plates. The
information is vehicle numbers. This information is captured from the scanner at the entry point and stored in parking database along with scanned bar code decoded data.

Check in: while check in barcode and image scanner both read by barcode scanner and vehicle respectively. Both the information decoded and stored in database and generate the parking ticket with parking slot number. Parking slot number may be preserved by the user or assigned by the system while ticket generation. user got the e-ticket on mobile application and proceed for vehicle parking. With this an event is triggered for timer and timer begins counting. As shown in fig 1.

**Sensors:** proximity sensors used to monitor the parking slot. When ticket is generated along with the information about the user, vehicle and parking slot number is binded in a single entity. While parking by mistake if user park the vehicle in wrong slot the sensor capture information form vehicle number plate and alert the system about wrong parking. System automatically send alert message to user with correct details, so that user can park vehicle correctly. With the advancement of technology, it will be a real-time alert. When User Park the vehicle in assigned parking slot proximity sensor turn the indicator red in sign of reserved.

**Payment and check out:** on check out when the vehicle moves out from the parking slot an event is triggered in proximity sensor and indicator turns green as the sign of vacant. With this an event triggered for timer to stop. The parking fees will calculate from the parking time. Calculated parking fees e-slip send to user application for user’s confirmation. After user confirmation the fees is deducted from the payment wallet. And an acknowledgment slip with a barcode sends to user on application for exit. If user find any mistake in fees calculation. User can communicate with the admin through application. At exit point user barcode scanned by barcode scanner and the barricade will open as exit for vehicle. As shown in fig 2.

**Fig 1:** Check in process for parking.

**Fig 2** check out and payment process.

V. CONCLUSION

Smart cities are a dream and need of humanity. With the help of IOT technology, smart cities are achievable. The development of internet of thing (IOT) and cloud innovation have offer asent to new opportunities for smart wrong parking. The efforts are made in this paper are indented to enhance the parking services to upgrade the nature of life of people.

VI. REFERENCES


[7]. International Parking Institute, “2012 Emerging Trends in Parking”.


