

Parking Availability in Sensor Enabled Car Parks

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ABSTRACT

In order to cope up with the growing problem of traffic congestion several means and methods have been implemented. For reducing this problem, an efficient method for traffic monitoring can be implemented by providing the availability of the parking spaces in advance. Since there exist no such system we intend to develop one using sensors and RFIDs. In proposed system, we consider car park equipped with sensors (IR) which checks for the availability of parking slots and updates the information periodically. This updated information is provided to the user via an android application. Using this application user gets directed towards the parking slot by using the shortest path algorithm (Dijkstra's). Also to avoid traffic congestion due to parking charges, car is associated with a unique RFID tag for the wallet parking.

Keywords:- IR sensors, RFID-tag, RFID-reader, Client-Server Architecture, Android Application

I. INTRODUCTION

Traffic congestion is the growing problem in today's scenario. The major factor that contributes to this problem is the existing parking system where there is no proper parking rules observed. Car registrations in India increased to 236761 cars in December from 228267 cars in November of 2015. Car registrations in India averaged 100437.09 cars from 1991 to 2015[7]. Car registrations in India is reported by the Centre for Monitoring Indian Economy. The current system is manual, and manual system is costly, time consuming. This give rise to the need of an automated parking system which would do the job in an effective way.

There is the need to make today's parking system automated not only for the car parks but also for payment of parking charges. A large queue is observed in huge infrastructures like malls, multiplexes etc for the payment of parking. Major goal of proposed system is to check the parking availability for sensor enabled car parks in advance in order to avoid traffic congestion. The system checks the parking slots and update it periodically on server. This information can be viewed by user using mobile application thus giving them idea about the availability and shortest distance to the parking slot using Dijkstra's algorithm. Wallet parking is used for parking payment purpose, thereby reducing the manual delays.

II. EXISTING SYSTEM

Current car park management is dependent on either human personnel keeping track of the available car park spaces or a sensor based system that monitors the availability of overall number of available car park spaces. In both situations, the information available was only the total number of car park spaces available and not the actual location available. so it becomes difficult for driver to search for actual location of park space. Also sometimes before the car reaches that location, that space is already taken. [2]

Drawbacks of this system:

- No automation in parking system.
- No indication of where to park the vehicle.
- No automation in Charges for parking. Manual intervention is needed.
- The proper Central Management for parking is missing

There are mainly four categories of car park guidance systems using different technologies – counter-based, wired sensor-based, wireless sensor-based and image-based. Counter-based systems use sensors to count the number of vehicles entering and exit a car park area. This can be gate-arm counters and induction loop

detectors located at the entrances and exits [3]. This system can give information on the total number of vacant lots in a closed car park area, but does not help much in guiding the driver to the exact location of the vacant lots.

III. PROPOSED SYSTEM

The process of advance parking system keeps track of all the traffic in all the big infrastructure and plays a very important role in Automated parking facility provided to the user of this system by minimizing the man power. The IR sensors installed at the slots detect the vehicle and in turn the information of the vehicle getting parked gets updated on the server. Payment of the parking charges gets deducted from account maintained with the Administrator by the user of the system. Any transaction or information is noticed to the user through message on the mobile or through an email. Promotion of this Application is one of the major modules, so as to make the users to know about the availability of this facility in big infrastructures.

In general proposes the need of parking to be accomplished efficiently using smart technologies like detecting the vehicles via IR sensors. Payment of the parking charges are deducted from account maintained with the service provider by the user of the system using unique RFID tag associated with every vehicle. Any transaction or information is noticed to the user through message on the mobile. This research is an attempt to develop a generic application and architecture for vehicle parks, which is fulfilling core activities and requirements based on the result of survey.

Block Diagram of the system:

IV. KEY CONCEPTS

- **Automated Parking:** This is Advanced parking system. This paper focuses on the less man power and an automated system
- **RFID and IR sensors:** The RFID and the IR sensors are the key part of this paper. The IR sensors detects the car coming from outside. Whereas the RFID tags are associated with each of the vehicle. The RFID tag is maintained for Wallet purpose.
- **Transaction:** Use of RFID reader to scan the RFID card attached to the vehicle is done. This RFID card is highly sensitive and is attached near the vehicles number plate, so as to be sensed by the sensors easily. The time read by the sensors will be managed by the Admin. This admin keeps track of the details of all user associated with this system. Users initially have to create an account with the admin providing his details, so as to enable this Application. This account has to be recharged by the user as per the requirement.
- The user's mobile phone will be used to display the available slot for the vehicle, so as to make an easy parking instead of searching for the parking slot, which may lead to traffic congestion [2]. This process will help to notify the customers with the vehicle if the parking area is fully occupied. Service provider will maintain and is responsible for allocation of the parking slots. The proper system block diagram can be inferred from Fig no.1

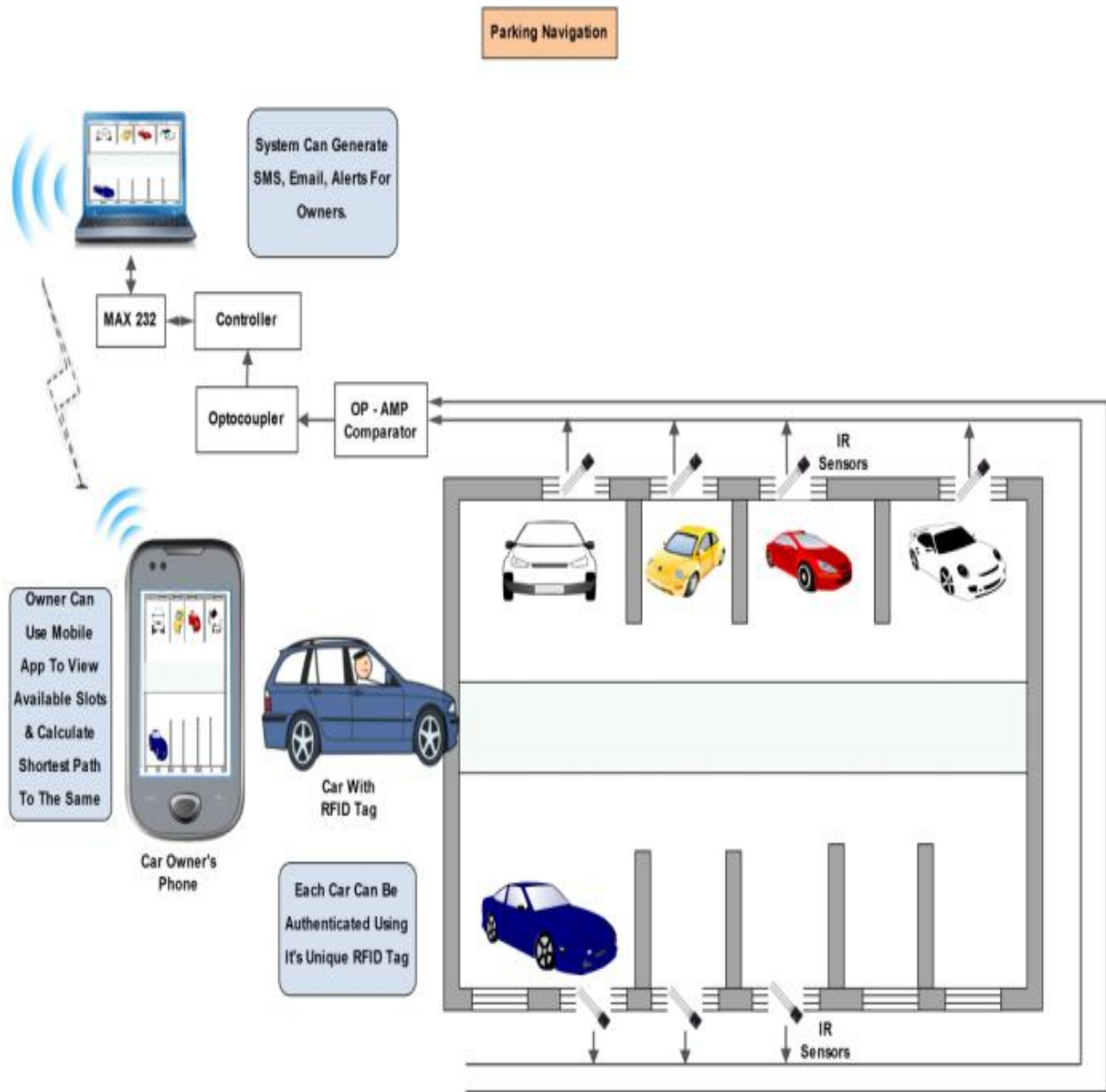


Fig no.1 Block Diagram of the system

V. SYSTEM ARCHITECTURE & DESIGN

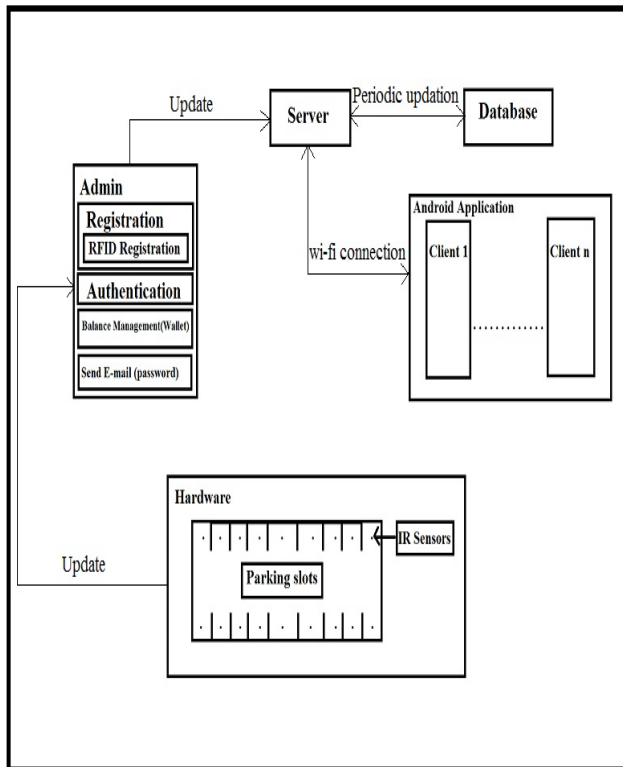


Figure.2 System Architecture

Software modules:

- Admin module - the admin controls the entire system. It provides registration of the user to the system and sends the password of the account via email or a message. The admin does this for checking the user authentication. The balance amount (Wallet) is also managed by the admin.
- Server - All the user data and the status of the parking slots gets updated on the server periodically.

Hardware Modules:

System Architecture embodies with various modules such as RFID Tag, RFID Reader, Microcontroller PIC16F877A, IR Sensor.[4]

1. RFID Tag: The RFID Tag used for authentication. RFID Tag contains a chip at the center and the coil field is surrounded over the chip.



Fig no.3 RFID Tag

2. RFID Reader: The RFID Reader which is used to read the RFID Tag. The Detection of authorized Tag is done by RFID Reader.



Fig no.4 RFID Reader

3. Microcontroller: The microcontroller AVR [Advanced Virtual Risc] is a 40 pin package; 8 bit microcontroller is used for controlling automatic devices.
4. MAX232PTH Pin: The MAX232PTH chip which is used for data transfer as well as voltage adjustment.
5. IR Sensor: The Infrared [IR] Sensor which is used for sensing the car in parking area.
6. RS232 Cable: Two RS232 Cable are used one for the connection between computer and the hardware and second for the connection between computer and RFID Reader.

VI. ALGORITHM

Dijkstra's Algorithm:

It picks the unvisited with lowest distance, calculates the distance through it to each unvisited neighbour, and updates the neighbours distance if smaller. Mark visited when done with the neighbours. It is an algorithm for finding the shortest path between the nodes in a graph, which may represent, for example, road networks. We use this algorithm to find the shortest distance between car at entrance and slot available for parking.

VII. CONCLUSION

It has been observed that conventional parking system needs more manual work and also it becomes difficult to search for vacant parking slot. This leads to traffic congestion. This system will automate the parking system by using the shortest path algorithm and online amount deduction to find the vacant slot for parking.

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