ABSTRACT

There has been a major problem addressed about the parking slots in the metropolitan cities recently as there is a very limited spaces available reserved for parking as such. Major issue with the vehicles parking is that the various malls and shopping complexes have a very limited space and on the other hand the vehicles have drastically increased these days. Due to rapid increase in vehicle density especially during the peak hours of the day, it is a difficult task for the drivers to find a parking space to park their vehicles. There have been a variety of researches done before to address this issue. Majority of the existing systems make use of sensors and RFID tags to identify the density of the vehicles and vacant parking slots to intimate the users about the occupancy of the parking slots. So this paper performs the thorough survey on the previously proposed systems so that the advance mechanism to overcome the existing system drawback can be proposed.

Keywords: Internet of Things, IR sensor, RFID, Smart Phone, Ultrasonic sensor, WSN, ZigBee.

I. INTRODUCTION

A. Motivation

In recent research in metropolitan cities along side increase in population there's high vehicle density on roads. Hence this results in anoying issue for the drivers to park their vehicles because it is extremely difficult to seek out a parking slot. The drivers usually waste time and energy and find yourself parking their vehicles finding an area on streets through luck. In worst case, people fail to seek out any parking lot especially during peak hours and festive seasons. However, in current parking system a better but not an optimal solution is being provided. It does not provide economic benefit, vehicle refusal services and there is no resource reservation mechanism leading to queuing system which is again time consuming. It also lacks to provide large scale parking system. There are android applications available where the cost is calculated from the time the parking slot has been booked which is not economically beneficial for the users. Parking Guidance and Information (PGI) systems for better parking management is also available.
PGI systems will provide the drivers with effective information on parking within controlled areas and lead them to empty parking slots [2][3]. And parking management system is also available which is using ZigBee technology [4].

To resolve the above mentioned issue, further we propose a cloud based smart parking system which uses Internet of Things (IoT) [1][5]. In this system, all the physical objects like smartphone, GPS location, cloud based servers and all car parks are connected to form network architecture and it is an automatic system where we use a Radio Frequency Identification (RFID) technology. We use RFID reader which is a sensor that reads the RFID tag and authenticates the user information. All the car parks in the intended area are connected to form a parking network. Here, each car park in the parking network is an IoT network which is connected to its neighboring car parks through Wi-Fi [1]. First, the parking manager should register his car park in the portal (cloud server), if he wants to provide the service in smart parking system and then login to the portal. The user has to register first to get the service from the smart parking system which returns him the RFID tag which contains a unique number. There are several methods employed for the vehicle parking. The concept of latest smart parking solves the parking problem by using mixed integer linear problem. The disabled person can park the vehicle at specially designed locations. Automatic parking and UN parking with the assistance of android applications. Yanfeng Geng and Christos G. Cassandras proposed [1] the concept of “A new smart parking system based on optimal resource allocation and reservations”. Drivers access the system via cellular phone or internet, a new concept for a “smart parking” system. This system explicitly allocates and reserves optimal parking spaces to drivers. It uses the concept of mixed integer linear problem. Drivers who are looking for parking spots send requests to the DPRC. Driver Processing Request Centre gathers driver parking requests. Cars location keeps track of driver allocation status and sends back the assignment result to drivers. A request is predicated on parking costs and walking distance between a parking spot and therefore the drivers actual destination. It also contains the driver’s basic information such as license number, current location and car size. An assigned parking lot is remit to every driver via the DPRC. If the driving force is satisfied with the assignment he has the selection to order that spot. Once reservation is made the driver still has opportunities to obtain a better spot. The PMRC [Parking Resource Management Center] then updates the corresponding parking spot from vacant to order and ensures that other drivers haven't any permission to require that spot. Parking Resource Management Centre collects and updates all real time information and disseminates it via internet. If a driver is not satisfied with the assignment or he fails to accept it for any other reason he has to wait until the next decision point. The mixed integer linear problem solves problems at each decision point. The requirements of the system are: first, the allocation center has to know the status of all parking spots, the location of all vehicles, issuing requests and traffic situations. Current sensing technologies make monitoring implementable. Second is effective wireless communication between vehicle and an allocation centre. Third is the centre must be able to implement a reservation that guarantees a specific parking spot to a driver. This is achievable through existing wireless technology interfacing a vehicle with hardware that creates a spot accessible only to the driving force who has reserved it. A softer scheme is use a red/green light system placed at each parking spot, where red indicates that the spot is reserved and only the vehicle assigned. Systems proposed by S. L. Bangare et al and P. S. Bangare et al were studied for the reference along with work done by P. A. Kotwal et al. [19] [20] [21] [22] [23] [24] [25] [26] [27] [28].

Fig 1. Typical Car Park System [1]
B. Survey of Existing Systems

A Cloud-Based Smart-Parking System Based on Internet-of-Things Technologies

This paper provides a singular algorithm which increases the potential of the present cloud-based smart parking system [5] and it also develops a specification supported by the Web of Things technology. This system helps the users to find a free parking space with minimal cost based on new performance metrics which is automatic. This metrics will calculate the user spaces in each parking lot. To enhance the parking management, an intelligent parking system was developed which reduced the aim of hiring people to take care of the parking system [1]. In this paper, it proposes an effective cloud-based Smart parking system based on the Internet of Things. The data that includes the vehicle GPS location and distance between car parks and number of free parking space in car parks will be sent to the data center. Here the data center is presented as a cloud server which calculates the costs of a user parking request and this information is regularly updated and is made available to the vehicles in the network at any time. In this proposed system, each parking lot is an IoT network and it operates independently as a daily parking lot. This paper implements a system model with wireless access in an open-source physical computing platform supported by Arduino with RFID technology. It uses smart phone that acts as an interface between the cloud and therefore the vehicles to see the feasibility of the proposed system [4].

Advantages:
2. Low Cost.
3. Includes resource allocation mechanism.
4. Provides large-scale parking system.

Disadvantage:
1. RFID tags and RFID Reader increases the System Cost.
2. System Reliability Reduces as the RFID tags can be duplicated easily.

A cloud-based intelligent car parking system

A cloud-based intelligent car parking system is described in this paper. It is considered as an important component of an Intelligent Transport System (ITS) for smart cities, there are three layers in the car parking system: sensor, communication, and application layer. In the implementation part, a sample car parking service for a university campus were proposed as shown in architecture. The related IoT sub-system includes following layers sensor layer, communication layer, and application layer. Using cloud-based intelligent parking system car parking services with proposed platform can be implemented. It can be used on any private parking space. As result the system development follows the personal software process (PSP) methodology. Methods used for the PSP are either test-driven or feature-driven. When a user/car enters the University campus through one of its gates, the car parking mobile app, installed on the user mobile phone, will send an automatic HTTP request through the gate’s access point toward a web server, and a JSON response will be returned, containing information about the ‘best’ available car parking lot. For a GPS-enabled mobile phone, a Route Utils generates the steps that must be followed by the driver, and displays them on the Google Map.

Advantages:
1. GPS provides great accuracy in determining the Location Accuracy
2. It is simple and based on android.

Disadvantages:
1. This system cannot be used for indoor or mall parking systems.

The Research and Implement of the Intelligent Parking Reservation Management System Based on ZigBee Technology.

With the increasing development of economy and city modernization level, traffic congestion and parking have become major social issue due to the increasing amount vehicle density. In order to overcome this parking issue a smart parking system has been proposed in this paper which is composed of ZigBee network which sends the user requested information to PC through a coordinator and further updates the database [4]. Using the internet, the parking information is provided to the application layer to make it convenient for the people seeking for the parking position with the help of web-services. The system consists of mobile client and server side parking lot. The client requests the server for parking information through web-service interface. Then the server searches for the requested information in the available database and returns the required information to the client using
the web-service interface. The real time update status is available to the mobile client to ensure the correctness of the required information in the process [6].

Advantages:
1. It uses an effective database.
2. It is simple and based on android.

Disadvantages:
1. The system choices are more expensive.

ZigBee and GSM based secure vehicle parking management and reservation system.
In this research, author has proposed a system in which Parking lot vacancy module uses ZigBee along with PIC. Security Feature: The exit password must be entered else the user is not allowed to get out of the parking bay as the barrier gate will not get open until correct exit password is entered. But the major drawback of the system is that The GSM and SMS module makes the system expensive. The SMS contains entry/exit password to the parking lot may not be received due to network congestion.

Car Park Management with Networked Wireless Sensors and Active RFID.
The main advantage of the gate management model is its low-cost and ease over lot management model. Gate management service: RFID Tags can also be used for gate management. As example, a gate can be opened automatically using an RFID reader and the vehicle’s tag at the gate. But the major drawback of the system is that No driver guidance systems to guide towards the parking lot.

Intelligent Parking Management System Based on Image Processing.
The system captures and processes the rounded image drawn at parking lot and produces the information of the empty car parking spaces. A camera is used as a sensor to take photos to show the occupancy of car parks. Single camera can detect the presence of many cars at once. But the major drawback of the system is that the weather conditions affect the System i.e. in terms of visibility. The camera should be in a position where it can see all the car parks and not be obstructed by any objects. No guidance is provided to the parking lot.

Automated Parking System with Bluetooth access
The system uses the user mobile’s Bluetooth for identification and registration. The vehicle is transported to the parking location with the help of a rack and pinion mechanism for linear motion. It automatically detects the unique registration number stored in the Bluetooth chip to check if the new vehicle is to be parked. Cannot be used in existing parking system. The whole parking lot is to be designed with mechanical components such as rack and pinion mechanism.

Smart Parking: A secure and intelligent parking system
A smart parking system is suggested. By using the secured wireless network and sensor communication, Smart-Parking is a intelligent parking service application as well as a novel security/privacy aware infrastructure. First, vehicles on the road can view and reserve a parking spot. The parking process can be an efficient and non-stop service as well as parking service is an intelligent service. New vacant parking spot and advertisement of discount of parking fees can be distributed to the cars passing by also the parking process has been created as a stochastic process. Not only maintenance work are often scheduled but also the revenue of the parking site are often predict. New business promotions are often broadcasted to all or any vehicles passing by the parking site through wireless networks. Finally, privacy of the drivers and security of the knowledge are protected by using the sensor infrastructure and encryption/decryption approach. Simulation results prove the proposed system leads to high parking lot utilization and fast parking spot finding time. The future work includes more extensive simulations on the proposal. The analysis of efficiency needs to be studied as well.
Comparative Drawbacks of Existing System

1. Hardware cost has made the system economically heavy.
2. Sensors have the limitation of shorter life span.
3. The systems are more prone to have the data misread as sensors might sometime malfunction.

II. PROPOSED SYSTEM

As per the survey done for the various systems proposed previously, the major factor that comes as the reason to have major shortcomings is that the hardware cost drastically increases for most of the systems due to wear and tear and limited life span of the sensors too. So in the proposed system, as per the research done, we tried to avoid any sort of data sensors and still achieve the efficiency the highest possible with the combination of image processing and machine learning to manage the possible crowd for car parking.
III. CONCLUSION

As per the survey done, various previous systems are analysed and we have determined that there are few drawbacks of the systems implemented. Many of the systems have hardware sensors used which cause it very expensive and therefore it stays a bit not feasible. So after the survey, we have proposed a feasible model which makes less use of external hardware and more use of software part to automate the parking management and reservation.

REFERENCES

1. Thanh Nam Pham, Ming-Fong Tsai, Duc Binh Nguyen, Chyi-Ren Dow, And Der-Jiunn Deng, “A Cloud-Based Smart-Parking System Based on Internet-of-Things Technologies”, Received July 24, 2015, accepted August 16, 2015, date of publication September 9, 2015, date of current version September 23, 2015.


