Smart Parking SystemTechnologies

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AbstractWith rapid growth in urbanization, the vehicle availability and its usage in urban areashas been increased in recent years. This leads to the scarcity of parking spaces especially during peak hours.Since the parking space is limited and cannot be increased due to increasing in the population of the urban areas.Hence, various parking management systems using Internet of things have been developed to manage the available parking area. With the implementation of the parking management system, users can easily locate, and book a parking space from anywhere anytime convenient to them. Vehicles entry and exit also becomes easy with implementation of hassle free online payment. For the detection of vehicles, plenty of sensorshave been used and choices are deferred due to pros and cons of the existing sensors.

Index Terms— IOT (Internet of things).

I.INTRODUCTION

With the emergence of automation technology, movement across the cities and country have become fast and easy. It has a great impact on the globalization, but it has an adverse effect on the environment and quality life of the society. A large population is migrating to the urban areas which result in increase in the traffic in the urban area and the number of vehicles are more than the number of family members. The annual registration of vehicles was 10 lakhs in 1993 and increased to 1.94 crore in 2014 according to Ministry of the Indian Transportation. Owning a car has become a status symbol, which results in the heavy traffic in the urban areas. The other reasons for the increase traffic of the urban areas are lack of public transport, lack of security in public transport and privacy etc.

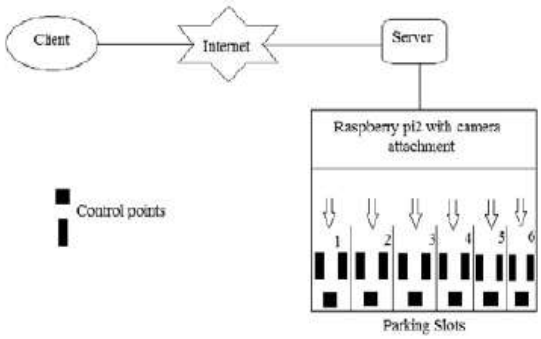
With the limited availability of the parking spaces, people spend their most of time in searching of the parking. Searching for parking spaces result in the wastage of time and energy resources. Therefore, problems such as traffic congestion, pollution etc. arises.More than 30 percent of traffic congestion is due to non-availability of the parking spaces. The paper focuses on the parking management system, which isIOT based Smart Parking Management System.The term IOT was first introduced by Levin Ashton in 1999.IOT (Internet of things) can be defined as any un-internet device which could be connected to internet.. [1]. With the help of IOT, the digital devices can be identified, able to think and communicates with the physical environment to collect the data.These physical devices are known as a smart deviceconsists of smart machines that communicates with other machines, devices etc. On the basis of the collected data, automated actions are taken [2].In recent years many smart parking systems with different wireless communications such assuch as ZigBee, Bluetoothdedicated short-range communication protocol(DSRC)and radio frequency identification (RFID). This paper will review the technologies of parking management and vehicles detection.

II. REVIEW

A few existing systems have been designed to manage the parking area.

A. Automatic Smart parking Using IOT

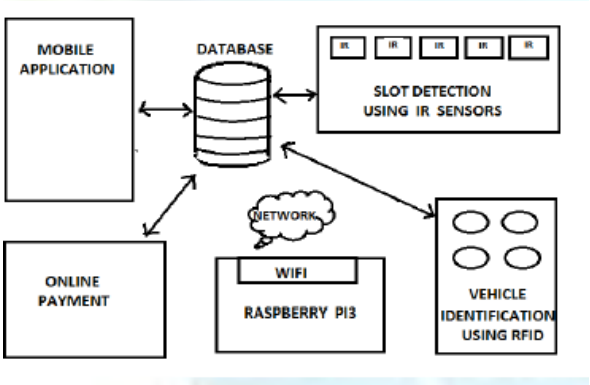
Basavaraju proposed parking system based on Raspberry pi-based parking sensor in 2005. There are four components of the proposed parking system`(Pi camera, Navigation System, Centralized server, Raspberry Pi). Pi camera continuously captures the images of the parking area. The captured images are transmitted via internet on the website to update the information of vacant and booked spaces.The navigation system displays the nearby location of the parking spaces and the direction to the parking slots from the user's current location to the user on the web.



Centralized serveraccommodates the parking spaces information.Raspberry pi microcontroller is used to control the sensor node. The information of the vacant and booked slots may not get updated due to bad weather and also, if the internet connection is too slow.

B. IoT Based Smart Parking System Using RFID

Prof. S.S. Thorat et al. proposed IoT Based Smart Parking System Using RFID based on the RFID (Radio Frequency Identification) reader



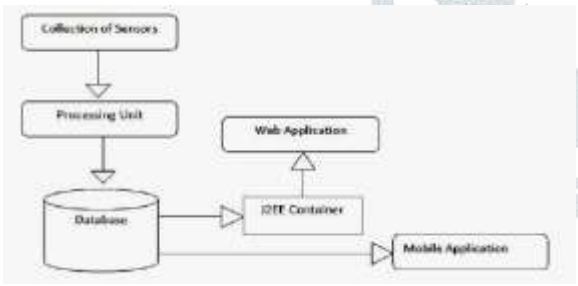
The parkedcar in the parking area are detected by RFID (Radio Frequency Identification) reader and IR(Infrared) sensors detects the presence of bikes in the parking area. Thevacant and occupied slot's information is collected by the RFID (Radio Frequency Identification) reader and IR(Infrared) sensor is transmitted over the internet and user can pay the charges online. Bikes cannot be acknowledged due to absence of RFID tag [3].

C. Online Vehicle Parking Reservation System

Prof. Suraj Damre et al. proposed Online Vehicle Parking Reservation System based on IOT and android application in 2107. Parking slotcanbe bookedwith the help of an android application.The application shows the information of booked and free spaces in the parking area. The reserved parking slot can also be cancelled with the help of the android application [4].

D. Smart Parking System and It's Simulation

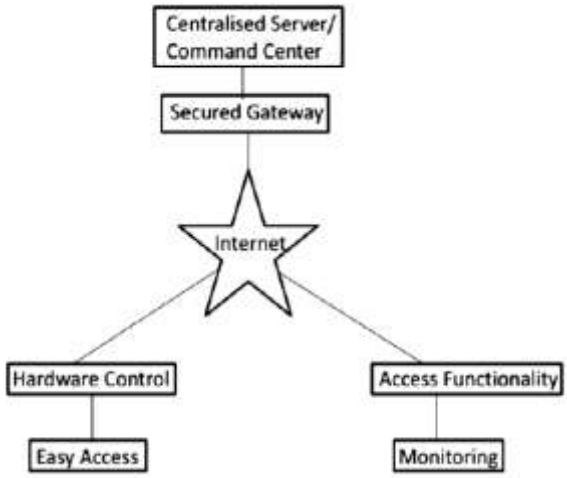
Gaurav Surtani et al. proposed Smart Parking System and It's Simulation based on IOT (Internet of things) in 2018. The parking slot can be reserved online for a interval of time and a ticket will be generated at the time of the



booking. The generated ticked has to be carried while going to the parking the car in the parking area. The parking charges can be paid online. It is more secure due to ticket acknowledgment [5].

E. IoT based Smart Assist Parking System

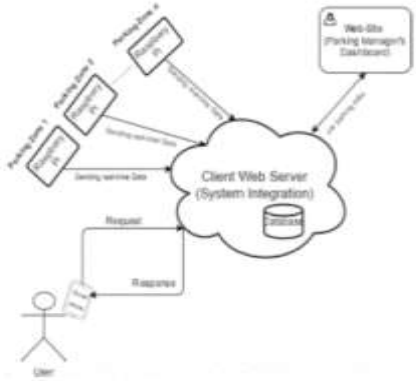
HarviBaabuet al. proposed IoT based Smart Assist Parking System based on IOT and cloud in 2016. The parking slots can be booked with the help of a mobile application.



The proposed system uses cloud to storesand compute the data, the data refers to parking details. Cloud provides some powerful computing tools to compute the data collected by the sensornode. The data transferred to cloud might be at risk [6].

F. Smart Urban Parking Detection System

Nastaran Reza Nazar Zadeh et al. proposed Smart Urban Parking Detection System based on IOT and androidapplicationconcept in 2016.



The user can find the vacant parking on the real map using android app and can also book the parking space. The ultrasonic sensor detects the vacant slot, send the data and gather user's information. Raspberry pi is used to control the hardware and the project is implemented on multilevel car parking and open car parking etc. Ultrasonic sensors are not reliable for detection of the vehicles [7].

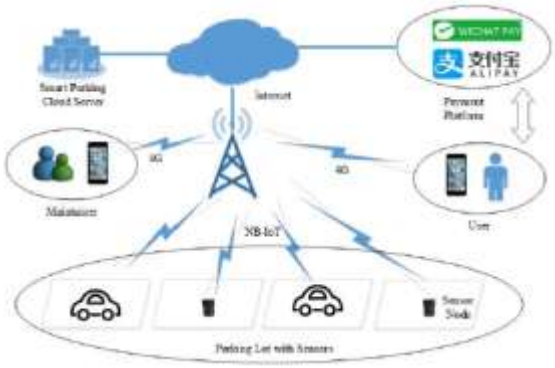
G. Smart Car Parking System Based on IoT Concept

Vrushali D. Ichakeet. al proposed Smart Car Parking System Based on IoT Conceptin 2006. The slots of parking can be booked either from a mobile or computer. Smart car parking uses the cloud infrastructure to compute and store the data.

Vrushali D. Ichake et al proposed Smart Car Parking System Based on IoT Concept. The slots of parking can be booked either from a mobile or computer. Smart car parking uses the cloud infrastructure to compute and store the data. It shows the weather condition of the parking area e.g. temperature and intensity of light etc. For example, if the temperature is too high than the critical temperature then it will give an indication by showing a red signal, if the light intensity is too low then it indicates the user to turn on the light[8].

H. A Smart Parking System Based on NB-IoT andThird-party Payment Platform

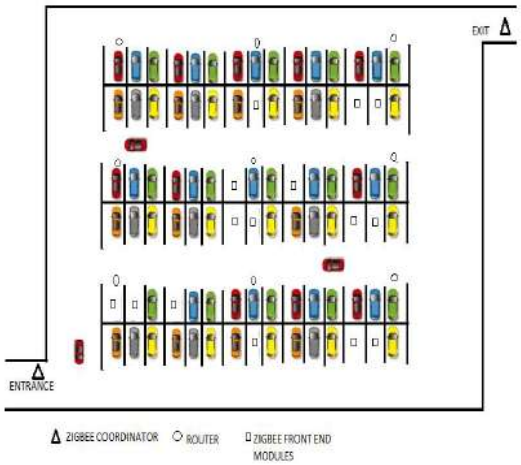
Jiong Shi et al. proposed H.A Smart Parking System Based on NB-IoT and Third-party Payment Platform based on IOT and data of sensor node is transmitted usingNarrow band IOT module.



It comprises of sensor node (Geo-magnetic vehicle detector), cloud server, mobile application and a third-party payment platform. Sensor node is installed in the parking area and continuously detects the changes if any changes occur then it updates on the server and user can pay the parking charges online[10].

I. Smart and Connecting City Parking–1Leveraging Iot

Nilasha Rakshit et al. proposed Smart and Connecting City parking-Leveraging Iot based on IOT and ZigBee wireless technologyusing SKY65336 in 2017.



Vehicles equipped with ZigBee terminal reaches the parking area, it communicates with the ZigBee par, king area network. The coordinator provides the map location of the parking to the user and the statistics of vacancy is shown to user on the map. If the parking area is fully occupied then the user is guided to anotherZigBee equipped Technology parking area[11].

III. Conclusion

All above addressed papers uses same technology i.e. IOT (Internet of things) but uses different sensors due to pro and cons of the sensors. Smart parking systems enable the users to book their parking spaces from anywhere and anytime. It also removes conflicts at the parking area. Some above addressed papers use latest technology such as Cloud and Raspberry Pietcand enables to use the hardware resources efficiently.

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