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Smart Parking System Based on Cloud Computing using Android and IoT

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Abstract:- **Cloud computing is one of the most widespread technology in recent time which has vigorously changed the nature of a business. Internet of Things is another technology which has impressed the day to day of human being. Improvement in Cloud computing and Internet of things can be united and functional for solving real-time difficulties. In our research work, we have combined the Internet of Things technology and an Android application using cloud computing to design an enhanced intelligent parking system. Overview for designing an Intelligent parking system has been narrated in this paper with an architecture diagram. The difference between this mechanism and the other existing systems is that we intent to make our system as less human dependent and less physical actions as possible by automating the cars and the entire parking lot. To solve the traffic congestion difficulty, we require a superior mechanism in the parking area to measure empty space, Services and show the information to the people who looking for the empty space for Parking lot. The reservation process is happening only by the user. Hence the user discovers the unfilled parking lot and makes the action of booking through an internet access by an Android Application with driver's own knowledge Parking Lot**.

Keywords:- Internet of Things, Android Application, Raspberry Pi, Smart Parking, Cloud Computing.

I. INTRODUCTION

In the development of traffic management systems, an intelligent parking system is needed to reduce the complexity of parking and for optimal use of resources for car-park owners. Currently, the common method of finding a parking space is manual where the driver usually finds a space in the street through luck and experience. This process takes time and effort and may lead to the worst case of failing to find any parking space if the driver is driving in a city with high vehicle density. The alternative is to find a predefined car park with high capacity. However, this is not an optimal solution because the car park could usually be far away from the user destination.

To resolve the aforementioned problems and take advantage of the significant development in technology, the Internet-of-Things technology (IoT) has created a revolution in many fields in life as well as in smart-parking system (SPS) technology. The present study proposes and develops smart parking system solution based on the Internet of Things and Cloud computing. Our system constructs each car park as an IoT network, number of free slots in car park areas will be transferred to the data centre. The SPS is based on various innovative technologies and can monitor and manage car parks on its own. Furthermore, in the proposed system, each car park can function independently as a traditional car park. This research also implements a system prototype with wireless access in an open-source physical computing platform based on Raspberry Pi using a smartphone that provides the communication and user interface for both the control system and the vehicles to verify the feasibility of the proposed system.

II. LITERATURE SURVEY

In the paper titled “A Cloud-Based Smart-Parking System Based on Internet-of-Things Technologies” published on IEEE Xplore on 09 September 2015, the authors have presented how to use of RFID and Arduino through manage parking lot and algorithm of the system operations to obtain a proposed system in real world.

In the paper titled “APPARKING: Smart Parking System based on Cloud Computing using Android and IoT” published in International Journal of Emerging Technology and Advanced Engineering, the author have presented how to use of Dijkstra’s algorithm and MD5 algorithm and the android app which is used to implement the parking system and it is attached with Raspberry Pi.

III. PROPOSED SYSTEM

The project smart parking slot booking system is designed by the combination of hardware and software. As per the software part is concerned it is done in the Android application

that is used for developing a mobile application that will have access to the information given by the raspberry pi. The raspberry pi is the core of the hardware and it is the most important component of the hardware part. DC power supply is used for giving supply to the circuit. An Ultrasonic sensor is employed at each parking slot and it will tell whether its parking slot is vacant or not. A motor driver circuit and a DC gear motor is connected to the microcontroller that is used to control the barrier at the entrance of the parking. At the entrance gate user will verify the booking details via QR code scanner and then the barrier can be opened or closed by the authenticated person. LCD is connected to the microcontroller which displays the number of devices that have been parked and the buzzer beeps when the parking space is filled. The information about the vacant or filled slot is sent to the microcontroller and the microcontroller sends this information on the designed application through Cloud server module that is connected to it. The Cloud server module sends the information to the application through Internet of Things and the command about opening or closing the barrier is sent from the application though the Cloud server module to the microcontroller, which through a motor driver circuit and a DC gear motor controls the functioning of the barrier. In software part user can view the booking history, tracking parking zone via google map, QR code generation and also provides the email notification of the booking details.

IV. SYSTEM ARCHITECTURE

A. Online Booking using Android application.

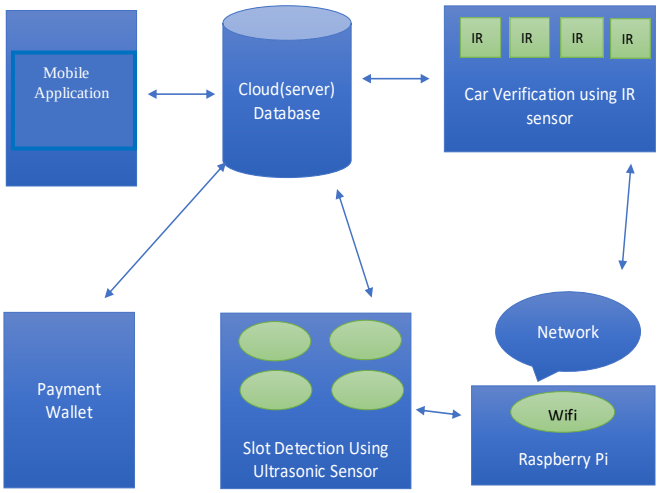
In urban areas finding parking space is difficult in rush hours. So here we developed Android application we can book the parking slots in advance like movie tickets booking online. We can book the parking slots by using a mobile app. The booking procedure explained in the below flow chart. Cloud Database provides parking availability information; if there are any vacant slots available then we can book the interested slot and complete the payments through e-wallet. When we finished booking, the database is updated with current availability.

B. Parking Entrance System

This parking entrance system uses IR sensor, DC motor, LCD display and a QR code reader. IR sensor is used to give the access of the car, DC motor is used to open the barrier, LCD is used to display the parking information and QR code reader is used to detect the car details like car number, owner name etc. After detecting the car number, If the user booked online his parking space then gate is opened and can move inside. The LCD displays the allotted parking slot and parking status also. This allotment details continuously updated to database.

C. Parking Management System

This part provides directions to the owners to park their car correctly. Here each slot allotted by one Ultrasonic sensor and a buzzer. Initially it will check the slot is assigned or not, if it's assigned then LED green turns 'ON'. If any car entered in the parking slot then Ultrasonic sensor detects, LED red turned 'ON' and LED green goes 'OFF'. If buzzer 'ON' user can understand he parked his car wrongly then he can have left the slot and goes to his allotted slot. This data continuously updated in database.



Architecture Description

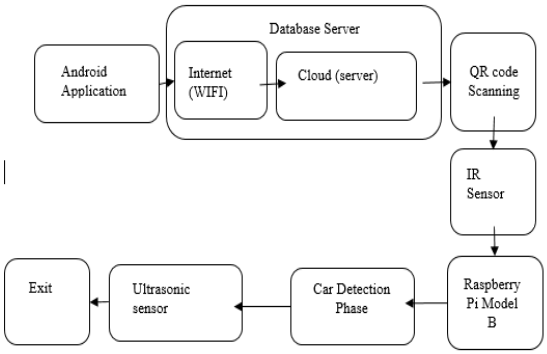


Fig. 1:- Architectural Diagram of proposed system

V. IMPLEMENTATION MODULES

The proposed system consists of these modules:

A. Android Application Module:

- Sign Up: User will open the application and new user will register on this application (Registered Information like Name, upload a photo, car number, contact number, email id)
- Login: Registered user will Login in into this application and get the required services
- Forgot Password: Users can recover their password through email
- Time Duration: Users will book the parking slot according to their timing.
- E-Wallet: After the successful booking according to their timing calculate the amount and pay through the e-wallet.
- Message generation: After the payment confirmation message users will get it on mail
- QR code generation: Generates QR code for users who has booked the parking slot.

- Android Application UI: Display the Parking Slot, Payment Gateway through e-wallet, GPS tracking feature using google map

B. Hardware Module

- Main Entry: Scan the QR code and IR sensor through get the main entry access.
- Car Detection: Each parking slot has ultrasonic sensors whenever car enters in the parking slot Ultrasonic sensor detects the car and its details send to the cloud and save it.

VI. ADVANTAGES

- Users can get to know about parking areas for different locations.
- Provides a graphical view (Android application) for parking spaces.
- User can pay through online transaction and confirm their slot for parking.
- It reduces the need of human resource for managing parking spaces.
- System generates bill for your booking and even sends a confirmation email.
- Cost-effective.
- Optimizing Parking Space.
- Using IoT technology will help traffic in the city flow more freely.
- Smart Parking enables better and real time monitoring and managing of available parking space, resulting in significant revenue generation
- It is based on modern thoughts and innovations that guarantee perfect results and functioning.

VII. CONCLUSION

For an entertainment center or a market place, the first and foremost question in the minds of everyone is about the parking slot. The proposed application helps users to find and book a parking slot. It helps the users in finding out the availability of a parking slot, get the availability confirmed, track the parking area via google map and reach the place within the time slot allotted. The proposed plan saves the time of users in booking a parking slot.

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