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Conceptualization of IoT Powered Parking System

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ABSTRACT
In the present world, traffic congestion caused by vehicle is a frustrating problem and it has been growing exponentially. Car parking problem is one of the major contributor for this traffic congestion especially in urban cities. Currently the manual method where in the driver finds the parking area by luck and in most cases it leads to failure, if the driver is in a city with high vehicle density. As an alternative for this we proposed "IOT POWERED PARKING SYSTEM". It mainly aims on deduction of time in finding the parking slots and also it avoids the unnecessary travelling through filled parking slots in a parking area. Thus by decreasing the fuel consumption which in turn reduces carbon elimination in our atmosphere.
Keywords: IOT, Raspberry Pi3, HCSR04 sensor, GPS, Smartphone

I. INTRODUCTION

For the development of traffic management, vehicle parking plays an important role. As an advanced system IOT can manage this parking more effectively and efficiently. The basic concept behind IOT itself is that, it can access and control anything, anytime, anyhow and from anywhere. IOT powered parking system typically obtains information about available parking spaces in a particular geographic area and process it real-time to place vehicles at available positions. Thus the user can automatically search for the free parking slot using a smart phone and pre-book an available slot by specifying the time interval as his/her wish. Further the paper also introduces the prospective of reduced waiting time as the designed system provides details about the previous booking time intervals.

Our system constructs each park area in the city as an IOT network and the data including the vehicles GPS location, distance between various car parking area in the city and number of free or available slots for booking will be transferred to the data centre. The research also implements a wireless access that is a cloud equipped with data received from Raspberry system and Ultrasonic sensor for sensing the vehicles at the parking slot and providing user access through internet.

II. PROPOSED SYSTEM ARCHITECTURE

The proposed system is represented in the below figure(Fig 1).The data transferring path from the sensors placed in the parking slot to the user who need to access those data is diagrammatically shown here.
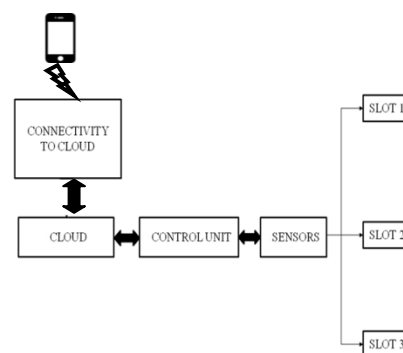

Fig1. Proposed system architecture

III.SYSTEM OVERVIEW

The system is derived from the idea of IOT [1]. The system uses sensor action to update the status of parking which helps to prevent disputes in the car park and helps minimize wasted time in looking for a parking space. Ultrasonic sensors are used here for this. The Ultrasonic range detection technique [2] enables to detect the presence of car on a particular slot. i.e, it works by transmitting a short pulse of sound at a frequency inaudible to the ear (ultrasonic sound or ultrasound). Afterwards listens for an echo. The time elapsed during transmission to echo reception gives information on the distance to the object. The Raspberry Pi3 [3] works as the control unit which is interconnected with sensor network. This control system will update the status from the sensor network (the status of car park spaces) when a new car entered in the system or a parked one is departed. Therefore, the status of the overall parking system is always updated in realtime.
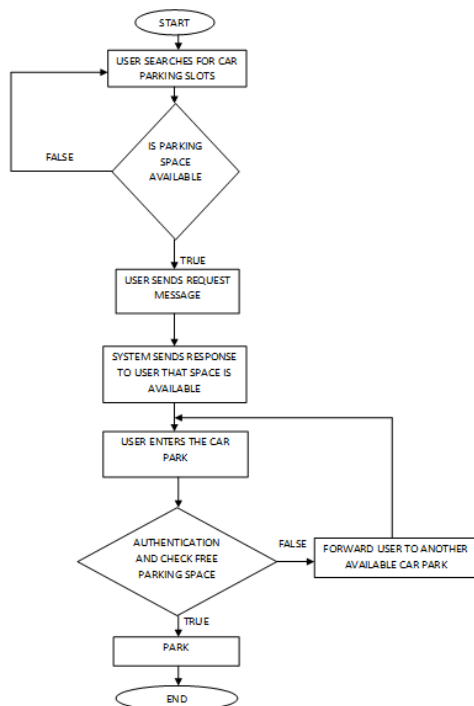
Fig 2. System operation algorithm

       The system operation helps the user to completely understand about the free slots and parking time duration it is represented in (fig2). The system provides details about the previously booked time intervals of unavailable slots which helps the user to book the slot at the time of availability. The user who has booked the parking slot with his vehicle number and details will only be permitted to park the vehicle after verifying the vehicle number and related details at the counter of parking slot with the help of construction of an automatic gate control system based on vehicle license plate recognition [4]. The user can easily drive to the parking area he/she selected by using the navigation provided from the system with the help of GPS facility [5].

The user can view the current status of the slots as per the guidelines below;

- The slot indicating green colour shows that the area is free to be booked and there is no vehicle currently at the slot.
- The slot with red colour indicates the user that it is unavailable for booking and the area is equipped with vehicles. There will be time indication to which the user gets acknowledgement regarding to how much time the previously booked driver parks his/her car in the slot and thus the user can book the slot after the duration.
- The slot indicating yellow colour denotes a recently booked slot but still is in hold, i.e in

waiting position for the booked user to arrive at the slot.

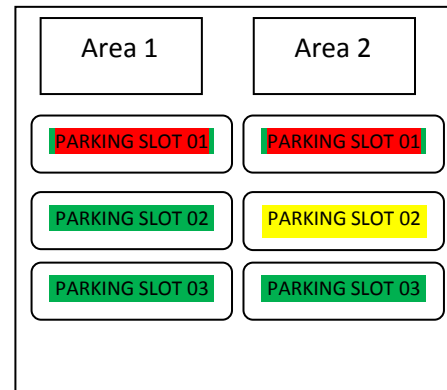The schematic description (fig3) given below clearly indicates the booking page in a users smartphone.

Fig 3. Booking page

IV. ELEMENTS IN THE SYSTEM
1. CLOUD BASED SERVER
       This is a web entity that stores the resource information provided by local units located at each car park. The system allows a driver to search for available parking areas and gain information on parking spaces from each car park without the need to directly access local server node and by directly accessing cloud based server.

2. LOCAL UNIT
       This unit being located in each car park area and stores information of each car parking slots. The local unit includes ultrasonic sensors which identifies the free parking spaces and transmits the information to control unit.
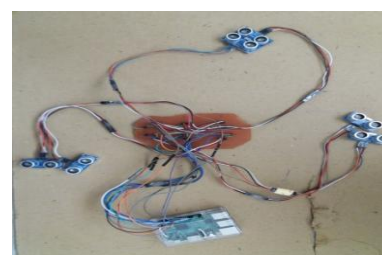

Fig 4. Local unit

3. CONTROL UNIT
       This is a Raspberry module which receives information from the Ultrasonic sensors installed in the car parking slots. The Raspberry module connects with cloud server through internet to transfer data from local car park to cloud server database.

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Fig 5. Raspberry Pi3 (control unit)

4. SCREEN

This displays information on the capacity of car parking area and availability of free slots and time durations as per the data fetched from the cloud server database.
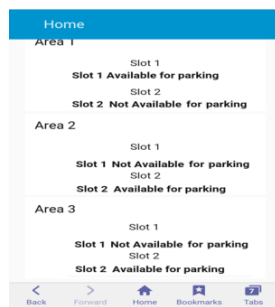

Fig 6(a): user window

Fig 6(b): system setup corresponds to above user window in fig 6(a)

V. CONCLUSION

An IOT cloud-based car parking system has been described in this project. This project has proposed a parking system that helps in reducing the number of users that fail to find a parking space and minimizes the traffic congestion. It saves time, fuel and controls the traffic for a great extent. The result obtained by testing the system is that it is time efficient and one can easily access the parking.

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