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IoT Based Smart Car Parking System Using Android Application

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Abstract: Mainly in metropolitan cities now a day's one of the major issue is availability of parking space. During the busy hours, the reserved parking area gets full completely which creates lot of confusion to the car owner to search vehicle among other vehicles in the parking area. To overcome this difficulty, it is very necessary to modernise the parking of commercial environment system. For designing advance parking slots one of the best solutions is to develop parking system with consideration the reservation of parking slot with the optimal parking space which is mainly dependent on cost and time. The cost function must also include the parking cost and proximity to the destination. The time driven sequence method solve the issue of parking using slot allocation method these proper process an android application which is used to implement a prototype Smart car Parking System based on Reservation(SPSR). These allow the passenger to easily locate and reserved the vehicle parking spaces with the help of IoT (Internet of Things) with slot allocation method.

Keywords: SPSR, IoT, Android Application, Node MCU, RFID, SPS, Parking Space Detection.

I. INTRODUCTION

Many of occasions turn up when we visit various public places for example: shopping malls, 5-star hotels, multiplex cinema halls etc. Various kinds of difficulties we encounter in our day-to-day life are about parking areas. Tremendous of the times we need to travel to find a free space for parking. The more problems occur if the parking slots are full and it becomes time consuming. This situation calls for the need for an automated parking system. Due to the scarcity of parking zone we proposed a system for an smart automated car parking that provides the parking space at any time to the user. By using smart phone, user's can reserved the car parking space by providing the information like name, date, and time. LED's are provided to shows the data about free parking slot thus after successful parking, the data will be automated automatically. The system is based on modules Android Application and Interfacing of Node MCU ESP8266 with LED. Node MCU is an open source IoT platform [15]. Thus this system had proved to be useful for the purpose of the car parking automation and this system helps to consume car driver's time as the user can book his/her parking area beforehand [3].Once the user reached at the parking spot the time stops automatically, by detecting the location of passenger and parking area being not changed. Once user renounces his/her area of spot then, it appears reserved for all other users and after leaving the spot area it is shown as the slot area 'available' for other users. In this paper we are going to discuss the problem related to car parking area and different available system with their advantage and disadvantages. Inline to this discussion paper is also descriptive to discuss how to improve the system so as to make convenient car parking system with the use of Slot Allocation method with the help of Android application.

II. LITERATURE SURVEY

Prof. Yashomati R. Dhumal, Harshala A. Waghmare, Aishwarya S. Tole, Swati R. Shilimkar has published a paper entitled "Android Based Smart Car Parking System". In this paper authors has given detail about implementation of Smart Car Parking System using micro-controller 8051 along with working principal of each section. In this paper, the development of reservation for parking slots commanded by android application, number plate recognition, parking slot status and electronic billing system is implemented. The proposed system reduces the driver's effort and time to search parking space. Also the payment transaction is handled online which makes the system less human dependent. Paper conclude with the fact that microcontroller can be a good processor for such implementation. The published paper is available at International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering (An ISO 3297: 2007 Certified Organization) Vol. 5, Issue 3, March 2016[3].

Mr. Basavaraju S R has published a paper entitled "Automatic Smart Parking System using Internet of Things (IoT)". In this paper authors has given detail about implementation of Smart Car Parking System using Raspberry pi along with working principal of each section. This designed automatic smart parking system which is simple, economic and provides effective solution to reduce carbon footprints in the atmosphere. It is well managed to access and map the status of parking slots from any remote location through web browser. Thus, it reduces the risk of finding the parking

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slots in any parking area and also it eliminates unnecessary travelling of vehicles across the filled parking slots in a city. Therefore, it reduces time and it is cost effective. In these paper they have focussing on less power consumption and more performance device so raspberry pi is the suitable microcontroller for our implementation. The published paper is available at International Journal of Scientific and Research Publications, Volume 5, Issue 12, December 2015 [5].

Renuka R. and S. Dhanalakshmi published a paper entitled "ANDROID BASED SMART PARKING SYSTEM USING SLOT ALLOCATION & RESERVATIONS". In this paper authors has given detail about implementation of Smart Car Parking System using RFID tag along with working principal of each section. In this paper, The Smart parking system based on Slot booking is implemented, using the Android application. Using the slot allocation method we can book and block our own cheapest and shortest distant parking slot. It is an efficient one for solving parking problems, which overcomes the traffic congestion and provides automated billing process using the RFID tag. Paper concludes with the fact that A Radio Frequency Identification Tag (RFID) tag is an electronic tag that exchanges data with a RFID reader. RFID tag has chip, memory and an antenna. The published paper is available at ARPN Journal of Engineering and Applied Sciences VOL. 10, NO. 7, APRIL 2015 [6].

III. METHODS AND ALGORITHMS

A. Smart Car Parking System using micro-controller 8051

The given system architecture gives the schematic of the design required to exploitation the system. The parking system commanded by smart phone with android application as shown in figure. In this system they used micro-controller 8051.Micro controller is interfaced with internet and LED but unfortunately the system noted with certain drawbacks as it achieve wireless technology with limited option of connecting to particular device only and hence it is not widely adopted.[4]

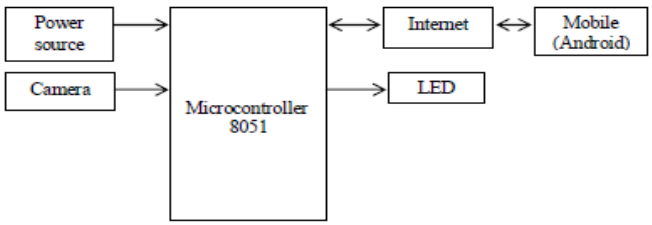

Fig. 1. Block diagram of Smart Car Parking System using micro-controller 8051

B. Automatic smart parking system using raspberry pi

The Smart Car Parking System is designed by making use of some IOT (Internet of Things) supports to hardware's like raspberry pi, arduino boards etc. This paper mainly focussing on low power consumption and high performance device so raspberry pi is the appropriate micro-controller for our implementation and NOOBS installer is loaded into the storage device of micro-controller. This installer consists of different hardware and operating systems (OS) such as mac OS, tiny OS, openelec, raspbian os etc. these operating systems basically consumes low power. On other side the authors also gives the limitation of system as the parking space are marked on to the captured image by administrator.[5]

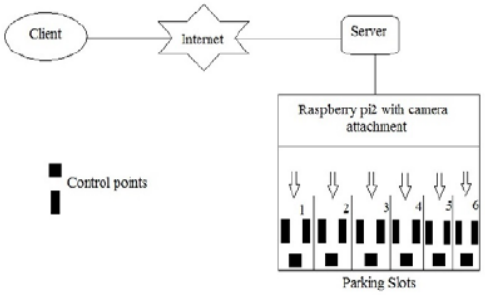

Fig. 2. Block diagram of IOT based system

C. Smart Parking System using slot allocation and reservation using RFID

The Smart car parking system based on Slot booking is implemented, using the Android application. Using the slot allocation method we can book and block our own low cost and distant parking slot. It is an efficient one for solving the parking problems, which overcomes the traffic congestion and provides automated billing process using the RFID tag. The disadvantage of these system is that the passenger has to pay some money for the booking the parking slot.

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Sometime if we did not park the car at a time the parking slot is allocated by other at that time the paid money goes wasted. The paid money will not get back. Some of disadvantages listed with the implemented system as the cost and time to develop personal area network technology is very expensive. It gives liability issue of stolen or lost.[6] Quad-band intelligent GSM/GPRS modem suitable for long duration data transmission.[12]

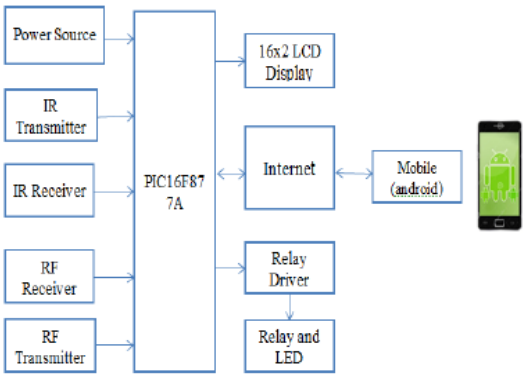

Fig. 3. Block diagram of System using slot allocation and reservation using RFID

D. Smart car parking system using Android Application

All the limitation discussed in above systems can be overcome if the system is implemented using android application. This system is will intimate the user about the vacancy of the parking slots. The user can choose the parking slot in advance, instead of waiting in the parking area, where the details of the parking is given to the user on their smart phones. IR Sensors will be attached in each slot for detecting the vacancy. The data from the sensors are collected to the node MCU ESP8266 and these data are changed into text format and given to the smart phones. The sensors are interfaced using Node MCU and the signal then read and transmitted through Wi-fi module [15]. Now the users are provided with the parking details and can choose the appropriate slots. The parking area is sensed by using the sensors which are placed in each slot. The sensors will detect each slot as input and the output of the sensors is preceded to the node MCU ESP8266. LED is used to detect the empty and reserved slots. The LDR will glows at night.

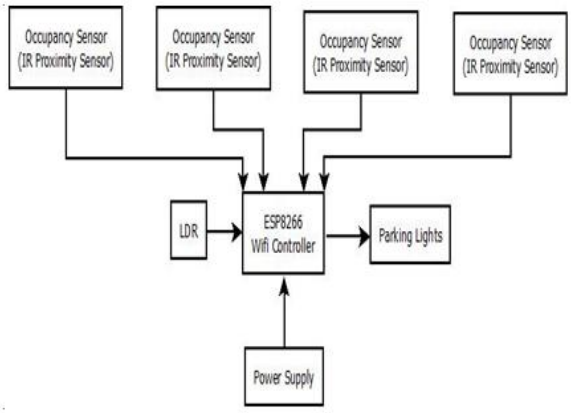

Fig. 4. System block diagram using Android Application

A. ESP8266 ESP12 Node MCU

Fig. 5. Node MCU hardware

The ESP8266 is the name of a micro controller designed by Espressif Systems. The ESP8266 it self is a self-contained Wi-Fi networking solution offering as a bridge from existing micro controller to Wi-Fi and is also capable of running self-contained applications. This module comes with a built in USB connector and a rich assortment of pin-outs. With a

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micro USB cable, you can connect Node MCU developing kit to your laptop and flash it without any trouble, just like Arduino [15].

B. IR Sensor

Fig. 6. IR sensor hardware

This Medium Range Infrared sensor offers simple, user friendly and fast obstacle detection using infrared. it is non contact detection. The implementations of modulated IR signal immune the sensor to the interferences caused by the normal light of a light bulb or the sun light. The sensing distance can be adjusted manually.

C. Light Dependant Resistor

A light dependant resistor also know as a LDR, photo resistor, photoconductor or photocell, is a resistor whose resistance increases or decreases depending on the amount of light intensity. LDRs (Light Dependant Resistors) are a very useful tool in a light/dark circuits. LDRs can have a variety of resistance and functions.

IV. EXPERMENTATION AND EXPECTED RESULT

As a part of experimentation every passenger needs to install the application on his/her smart phone based device. After installation, the icon of the app will appear on the screen of the passenger's device. Welcome screen will be flashed to the passenger on the opening application. The passenger has to enter details like user name, time and date etc. The user is provided with the multiple parking areas. User has to select one of the particular areas provided, where he/her wants to park the vehicle. Status of the slots based on the vehicle selected will must show the availability of the empty. An infrared sensor (IR) is an electronic device which is used to sense light wavelength of its surroundings by either emitting or detecting infrared spectrum. The Colour coding is used to indicate the empty versus reserved parking area. Green LED indicates empty slots, Red LED indicates that parking is booked by the user and yellow LED indicates that user has pre-booked the parking space. For experimental testing will create four slots using android application in mobile and parallel system will update on node MCU ESP8266 using the internet. Initially if a slot is available the system must give a green signal for the same slot which indicates that the parking status available. However if any of the slot was booked the signal must change to red colour. While designing the printed circuit board it is very important to take some precaution as discussed [8].

V. CONCLUSION

In this manuscript different types of system useful for automatic car parking such as Smart Car Parking System using micro-controller 8051, Automatic smart parking system using raspberry pi, Smart Parking System using slot allocation and reservation using RFID and Smart car parking system using Android Application ware discussed. Mainly the paper focused on selection of best compatible design for parking system. Some of the exiting implementation was discussed with their advantages and disadvantages. Finally it is conclude that if the system design with the use of android application and IoT then it will be the more efficient implementation. In line to this the experimentation and expected result also discussed for further implementation.

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