Slot Reservation for Vehicle Parking Using IOT

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Abstract- *The continuously exploding population and the lack of empty spaces, in general, is a problem that needs to be tackled in populated cities. One major problem is the lack of parking spaces and inefficient parking. We must use technology as a means to solve this problem. The problem of parking spaces can be solved if the user already has an idea about the availability of spaces in a particular area. Building separate areas for parking can also contribute to the solution. To that end, we have proposed a model that uses the concept of the Internet of Things to let the user know the availability of parking spaces via an app/webpage using his smartphone. The user may book a slot on the webpage remotely and go to the parking area assured that he would get to park in his registered slot. The gate is automated to provide entry only to registered users. This concept also encourages the use of technology to minimize problems.*

Key Words: *IOT, Raspberry Pi, PhpMyAdmin*

1. INTRODUCTION

With the ever-growing need for automation and communication between hardware equipment, the Internet has become a necessity in the field of automation. This calls for the need for "INTERNET OF THINGS" (IOT). Internet of things is the concept of connecting things that are conventionally without connection-to-the-internet, to the Internet. These devices can communicate with each other and are remotely controlled and monitored using specific hardware that can be connected to the internet. The use and implementation of IOT range from the fields of home automation to medical and healthcare [4].

The Parking problem in populated cities is a major reason behind traffic-congestions, air pollution, and road-rage. Most of this difficulty roots from the fact that drivers have no idea where they may find parking space. So for the purpose of finding a space, time and fuel are wasted. To avoid this, monitoring the spaces can be an efficient solution. City planners are finding ways to efficiently manage parking spaces to solve this problem[3].Smart Parking is the concept of providing users with an app or a webpage as an interface to check available parking spaces. This app/webpage can be accessed using a smartphone. The smartphone technology is pervasive in the urban society and hence the app can be accessed by almost anyone. Many cities have implemented the concept of a Car Parking System. However, such systems can be extended using IOT to multiply the benefits and make use of the latest developments in technology. This paper gives a brief description of the smart parking system that we intend to develop using Raspberry Pi. The user can see real-time status of the availability of slots and can book a free slot [2].

It has been found that find parking spaces is a huge problem in congested cities and contributes harshly to air-pollution, traffic jams, and wastage of fuel. These effects can be avoided to a large extent if the drivers knew the availability of spaces or lack thereof. Thus, we developed a system that can remotely tell a user about the status of a parking area [1]. The user can then book a slot remotely and secure a space to park his car. If slots are not available the user can save time and fuel by not going to that particular parking area.

1.1 Literature Survey

We have considered and studied the few existing systems that have been developed to solve this problem. With the system we have proposed we will update the previous system and in addition, it will smooth the entire system.

Dr. Y Raghavender Rao proposed a system consisting of PIC16F73 microcontroller, IR sensors, and Wi-Fi module [1]. Also, a webpage which consists of parking availability details of the area is interfaced with a controller and a Wi-Fi module. The IR sensor detects the presence of a vehicle in the particular slot and the data is sent to the webpage. This data is then used by the user to know whether there is the availability of the

parking slot. This way user can be notified whether the parking lot is available or not.

Many projects have been developed on the concept of smart parking. The Guangdong AKE Technology Co. Ltd, China has developed a car parking and management system that communicates the status of the system using RS485 cables [5]. While studying these systems, we came to know that this particular model only allows us to know the condition of the parking slot [2]. This way, the user may reach the area under the impression that the slot is free and find that the slot has been occupied by another user who also found the slot free. With the updated system, a controller with the help of the Wi-Fi module. The presence of the vehicle in a particular slot is detected by the IR sensor and the data get updated on the webpage. This data is then used by the user to know whether there is the availability of the parking slot. This way user can be notified whether the parking lot is available or not.

2. PROPOSED SYSTEM

A. Project Overview

The proposed structure is an internet-based registering system. The users have to register and book an empty slot in the parking area on the webpage. User details such as name, mobile number, car license plate number are taken from the user on the webpage and uploaded on the database. During entry, the number plate is automatically captured and checked with the registered number plates on the database. If the system finds a match, that is, the incoming user has registered, the gate opens and the fare timer for the user starts. When the car departs, the fare timer ends and the system send a text message to the user indicating the total fare. The user needs to pay the fare before exiting the parking area.
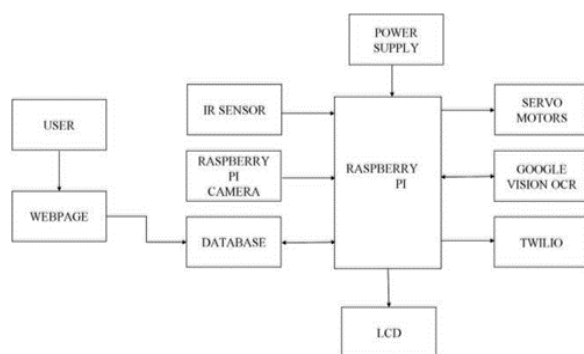
B. Block Diagram

Fig -1 System Architecture

Fig-1 shows the block architecture of a slot reservation of vehicle parking. Raspberry Pi serves as the main processing unit in the system. The users have to pre book a parking slot for themselves through an app or a web page and can see whether slots are available/unavailable. There they are asked to fill the required details and the time slot at a particular place. If the slot is available they can select the slot and mention the time from which they are willing to use the parking arena, and once done they immediately receive a confirmation message on their smart phones. When the user enters his details on the webpage and registers, the details are updated on the database and the corresponding slot is updated as unavailable on the webpage.

When a user arrives at the entry gate of the designated parking area, IR sensor detects its presence at the gate. If it finds a match, the gate is opened and if not the gate will not open. A camera module present at the entrance scans the car number plate. The IR sensors detect the car and the camera module captures and transmits the data to the cloud. The raspberry pi camera stores the image at a particular destination. We use Google vision in python to decode the number plate. Then python checks the string of characters with the number plate stored into the database. Once it is detected it stores all the details of the user and its result in the database for further access. If the number plate matches with the one entered in the app / webpage the entry gate opens and allows the user to enter the parking arena and avail the slot.

Once the vehicle is parked in the allocated slot the IR sensor will detect the vehicle and the output will be sent to the timer. The entry time for that user is recorded. On departure from the slot, the IR sensor will detect no object in the slot and this signal will be sent to the timer and it will stop. The time duration will be multiplied by a constant value to calculate the fees. The exit time is calculated and the user will receive a SMS regarding the fees to be paid at the registered mobile number. The user needs to pay the fee before exiting the parking arena. IR sensor detects the vehicle at the exit gate and the gates are opened for the vehicle to exit the parking arena. Till the time IR sensor gives low output the gates will remain open. As the car leaves the parking arena the sensor output turns high and the gates are closed. When there are no vacancies the HTML page will pop a dialogue box indicating Unavailable Slots.
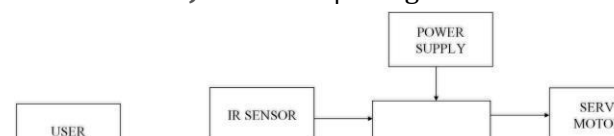
3. HARDWARE DESCRIPTION

3.1 Microcontroller:

The microcontroller used in this project is Raspberry pi 3B. It is used for processing all the incoming data from the sensors. All the outputs are saved in the form of a text file in Raspberry pi.

3.2 Servo Motor:

This proposed system requires two servo motors one at the ENTRANCE and the other at the EXIT gate. The interfacing of these motors are done using a python script. The rotating angle of the motors are pre stated in the python script. Wired connection are used for the servo motors to connect.

3.3 IR Sensor:

IR sensors are being used for detecting presence of vehicles at the gates. A connection is made between microcontroller and sensors through wires. The input/ output pins are connected to the GPIO pins of Raspberry pi. IR sensors come in pair of Infrared emitter and receiver. Whenever there is an object blocking the infrared source, it reflects and the receiver gets the signal. The received signal is sent through a comparator circuit on board. Based on the calibrated threshold, the output logic indicates a LOW output. Due to this the LED turns green indicating a detection.

3.4 Liquid Crystal Display (LCD):

LCD is a flat panel display module. LCD's have no limitation of displaying special characters and are easily programmable. The characters are displayed in a 5x7 pixel matrix.

3.5 Pi-Camera Module:

The Pi-camera module captures images and send them to the controller. These images are captured when the camera module receives a signal from the IR sensors.

4. SOFTWARE DESCRIPTION

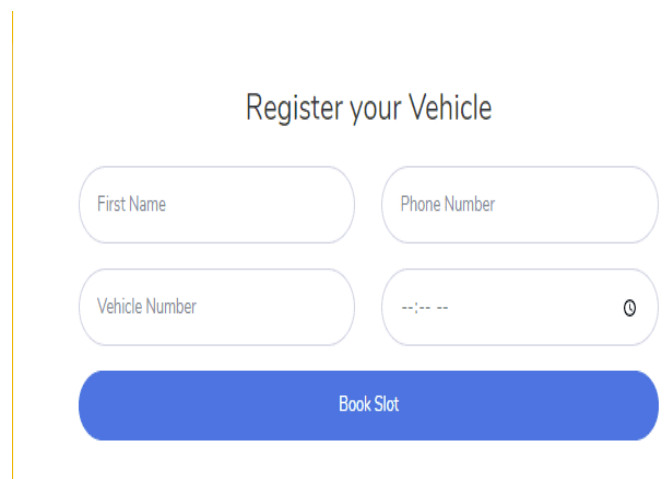### 4.1 Number Plate Detection using Google OCR:

Google OCR is the tool used to convert an image file into a text. It is an automatic license plate recognition library which is both commercial and open-source. The API is designed to convert an image featuring the number plate into a text file using Python Script which is based on JSON tool. The OCR is a web service running in the cloud that analyzes images of vehicles. Open-ALPR can be used by almost any programming language on any operating system. When we make an API call to Open-ALPR it extracts the number plate characters and feeds it to raspberry pi.

4.2 Twilio:

Twilio is a cloud communication platform which provides to make or receive call or message over internet programmatically to the developers. This uses web services API for the same operation. The script for this is written in many software languages like Python, C, PHP, and Java. This open source software helps to reach out anyone in the world by integrating software and networking. It is a communication platform between client and user.

5. RESULTS

Fig -2: Registration page

Fig -2 shows the registration page, here the users are asked to enter their name, phone number, vehicle number and the time slot for which they wish to book.
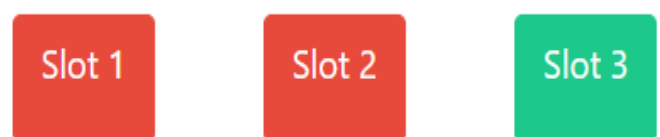

Fig -3: Parking Slots

Slot green= available/empty
Slot red= occupied

Fig -4: Database

The database created has four columns for storing the user details. The information filled in the app/webpage get stored in the database. The purpose of database in the model is security.
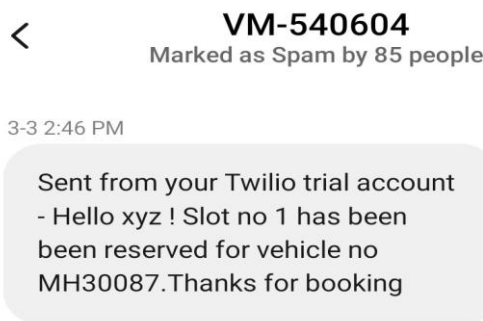

Fig -5: Sms received from Twilio

Once the slot is booked successfully the user immediately gets a confirmation message from twilio like the one sown above.
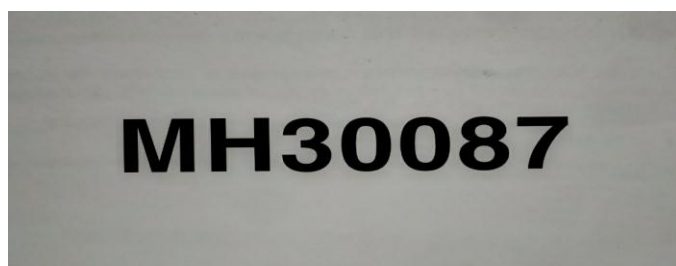

Fig -6: Number plate

Fig 6 shows the car no plate, whenever the car arrives at the parking arena the camera module captures the no plate and if it matches with the data stored in the data base the door opens and lets the car in.

6. CONCLUSIONS

This paper presents an effective way to manage car parking in a city by real time-monitoring and online registration. The concept of IoT has been used so that parking slots can be seen remotely by users instead of going through the trouble of driving from place to place to find an empty slot and contributing to traffic in the process. Although the implementation of the proposed system has a high initial cost and the requirement of a designated parking area, it will definitely help conquer traffic in the long run and reduce frustrations for many people.

FUTURE SCOPE

This type of a smart parking system is a small initiative towards making a 'smart-city'. It can also be implemented in future on a large scale. Having such a system can even control congestion on road, and more parking spaces can u used. Since the entire system will be automated no need for any man force to keep an eye on the cars parked.

REFERENCES

[1] Automatic Smart Parking System using the Internet of Things(IoT) by Dr. Y. Raghavender Rao

[2] The Internet of Things: A survey, Luigi Atzori, Antonio Iera, Giacomo Morabito

[3] Priyanka S. Patil, S.K. Shah, "A Review: Development of Android Applications WHATS HERE Places", International Journal of Advanced Research in Electronics and Communication Engineering (IJARECE) Volume 4, Issue 4, April 2015 K. Elissa, "Title of paper if known," unpublished.

[4] M. M. Rashid, A. Musa, M. Ataur Rahman, and N. Farahana, A. Farhana, "Automatic Parking Management System and Parking Fee Collection Based on Number Plate Recognition", International Journal of Machine Learning and Computing, Vol. 2, No. 2, April 2012.

[5] Vrushali D. Ichake , Priya D. Shitole, Mohsina Momin, Kanchan S Thakare (Assistant Professor), "Smart Car Parking System Based on IOT Concept", International Journal of Engineering Science

Invention ISSN (Online): 2319 – 6734, ISSN (Print): 2319 – 6726, www.ijesi.org , Volume 5 Issue 3, March 2016, PP.48-54

[6] Mr Basavaraju S R, "Automatic Smart Parking System using Internet of Things (IOT)," International Journal of Scientific and Research Publications, Volume 5, Issue 12, December 2015, ISSN 2250-3153