SMART CAR PARKING SYSTEM USING IoT AND CLOUD

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Abstract - *With developing society and nation the development of cities is also taking place. People are using technology to make things easier for their lively hood some of them is internet of things. Using this concept of technology many problems of day to day life are solved some of them are traffic signals, parking lots and operating electronic gadgets at home with the user away from them. The idea of wireless access to the system is used in this project of smart parking system. This method is used to monitor the vehicles in the parking lot as well as display the parking lots available in the area. The main aim of this project is to save time as well reduce the pollution due to searching for a parking lot in the parking area. Wireless sensors are used to sense the movements of the car.*

Keywords - **Internet of things, Arduino, wireless sensors, cloud computing, Raspberry Pi.**

I. INTRODUCTION

Internet of things(IoT) is the transfer of data on internet with interconnected systems connected to same internet. This is used in place of human- to – human or hand to hand transfer of data where the user should be present at the same place as that of the data to transfer the required data to the other user. The word internet of things consist of words like "internet" and "things" were both have varies definition to them depending the situation in which there are used. Internet can have definition of transfer of data to the computers and other electronic on devices used by the users. The other word is "things" which can mean an electronic object or any product. The concept of cloud computing deals with the storage of data. It is a virtual storage which can make user to easily access, retrieve and modify the data.

The parking area is equipped with the wireless sensors that sense the vehicle with the conditions that are instructed to it. The sensors transmit the signals to arduino with acts like a convertor that converts the signals into waves and check them. The checked signals are then forwarded to the raspberry pi which is a mini processor, it runs the code and gives the result to the user who is connected to the server of the website. The user who requests for the parking area is given response whether a lot is free or not. The same data is updated with the parking attendant who can check with the client. The data is stored in the cloud storage which helps in easy retrieval, updating and modification of the data.

II. RELATED WORKS

There are previous works on this topic where some use different approaches or methods to calculate the ways to find the parking area in the lot. An algorithm makes a lot of difference as it can increase or decrease the efficiency of cloud based parking system. The algorithm which is used in this project helps the user to find the lot when he/she enters from any side of the parking lot. The user can check the parking lot gate which is nearer to him/her and book the parking area through the mobile app. The user is shown the parking areas available which is accessed from the cloud storage, the user can choose the available area which is comfortable to his/her access. With the help of this algorithm the waiting time required for the user when entering from any gate is minimized. Security aspects are not included in this project. The user is given a printed paper or the attended can use the facial recognization method to identify the user. The technology used here is economical. The previous projects has security measures like intrusive sensors and non-intrusive sensors where the intrusive sensors are installed in the holes on the surface of the road by tunneling under the road whereas the non-intrusive sensors don't affect the road and are easy for installation and maintenance.

In the recent activities recorded the pollution and traffic congestion due to finding the parking area nearby has increased rapidly, therefore to decrease the above problems this method of parking system is useful. Many projects use the feature of Bluetooth and wifi modules to locate the area where the vehicle is present. This paper uses the mobile application which uses the GPS of the user which is automatically turned on when the app is opened,

the app is connected with the Google API giving the user easy ways to reach the parking lot.

Smart parking system uses the IoT technology which helps in updating user with parking lots available and also helps them to find the nearest gate to enter to the parking area. The user can pay money for the space through online services like Paytm, Googlepay, and PhonePay or their can directly pay the amount to the working attendee. The user will get a message with their car number along with their parking lot number and their payment amount. This additional detail helps the user even if they lose the paper transcript.

Smart parking system allows reservation that is stored in the parking database managements, it collects and stores data about the driver, vehicle number, the parking lot which they choose to park along with the number of hours. When the parking time is less than half an hour a message is sent to the user to either automatically increase the parking time or decline the offer. When the parking time is increased the amount for the extra hours are calculated for the user who can pay through online mode or can pay while leaving the premises of the parking area.

III. SYSTEM ARCHITECTURE

A. Proposed Architecture

It consists of three sections: first section is the parking area where the ultrasonic sensors are placed along with the arduino devices. These sensors are used to find if the parking area is vacant or occupied. It is connected to the arduino which is an IDE. The second section consists of the cloud based web services which act as a mediator between the user and parking area. The cloud is used for easy updating, retrieval and modification of the user data, it also keeps in check of the available and booked parking lots. This helps the user to look up for the parking lots and also book the available parking lot. The third section is the user side; the user gets a notification of his booked area and the time for he booked the area for, he also gets the payment receipt if he pays it through online mode or offline mode, the SMS is sent through the raspberry pi module.
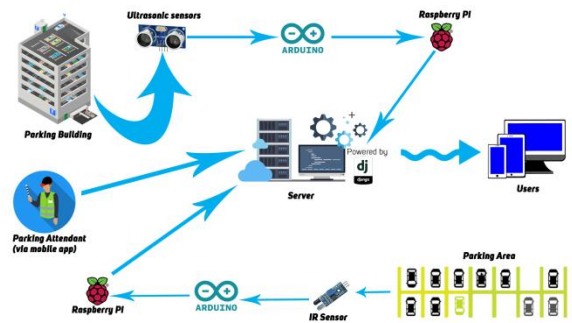

Fig 1. System Architecture

B. HARDWARE

The three main hardware components used are ultrasonic sensors, Arduino and Raspberry Pi. The ultrasonic sensors are used to check if the space is vacant or occupied. The sensors are instructed with a code that has conditions that involves the obstacle in this case the bottom of the car. The state can be "occupied" if the distance is in the range of 10cm-50 cm; "free" if the distance is more than 500mm and "unclean" if the distance is less than 100mm, which means the sensor is unclean. The data is sent to cloud so when the user enter the website of the app for booking the arduino checks for the availability of parking lots.

IV. DETAILS OF THE MODULE

A. Raspberry Pi

The Raspberry Pi 3 model B is a circuit that has inbuilt Wi-Fi /Bluetooth support that helps to locate the user and it also acts to send SMS to the user.

Fig 2. Raspberry Pi 3

B. Ultrasonic Sensors

An ultrasonic sensors is used to measure the distance of the object by using the method of ultrasonic sound

waves. It uses the transducer to send and receive the pulse that helps to find the distance of the object.

Fig 3. Ultrasonic Sensors

C. Servo Motor

The servo motor is used to push or rotate an object in this case the entry and exit gate. Servo drive transmits electrical signals to the servo motor for producing motion.

Fig.4. Servo Motor

D. Arduino Uno

The arduino Uno board is a microcontroller which has 14 input/output pins. It functions allow structuring the programs in the segments of code to perform individual tasks.
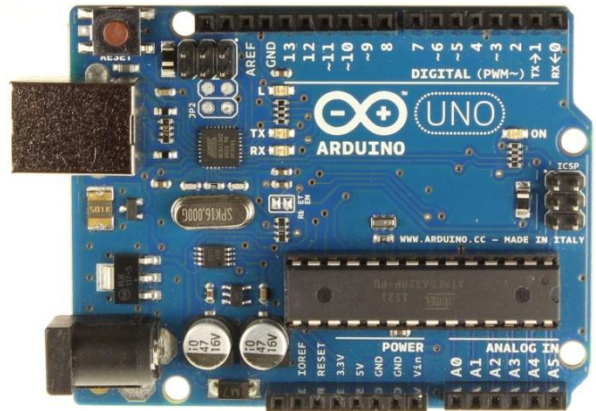

Fig. 5. Arduino Uno

V. IMPLEMENTATION

In this section we see how the project is implemented and worked out in real life. The working of this project is shown in the following steps through flow chart:
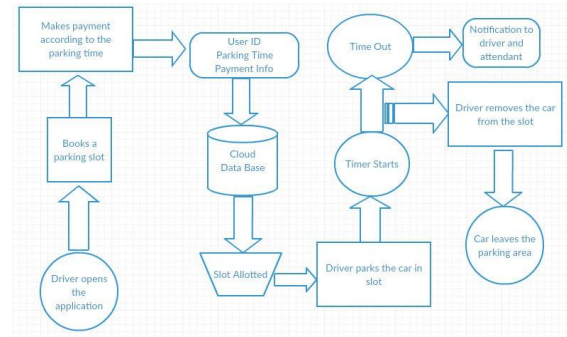

Fig.6. Flow chart for system

The following steps are to be followed by the driver if he/she wants to park their vehicle in the parking lot using this parking system. The steps are:

1. Install the website to make the booking.
2. The driver checks the parking area where he wants to park.
3. Check for the availability of the parking lots.
4. The driver makes payment for the lot either through online mode or through offline mode.
5. The driver receives a message of all the details consisting of the driver information, vehicle number, parking lot number and number of hours it is booked for.
6. The driver parks the car in the lot.
7. When the parking time has only half an hour left then the driver will get the notification for further increment of parking time or can reject the offer.

8. If the time of parking is incremented then the money for the extra time can be paid through online or through the offline mode.
9. The driver will leave the parking area before which he has to show he pass or message to the attendant so no further dues are to be paid.
10. The parking lot is once again open for other user which is updated in the cloud.

The below screenshots will help in better understanding of the above steps:

Fig.7. Booking the lot

In the above screenshot the user can see the already booked and available slots in the parking area.

Fig.8. Selecting the time

In the above figure the user can select the amount of time for which the particular parking lot is booked.

Fig.9.confirming the booking

In the figure 9 the user can confirm the booking of the lot after he parks the car in the lot. If the driver fails to confirm the lot within 1 minute of parking the car then an alarm is raised to the attended who checks for the wrong parking of the car.

VI.   CONCLUSION

The concept of smart car parking arises from the concept of smart cities. The smart cities is the dream of humanity and it has been in progress from the past couple of years by continues changes in the society making the concept a reality. With the help of technologies like Internet of Things and Cloud Computing the development of the smart cities has rose to a different level. The integration of IoT with Cloud has lead to new society. In this project we have used this technology to help people coming from remote areas as well as urban areas to book a parking lot for their vehicles. The main aim of this was to reduce the time consumption of the user, the traffic congestion as well as the reduction of carbon footprints. The efforts made in this paper is to improve the quality of the people and the environment.

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