

ONLINE PARKING BOOKING SYSTEMS

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Abstract—Not finding a parking spot for you once in a while is to be sure a basic issue. The quantity of vehicles is likewise expanding day by day adding to the parking pledges at open spots. Urban areas took note that their drivers had genuine issues to discover a parking spot effortlessly particularly amid top hours, the trouble roots from not knowing where the parking spots are accessible at the given time. Regardless of whether this is known, numerous vehicles may seek after a little number of parking spots which thusly prompts movement blockage. The movement on streets and parking spot has been an region of worry in dominant part of urban communities. In this way, parking checking is an critical arrangement. To stay away from these issues, as of late some new innovations have been produced that assistance in understanding the parking issues as it were. Right off the bat, this paper gives a review about the idea of brilliant parking booking system, which involves filling of garage efficiently allowing the registered garage and then automating statistics with a web-based solution, valet assistance, management system using sorting algorithm.

Keywords — parking booking system, management system, sorting algorithm

I. INTRODUCTION

The parking issue in huge urban areas, particularly the super urban areas, has turned out to be one of the key reasons for the city movement clog, driver disappointment and air contamination. So analysts are as of late swung to applying advancements for administration of parking region by planning and execution of a model arrangement of keen parking that enables vehicle drivers to viably locate the free parking places. Later on the interest for the keen parking administration will increment on the grounds that the fast development in the car ventures. A viable answer for this administration can be given by numerous new innovations. One such innovation is online parking booking system will allow to help the people to book the place before and create reservation online, provide easy interface to get the knowledge of their reservation and easy management of garage.

II. PREVIOUS WORKS

In this paper a novel "smart parking" framework for an urban condition. [1] The framework allots and saves an ideal parking spot in light of the driver's cost work that consolidates closeness to goal and stopping cost. The approach illuminates a blended whole number straight programming (MILP) issue at each choice point characterized in a period driven arrangement. The arrangement of each MILP is an ideal designation in light of current state data furthermore, is refreshed at the following choice point with a certification that there is no asset reservation strife and that no driver is ever relegated an asset with a cost work higher than this driver's flow taken toll work esteem. In view of reproduction comes about, contrasted and uncontrolled stopping procedures or best in class direction-based frameworks, framework decreases the normal time to discover a parking spot and the stopping cost, though the generally speaking stopping limit is all the more effectively used. It additionally portrays full usage in a carport to test this framework, where another light framework conspires is proposed to ensure client reservation. [2]With the expansion of monetary conduct and the redesign of expectation for everyday comforts, the proportion of individuals in India who claim vehicles and cruisers have as of late expanded giving a lift to Metropolitan Traffic. In this manner, stopping issues will be a major test to encourage movement arrange and guarantee urban life quality. Hunting down parking spot in most metropolitan regions, particularly amid the surge hours, is troublesome for drivers. The trouble emerges from not knowing where the accessible spaces might be around then; regardless of whether known, numerous vehicles may seek after exceptionally restricted parking spots to cause genuine activity blockage. In this paper, we outline and actualize a model of Smart Parking System in view of Reservation (SPSR) that enables drivers to successfully discover and hold the empty parking spots. By occasionally taking in the stopping status from the host stopping database administration in parking areas, the reservation benefit is influenced by the difference in physical stopping status. The drivers are permitted to get to this digital physical framework with their own specialized gadgets. Besides, we contemplate cutting edge stopping strategies in savvy stopping frameworks and think about their execution. The analysis comes about demonstrate that the proposed reservation-based stopping arrangement can possibly improve the tasks of stopping frameworks, and in addition reduce activity clog caused by stopping looking. [3]With the expansion of monetary conduct and the redesign of expectation for everyday comforts, the proportion of individuals in India who claim vehicles and cruisers have as of late expanded giving a lift to Metropolitan Traffic. In this manner, stopping issues will be a major test to encourage movement arrange and guarantee urban life quality. Hunting down parking spot in most metropolitan regions, particularly amid the surge hours, is troublesome for drivers. The trouble emerges from not knowing where the accessible spaces might be around then; regardless of whether known, numerous vehicles may seek after exceptionally restricted parking spots to cause genuine activity blockage. This paper outlines and actualizes a model of Smart Parking System in view of Reservation (SPSR) that enables drivers to successfully discover and hold the empty parking spots. By occasionally taking in the stopping status from the host stopping database administration in parking areas, the reservation benefit is influenced by the difference in physical stopping status. The drivers are permitted to get to this digital physical framework with their own specialized gadgets.

III. REQUIREMENT ANALYSIS

The system shall recognize registered customers via plate number and display relevant information such as name and address. The system shall allow for creation of profile on website through registration and shall also allow valets to create a profile for walk-ins. The system shall allow the valet to view customer information via tablet/smart phone/web application. The system shall manage the parking garage (example: payroll, pricing, offers, etc.) The system shall process payments based on length of parking time and also allow for early payments for registrations. The

system shall consolidate parking spots and use efficient allocation algorithm to maximize space availability. The system shall allow for manual input and parking spot allocation in case of system failure or any kind of server problems

IV. OVERVIEW OF SYSTEM

The parking lot automation management and automation that we are proposing involves the interaction of multiple parties working simultaneously to make the system efficient, accurate and easy-to-use. The user who is the owner of a vehicle to be parked can register them online. Their name gets stored in database and they are given a ticket number but not a parking slot number. The parking slot number is given on spot upon showing the ticket as it dynamically generated on spot using our proprietary sorting algorithm which takes into account various factors such present condition of car, size of car, distance of car, preference exit time of user, etc. This booking process can also be done on spot using the valet interface at a higher cost. The valet at the parking lot will have a handheld device like a tablet for directing the cars, verifying tickets and also for on spot booking. The tickets and the corresponding cars are verified by using image processing algorithms on the number plates of cars. This helps to automate the process to a large extent as human intervention is not necessary due to the fact that all cars stop at the same spot before entering the parking lot. The sensors at the gate and computer vision algorithms help to identify the entry and exit of car which correspondingly updates the database for staging they are for next cars to be parked.

V. HARDWARE AND SOFTWARE REQUIREMENTS

As explained in the system overview, the parking lot management and automation requires a set of hardware and software requirements for it to work efficiently and accurately. The hardware set includes various types of sensors for detection and analysis. The set used here has camera sensors at gates and vantage points for security, car identification and also for recognizing the entry and exit of vehicles from the parking lot. They also include proximity sensors present minimally in all parking slots to identify or to verify whether the parking lot is occupied or not. It also present time allocated to it as it is a centralized system over low power Wi-Fi. This helps it to detect when the slot got filled in correspondence to car entered through the gate which helps it to identify if a car has been placed in its proper position.

It does so by observing the time of entry, time of parked and average time required for getting from entry to the allocated slot. This all happens in the backend in an instance. An optional hardware may be the turnstile gate at sections of parking lot which will automatically open upon recognizing the number plate on cars' front. For increasing efficient, we can use more sensors like weight sensors, ambient sensors or light sensors which will help to get more contexts if artificial intelligence is too clubbed along with the system.

The software requirements include any kind of database whether it is SQL based or No-SQL based. It doesn't make any difference except for the cost as the load will be less considering the fact that parking lots are generally small in size. Apart from the database, there are python modules to manipulate the raspberry pi connected at various required places. The modules written in python programming language also helps as they can easily interact with the backend in Django which is a python-based library. The backend is thus based on Django as a server-side scripting language and a database. The front-end of the website can be made with HTML, CSS, and JavaScript along with any other language as deemed appropriate. Latest design elements like Google's material design can also be implemented very easily.

VI. PARKING SLOT ALLOCATION AND SORTING

The parking slot allocation and sorting helps in tackling problems like inefficient use of employee resources, filling up of garages inefficiently, manual statistical analysis etc. A simple sorting algorithm is being modified for efficient use of parking which uses sorting to search for the efficient place for parking a vehicle. The main idea on which the algorithm works is that it cycles through all the rows and calculates the minimum gap available for parking which fits the vehicle. As such, the space doesn't get wasted due to fragmentation. Another principle that is followed is by allocating slots from a one-sided orientation approach which prevents space being left out in between. All these precautions are being taken in order to increase efficiency and to drive down costs. The algorithm starts a counter from 0 to the maximum number of cars that can be allocated in one row. For each value of the counter, the algorithm cycles through all the rows once to find either the left most or the right most oriented empty slot corresponding to the size of counter. That slot is then booked and given to customer. Since, the counter goes from minimum to maximum; the least space is always selected. The running time of this algorithm is $O(m*n)$ where m is the number of rows and n is the number of cars that can be allocated in one row when the parking lot is full.

VII. SYSTEM IMPLEMENTATION

The process of the full parking lot management is being described below from three perspectives. It includes the website from user perspective, the mobile app from valet perspective and the database from the administrator perspective. With the mobile application, the valets will be able to verify customer information remotely. The result will be based on the criteria the user inputs. There are several parking lot positions and it will be possible for the administrator of the system to manage the options according to the desired algorithm. The result of the parking lot seat will be dependent on what criteria was included in the search and underlying algorithm used, like fill rows first or fill columns first. The valet will also be able to accept walk-ins from on spot customers that may be given a suitable seat according to availability. The web portal will provide functionality to manage the entry gate sensor, license plate reader. It will also provide information to the parking lot manager to oversee everything and also do manual entry if the server or sensor is down. Since neither the mobile application nor the web portal have any designated hardware, it does not have any direct hardware interfaces. The physical GPS is managed by the GPS application in the mobile phone and the hardware connection to the database server is managed by the underlying operating system on the mobile phone and the web server. The only piece of optional hardware interface is the in-house Raspberry Pi with a sensor for detecting the arrival and departure of cars at the parking lot entrance.

VIII. SYSTEM EVALUATION

Each unit will be tested before integration with one another. The units that need to be tested are: Valet Assistant Interface, Website, Database, Classes and Methods

8.1 Testing the valet assistant interface

The Valet Assistant Interface is responsible for interacting with the driver upon entrance of the garage and interacting with the Valet as he/she works, parking and retrieving cars. We have to check if driver has reservation or not [7]. This is done to make sure that the interface can

communicate with the license plate reader and then checks the database. Also, we need to see if we are able to search for a reservation given a license plate number provided by the reader. Moreover, checking of a valid input has to be done. We have to use the valet assistant interface to see if modifications to the layout are needed. There is a need to get input to see how to change the layout to make it more users friendly. The valet needs to use his/her side of the system to do his/her job. To check this we will see if the valet can log in using a valid username and password. There is a need to obtain pictures from camera and send to the database for security reasons. To check this we need to see if the pictures are stored into the database and able to obtain the pictures from the database to show the driver in case he wants to see them [8].

8.2 Testing the website

The website allows the drivers to make online reservations and create an account to manage their reservations. To check this we will see if we can create an account and verify it with an email address. For creating a reservation we need to check if a reservation is stored in the database and make sure that a driver cannot make a reservation in a time slot that is taken already. To check for the manager login we will see if the manager can log in using a unique username and password. To check employee information we will see if the website displays correct employee information and then the required changes can be made. We will also see if we can delete and add more employees. To check garage fees and prices we will see if a change in the manager's log updates the fees.

8.3 Testing the Database

The database is responsible for recording driver's information, vacancy of the parking garage, employee information, garage fees, security check pictures and reservations. We must check the database to record the data and see if information is being stored properly and if correct information can be obtained.

8.4 Testing Classes and Methods

The classes and methods in our system are responsible for making the units work; these are the tools that the units use to accomplish their task [9]. To test Data Types and Operational Signatures we will use a combination of print and if statements to see if the output is valid.

IX. CONCLUSION

We have developed a fully functional website that could optimize the resources for a customer or manager, and having algorithms to optimize the parking of the garage. With this automated parking system as a foundation, others may be able to come along and continue our work by implementing various expansions in the project. This can include concurrent systems to handle the arrival of more than one car at a time, such as the case in major cities [10]. Also others may be able to fully realize our original vision of a better website security and functionality with respect to having dedicated designs for a customer compared to that of a manager.

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