SMART PARKING SYSTEM

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Abstract

Parking in major cities, particularly with dense traffic, directly effects the traffic flow and peoples life. In this paper, we introduce a new smart parking system that is based on intelligent resource allocation, reservation, and pricing. The proposed system solves the current parking problems by offering guaranteed parking reservations with the lowest possible cost and searching time for drivers and the highest revenue and resource utilization for parking managers. New fair pricing policies are also proposed that can be implemented in practice. The new system is based on mathematical modeling using mixed-integer linear programming (MILP) with the objective of minimizing the total monetary cost for the drivers and maximizing the utilization of parking resources.

Keyword : - *Dynamic pricing, dynamic resource allocation, mixed integer linear programming (MILP), reservation, smart car parking.*

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1. Introduction

Parking is an expensive process in terms of either money or the time and effort spent for the free spot chasing. Current studies reveal that a car is parked for 95 percent of its lifetime and only on the road for the other 5 percent [1]. If we take England in 2014 as an example, on average a car was driven for 361 hours a year according to the British National Travel Survey [2] yielding about 8404 hours in which a car would be parked. Now where would you park your car for these very long hours? Cruising for parking is naturally the first problem caused by the increase of car owners globally. On average, 30 percent of traffic is caused by drivers wandering around for parking spaces [3]. In 2006, a study in France revealed an estimation that 70 million hours were spent every year in France only in searching for parking which resulted in the loss of 700 million euros annually [4]. In 2011, a global parking survey by IBM [5] states that 20 minutes is spent on average in searching for a coveted spot. With these statistics, we can assume that a great portion of global pollution and fuel waste is related to cruising for parking. we present a new smart car parking system, named Smart Parking system, with static resource scheduling, dynamic resource allocation and pricing models, to optimize the parking system for both parking managers and drivers. The contributions of our work include:

1) increasing parking resource utilization,
2) increasing parking revenue,
3) improving parking experience of drivers by lowering cost, parking spot searching and walking times.

2.Literature Survey:

In todays world parking lots have become redundant and needs lot of manpower to handle and maintain it. These parking lots are not user friendly and do not provide data regarding availability of free spaces. Many researchers have contributed to this issue and formalized with various methods to better optimize the parking lot to serve the needs. The author proposed smart parking reservation system using short message services (SMS), for that he uses Global System for Mobile(GSM) with microcontroller to enhances security[3]. The ZigBee technique is used along with the GSM module for parking management and reservation. The author uses Global Positioning System(GPS) and Android platform to show available parking spaces. However, reservation for the same is not available[9]. Another impact of manual systems is on Customer service. Customer queries can be difficult to respond to as information is stored in different places and may even require that you find the right person before being able to respond[2]. This is no good if they are out to lunch or only work part time, Inconsistency in data entry, room for errors, miss keying information.Large ongoing staff training cost[8]. System is dependent on good individuals, Reduction in sharing information and customer services, Time consuming and costly to produce reports, Lack of security, Duplication of data entry[2].

3. System Architecture:

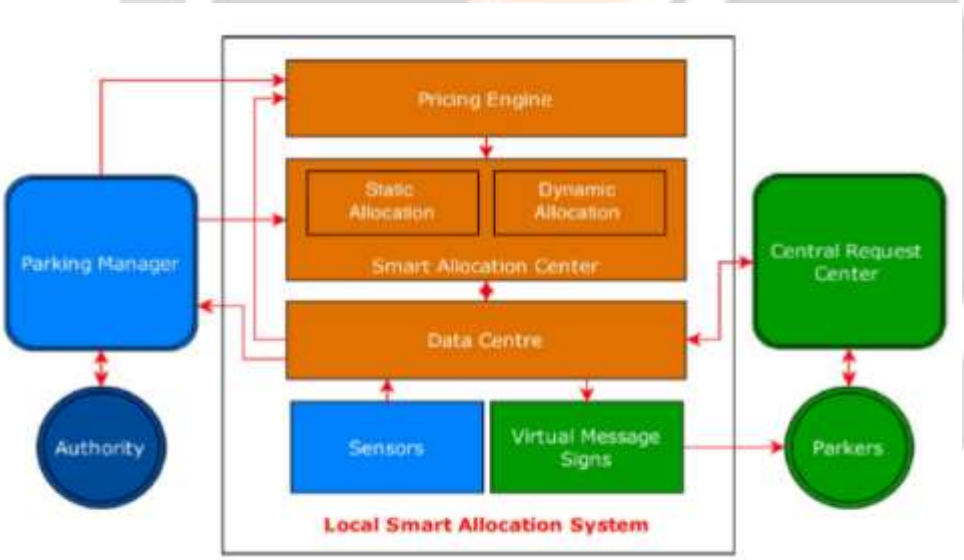

Fig: System Architecture

4.Implementation:

The problem addressed in this study combines the real time and share time reservation systems. Real time reservations are typically independent on the amount a parker will consume in a parking space, i.e., a parker can spend as much time as he/she needs without affecting the rest of the parkers. On the other hand, share time reservations are dependent on the exact spot occupancy and spot leave times. Share time reservations are generally modeled as birth-death stochastic processes. In our model, dynamic reservations are real time and static reservations are share time. The objective of our MILP model is to minimize the total monetary cost for parkers and ultimately maximize the total resource utilization to obtain the maximum revenue for

parking managers. We will formulate our model based on the queuing modelin process diagram. There are N resources in which every resource j is split into P1 spots (number of normal parking spots for dynamic reservations), P2 spots (number of normal parking spots for static reservations) P3 and P4 (similar to P1 and P2 but for disabled people).

4. Construction

Lab automation gives us access to control devices in lab from a mobile devices anywhere in the world.The first and most obvious beneficiaries of this approach are " Smart" device and appliance that can be connected to a local area network via Wi-Fi or Internet .We are used many hardware component for lab automation.First connect your HDMI cable to your Raspberry-Pi and your monitor or Laptop. Then connect USB device .If using an Ethernet cable to connect to Router ,go ahead and connect that as well.Finally one everything is connected ,go ahead and plug in power adapter.The Raspberry-Pi is connect to IR sensors and Relay switch.IR sensors can measure the heat of an object as well as detects the motion.Usually in the infrared sensors all the objects radiate some form of thermal radiation .A relay is an electromagnetic switch operated by a relatively small electric current that can turn On or Off a much larger electric current.This relay circuit connects to your laptop or Pc and Switch. It gives us final output.

5. Objective:

Our new concept is to combine real time reservations (RTR) with share time reservations (STR), thus a driver can reserve a spot while heading to it (e.g., few minutes away) and also can reserve it at any time earlier (e.g., many days away). RTR are achieved by performing dynamic resource allocation which is similar to skills based routing in call centers. In the case of RTR,drivers are constantly allocated the best parking spots available until they reach their destinations. Whereas STR are achieved by performing static resource allocation that is based on time scheduling where a driver can explicitly choose the preferred resource and the time frame at which it will be occupied at any time in the future[4]. Different pricing policies for both types of reservations that are fair for drivers and parking managers are proposed in this paper. In addition, a dynamic pricing engine which periodically updates the parking prices based on real time resource utilization by occupancy and reservations and other events is introduced. Smart parking features the normal and disabled parking spots and drivers are given the freedom of choosing multiple destinations and the system will assign the optimal resources according to their chosen destinations and circumstances.

6.Software,Hardware &Test Data Requirements:

6.1Hardware Requirement:

Smart phone

6.2Software Requirements:

Operating System : Windows95/98/2000/XP/7./Android
Front End : java
Database : Sql database

7. Conclusion:

We have proposed, a new smart parking system which is based on MILP model that yields optimal solution for dynamically and statically allocating parking resources to parkers providing flexible reservation options. The new concepts introduced in this paper are the combination of real-time reservations with share-time reservations, dynamically performing system decisions (reservation time constraints and pricing) according to realtime utilization information, and offering the drivers the choice of choosing multiple destinations and reservation type. We also have proposed pricing policies for both static and dynamic reservations that maximize the profit from parking. Extensive simulation results indicate that the proposed system significantly cuts the total effective cost for all parkers by as much as 28%, maximizes the total utilization by up to 21% and increases the total revenue for parking management up to 16% as compared to the non-guided parking system. Finally, we proposed a dynamic pricing scheme and by integrating it to smart parking system model, we found by simulations that it balances the utilization across all the parking resources and thus, assist in eliminating the overall traffic congestion caused by parking. Currently, the research focuses on a new parking sensing infrastructure and an indoor navigation service for car parking. In the future, we aim to evaluate our system using real-time data and greater number of resources and destinations. In addition, a scalability analysis is to be performed to examine the efficiency of the proposed scalability techniques. Last, it would also be useful to simulate different parking arrival scenarios in real life.

8. References:

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