

A New Smart Car-Parking System

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ABSTRACT: This paper proposes another "brilliant parking" framework for a urban domain. The framework appoints and holds an ideal parking spot in light of the driver's cost work that joins nearness to goal and parking cost. Our approach unravels a blended number direct programming (MILP) issue at every choice point defined in a period driven arrangement. The arrangement of each MILP is an ideal allotment in light of ebb and flow state data and is refreshed at the following choice point with a certification that there is no resource reservation conflict and that no driver is ever allocated anresource with a cost work higher than this present driver's momentum taken a toll work esteem. In light of reproduction comes about, contrasted and uncontrolled parking procedures or cutting edge direction based frameworks, our framework diminishes the normal time to find a parking spot and the parking cost, though the general parking limit is all the more efficiently used.

KEYWORDS:Dynamic resource allocation, mixed-integer linear programming (MILP), reservation, smart parking.

I. INTRODUCTION

The motivation for this paper is provided by the need to reduce traffic in urban cities caused by vehicles searching for parking. On a daily basis, it is estimated that 30% of traffic congestion in an urban downtown area is caused by vehicles cruising for parking space, and it takes the driver an average of 7.8 min to find a parking space . This not just purposes exercise in futility and fuel for drivers searching for parking yet additionally adds to extra exercise in futility and fuel for different drivers because of traffic blockage. For instance, it has been accounted for that, for more than one year in a little Los Angeles business area, autos cruising for parking made what might as well be called 38 trips the world over, consuming 47000 lady of gas and delivering 730 tons of carbon dioxide.

On average, 30 percent of activity is caused by drivers meandering around for parking spots [1]. In 2006, an examination in France uncovered an estimation that 70 million hours were spent each year in France just in seeking or parking which brought about the loss of 700 million euros every year.

With these measurements, we can accept that an extraordinary part of worldwide contamination and fuel squander is identified with cruising for parking. Parking spots are observed to be more than bounty in a few spots and extremely uncommon to discover in others. Estimating strategies had assumed a vital part in the general parking accessibility for a considerable length of time [2].Here comes the vital inquiry: do we need additionally parking spots or improve parking administration? We trust it is the later and subsequently the inspiration driving this work is about better parking administration with reasonable and beneficial evaluating arrangements. The work displayed in this paper consolidates parking reservation and evaluating models to defeat the parking issues.

In the course of recent decades, traffic experts in numerous urban areas have grown supposed parking direction and data (PGI) frameworks for better parking administration. PGI frameworks give drivers dynamic data on parking inside controlled territories and direct them to empty parking spaces.

On the parking reservation side, Moisakos et al.[5] demonstrated the reservation procedure as an resource allotment issue. Their model depends on MILP with the goal of limiting driver cost.Their show offers constant reservations with settled valuing. On the valuing side, Shoup et al[1]. acquainted new ideas which drove with the advancement of San Francisco Park (SFPark) in San Francisco which expects to conquer the activity blockage by progressively changing costs in view of sensor recorded information. In SFPark, sensors are sent on the black-top to accumulate parking data that are put away in a database and prepared week by week or month to month.

This exhibit another savvy auto parking framework, named iParker, with static resource planning, dynamic resource portion and valuing models, to streamline the parking framework for both parking supervisors and drivers. The inspiration to is given by the need to decrease activity in urban settings caused by vehicles hunting down parking. Regularly, it is assessed that 30% of movement clog in a urban downtown region is caused by vehicles cruising for parking spot, and it takes the driver a normal of 7.8 min to discover a parking spot . This not just motivations exercise in futility and fuel for drivers searching for parking yet in addition adds to extra exercise in futility and fuel for different drivers because of movement blockage. In this paper, we display another savvy auto parking framework, named iparker, with static resource booking, dynamic re-source designation and estimating models, to enhance the parking framework for both parking directors and drivers.

II. LITERATURE SURVEY

1. "Mathematical Formulation of Deterministic Parking Reservation System (PRS)With Fixed Costs"

K. C. Mouskos, J. Tavantzis, D. Bemsteinand A. Sansil

In this paper, a mathematical formulation is provided for performing parking space allotment to the users based on the lowering of the system wide parking cost subject to the allotment constraints and the parking lot capacity constraints. The new concept in the area of intelligent transportation systems is the development of Parking Reservation Systems (PRS) to aid travelers in securing a parking space either prior or during their trip. The objective may consider either parking revenue maximization or user parking costminimization or both, which can be formulated asa max-min type of problem.The problem addressed in this study assumes deterministic arrivals and departures, and that there is at least one parking lot with sufficient capacity to accommodate allthe vehicles that arrive during one time interval. The time of the parking lot operation is discretized into smalltime periods. The smaller the time period the more realistic the problem becomes as it represents the actualpattern of arrivals and departures. Thisproblem falls under the category of the standard transportation assignment problem. The problem *can*be formulated as a binary integer linear program. The advancements in telecommunications and intelligent transportation systems have fostered the development of parking guidance and information systems in various countries around the world. In this paper an innovative solution to alleviate the time needed to search for parking is presented. A deterministic dynamic parking reservation system is formulated asan assignment binaryinteger linearprogram, which *can*be solved through any available linear programming software. Future formulations will consider the stochastic nature of arrivals and departures aswell asthe max-min problem of parking profit maximization and user cost minimization.

Disadvantage:

- The time of the parking lot operation is discretized into smalltime periods, due to which a driver can't park for longer time.

2. "New Smart Parking System Based on Resource Allocation and Reservations"

YanfengGeng, Student Member, IEEE, and Christos G. Cassandras, Fellow, IEEE

The inspiration for this paper is given by the need to diminish traffic in urban settings caused by vehicles looking for parking. So they propose a novel "smart parking" framework for a urban domain. The framework dispenses and saves an ideal parking spot in light of the driver's cost work that consolidates closeness to goal and parking cost. This approach utilizes a mixed integer linear programming (MILP) issue at every choice point defined in a period driven succession. The arrangement of each MILP is an ideal allotment in view of present state data and is refreshed at the following choice point with a certification that there is no resource reservation conflict and that no driver is ever relegated anresource with a cost work higher than this current driver's ebb and flow cost work value.Based on reproduction comes about, contrasted with uncontrolled parking procedures or cutting edge direction based frameworks, our framework limits the normal time to find a parking spot and the parking cost, though the general parking limit is all the more efficiently used.Over the previous two decades, traffic experts in numerous urban areas have grown alleged parking guidance and information (PGI) frameworks for better parking administration. PGI frameworks give drivers dynamic data on parking inside controlled regions and direct them to empty parking spaces.

Disadvantage:

- If the system fails to find a parking space for the driver, then a notification asks the driver to wait for the next allocation time.
- Parking fee is fixed.

3. "Auction-based Parking Reservation System with Electricity Trading"

S. Hashimoto, R. Kanamori, and T. Ito, *IEEE 15th CBI*, Jul. 2013, pp. 33–40.

This study presents an auction based parking reservation system that involves electricity trading, and uses simulation combined with a driver parking duration model to calculate it. The driver parking duration model is developed using actual parking data that can estimate parking times after parking fees have changed. The target in this study is the pay-by-the-hour parking in the private sector. We assume parking lots that provide multiple parking spaces across multiple time zones. The allocation of parking spaces and the parking fee is determined by auction. The allocation of parking spaces is not based on a first-come first-serve rule, as traditional parking is, but on willingness to pay. The parking fee is not fixed as it is with traditional parking, but is determined based on the user's willingness to pay. Parking revenue is increased by using the auction method instead of the traditional method (first-come-first served and fixed fee) because users who are willing to pay more are allocated with a parking space. Furthermore, parking management becomes more efficient because users who have a high willingness to pay and high intention to park have priority.

Disadvantage:

- Due to auction all the users are not allotted the parking slot.
- Fee is fixed.

4. "On-Street and Off-Street Parking Availability Prediction Using Multivariate Spatiotemporal Models"

ToorajRajabioun and Petros A. Ioannou, Fellow, IEEE.

To solve the problem of predicting parking availability, Caicedo proposed a prediction system for parking garages which involves probabilistic models as well as simulations. Rajabioun et al. implemented a PGI system which is illustrated and takes in to account individual drivers choice and involves a prediction algorithm based on probability distributions of parking availability. Parking guidance and information (PGI) systems are becoming important parts of intelligent transportation systems due to the fact that cars and infrastructure are becoming more and more connected. One major challenge in constructing efficient PGI systems is the uncertain nature of parking availability in parking facilities (both on-street and off-street). A reliable PGI system should have the capability of predicting the availability of parking at the arrival time with reliable accuracy. In this paper, the nature of the parking availability data in a big city and propose a multivariate autoregressive model that takes into account both temporal and spatial correlations of parking availability. The model is used to predict parking availability with high accuracy. The prediction errors are used to recommend the parking location with the highest probability of having atleast one parking spot available at the estimated arrival time.

III. SYSTEM REQUIREMENTS AND SPECIFICATION

FUNCTIONAL REQUIREMENTS

- Admin Module
 - a. Login
 - b. Create the Vendors
 - c. Statistics
- Vendor Module
 - a. Login
 - b. Edit Profiles
 - c. Register Vehicles
 - d. Check-in
 - e. Check-out

- User Module
 - a. Login
 - b. Book Parking slots

Non-Functional Requirements

- UI Design should be attractive
- Minimum 10000 users should be supported
- Should be dynamic and good performance
- Cost should not exceed as per committed agreement.

IV. SYSTEM IMPLEMENTATION

Module 1

User Request:

- User enter the Car information for the parking system.
- User give the car related data and choose the any one of the two process
 - 1. Static Process

2. Dynamic Process

- 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.

Module 2

CRC:

- The CRC receives parkers' requests, processes them and diverts them to the relevant local SAS.
- The request process is as following: parker chooses one to many destinations and if he/she is an S-type, preferred parking resource can be selected.
- Both types have to assign a weight parameter from 0-1 which reflects their desire between resource-destination proximity and resource price.
- Both types also set the maximum price and walking distance they can tolerate.

Module 3

Static Process:

- For S-type, the spot occupancy interval has to be defined.
- parker chooses one to many destinations and if he/she is an S-type, preferred parking resource can be selected.
- For both static and dynamic parkers, we allow them to choose multiple destinations. $DL_i = \{ d1_i, d2_i, \dots, dnd_i \}$ is the set of locations of the destinations D
 $i = \{ 1, 2, \dots, nd \}$ chosen by parker i with $d1_i$ being the first destination. A parker can choose up to ND destination.

Module 4

Dynamic Process:

- For D-type, the GPS coordinates are measured and attached to the request.
- Finally the parker identifications (i.e., driver and car license IDs) are accompanied with the request. CRC also responds back to all parkers with reservation offers and in the same fashion notifies the local SAS with parker's response.
- "D-Type" to refer to a dynamic reservation, RTR or the type of a driver requesting a dynamic reservation.

Module 5

Allocation:

- All parkers arrive to the allocation center randomly and independently joins the relevant WAIT queue.

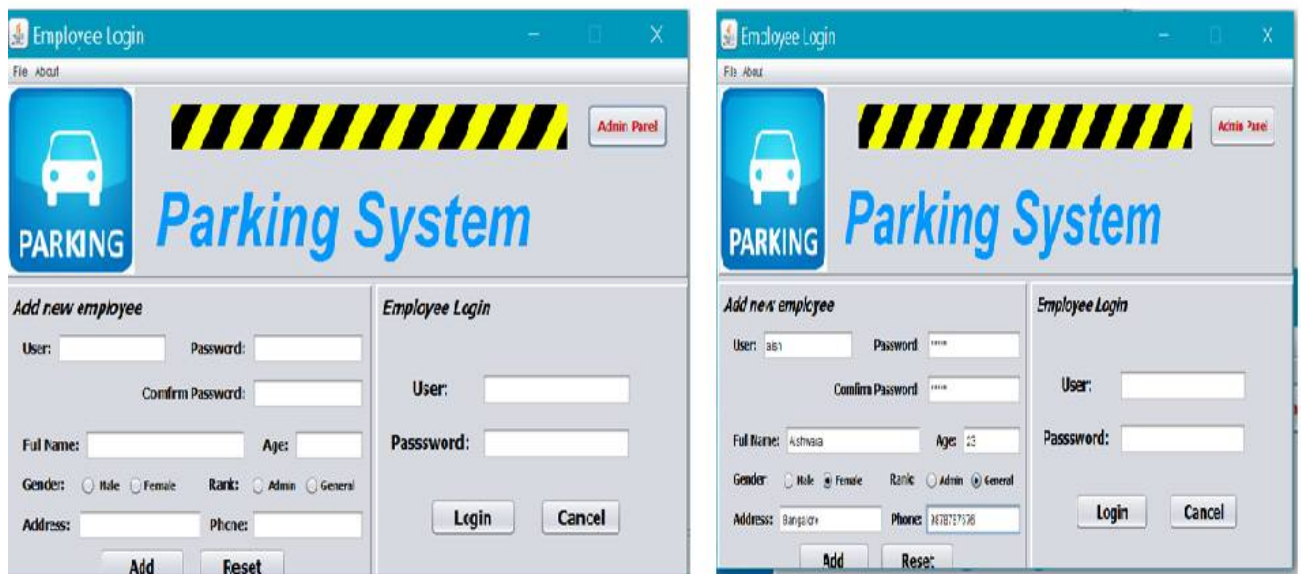
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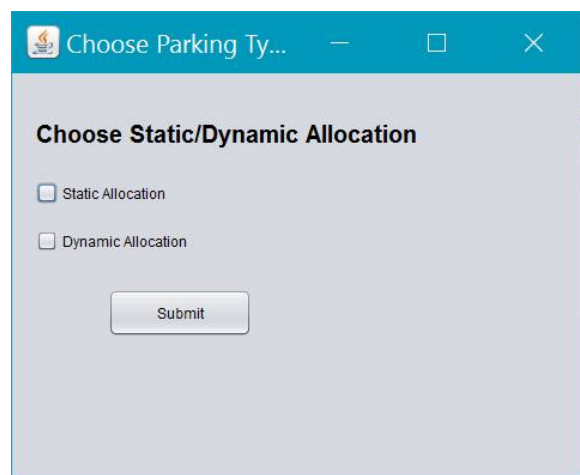
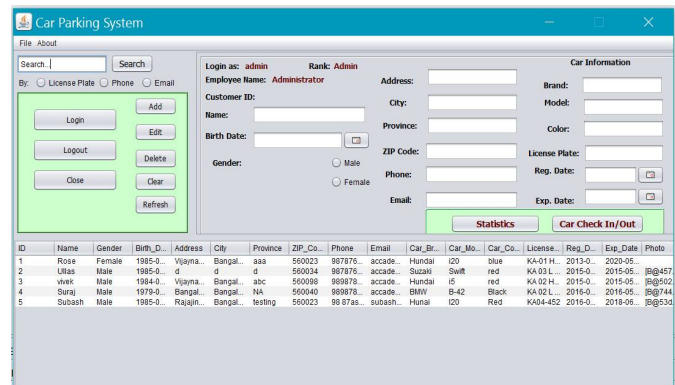
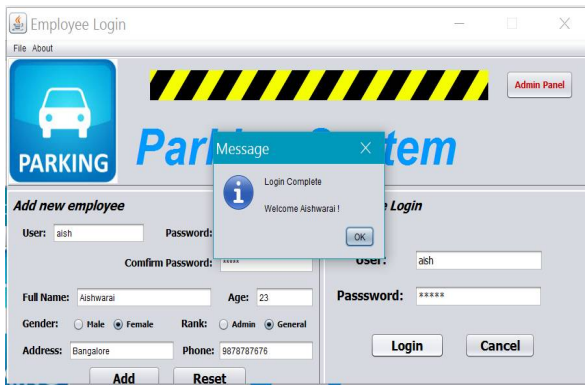
- At each decision point, the allocation centre will allocate resources to dynamic and static parkers and move them to the relevant RESERVE queue.
- Parkers in the dynamic reserve queue (DRESERVE) will get re-allocated a better parking spot(if available)after each decision point until they reach a defined zone defined as their first destination.

Algorithm Usage

1. Using the Random key generator algorithm.
2. Get the available slot based on the random number.
3. Validate the availability of the parking slots.
4. Allot/Block the parking slot for the Customers.
5. Generate and apply the specific price for the parked vehicle.

V. EXPERIMENTAL RESULTS





VI. CONCLUSION

We have proposed, another smart parking system which depends on MILP model that yields ideal answer for progressively and statically designating parking resources to parkers giving adaptable reservation alternatives. The new ideas presented in this paper are the mix of ongoing reservations with share-time reservations, powerfully performing framework choices (reservation time limitations and estimating) as indicated by continuous use data, and offering the drivers the decision of picking different destinations and reservation write. We additionally have proposed estimating arrangements for both static and dynamic reservations that augment the benefit from parking. Broad recreation comes about show that the proposed framework altogether cuts the aggregate compelling expense for all parkers by as much as 28%, augments the aggregate use by up to 21% and expands the aggregate income for parking administration up to 16% when contrasted with the non guided parking framework. At long last, we proposed a dynamic valuing plan and by incorporating it to savvy parking framework show, we found by reproductions that it adjusts the usage over all the parking resources and consequently, help with taking out the general activity clog caused by parking. At present, the examination centers around another parking detecting foundation and an indoor route benefit for auto parking. Later on, we plan to assess our framework utilizing continuous information and more noteworthy number of resources and goals. Likewise, an adaptability investigation is to be performed to look at the proficiency of the proposed versatility strategies. Last, it would likewise be valuable to reenact diverse parking entry situations, in actuality.

REFERENCES

- [1] D. C. Shoup, "Cruising for parking," *Transp. Policy*, vol. 13, no. 6, pp. 479-486, Nov. 2006
- [2] D. C. Shoup, "The high cost of free parking," *J. Plann. Educ. Res.*, vol. 17, no. 1, pp. 3-20, Fall 1997.



- [3] K. C. Mouskos, "Technical solutions to overcrowded park and ride facilities," City Univ. New York, New York, NY, USA, Tech. Rep. FHWANJ- 2007-011, 2007.
- [4] S. Hashimoto, R. Kanamori, and T. Ito, "Auction-based parking reservation system with electricity trading," in *Proc. IEEE 15th CBI*, Jul. 2013, pp. 33–40.
- [5] K. Mouskos, J. Tsvantzis, D. Bernstein, and A. Sansil, "Mathematical formulation of a deterministic Parking Reservation System (PRS) with fixed costs," in *Proc. 10th MELECON*, 2000, vol. 2, pp. 648–651.
- [6] Y. Geng and C. Cassandras, "New smart parking system based on resource allocation and reservations," *IEEE Trans. Intell. Transp. Syst.*, vol. 14, no. 3, pp. 1129–1139, Sep. 2013.