



# International Journal of Innovative Research in Computer and Communication Engineering

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## Multi-storey Parking Space Management System Using Algorithm

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**ABSTRACT:** The number of vehicles is increasing day by day due to numerous factors. To alleviate the parking problems caused by that, the Multi-storey Parking Space Management system has been developed. Multi-Storey Parking Space Management System is a software application. It will be based on the algorithm which has several parameters like the total time needed for parking, no of floors, no of slots in a particular floor. We have studied some of the existing systems and it shows that most of the existing systems are not completely automated and require a certain level of human interference or interaction in or with the system. The difference between our system and the other existing systems is that we aim to make our system as less human-dependent, on the other hand, most existing systems needs human personnel to direct where to park the car. To prove the effectiveness of the system proposed by us we have developed and presented an algorithm which will be discussed in brief further in the paper.

**KEYWORDS:** Parking, Parking Space, Parking Slots, Floors, Timing, Algorithm.

### I. INTRODUCTION

As we all know that the world's population is increasing day by day. Increasing population increases the vehicle use. Hence, parking has become a major issue now a days. There is a huge demand for proper parking facilities.

The parking problems urge that the traffic professionals should seek more efficient solutions as to how the parking system could be used more efficiently and how parking planning and management could be improved by using new technologies and new methodologies. To overcome the traffic and parking problems, we need to understand the parking demands so that we can improve the parking facilities. So, in order to know the parking demand, we have to analyse firstly the parking patterns.

Proper allocation of parking space is very important. If there will be any ambiguity in allocating a parking space then it will be a chaotic condition for everyone. It seeks several parameters that we need to know.

### II. LITERATURE REVIEW

Parking Management system is a system that is used to help managing cars and vehicles in the parking area in other to avoid congestion and arrange vehicles in an allocated position. The system also helps to track how many vehicles enter in the parking area and the duration taken by each, and then it will calculate the amount of money a car should pay when exiting the parking area. Parking Management system is being used in many congested area or location where there are many meeting points of people like where there is more than one shopping complex near to each other or where there is megamall or stadium. To illustrate, Sunway pyramid, Lowyat and Timesquare, and Midvalley megamall all in Malaysia.

The general feature of Parking Management System is to collect the ticket upon entrance. There are certain systems which can automatically generate tickets and some places employees to be hired to give the tickets to a driver

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of each vehicle. After getting the ticket every customer will have to find the available space to park their vehicles. So, it is waste of time and sometimes in a large parking area customer get stuck by the traffic in some places in the parking area. There are many existing Parking Systems: Sunway pyramid car parking system, COINS, and Lowyat car parking system.

This Multi-Storey Parking Space Management System is based on the information provided by the available space inside each of the parking area. In this research algorithm, the focus is on the multi-storey floor parking. The reliability of this system is that user can easily find their parking slot to park their vehicles in the parking area and admin does not have to hire employees to manage the whole parking area to give the direction to the vehicles. This principle will be used to evaluate the system able to provide customer support through the different means available.

The strength of the old system is that no restriction or limitation of time for a car to spend in each parking area. Most of the system provides a very affordable price to the customer. The charges are based on hours spent by a car in the parking area. The limitation of these systems of the existing system is that it does not assign a car to a specific parking lot and this result in roaming of cars inside the area in searching of parking space.

In the end, the possible solution to this problem of allocation parking slots by creating a system or a feature that to assign parking slots using an amount of time user wants to park their vehicle in the parking area. So, by doing this user can easily get the direction in the big parking areas and it saves the customer's time by not roaming in the parking area to find a parking space. They can easily enter and exit from the parking area.

### III. PARKING PATTERNS

#### 1. ON STREET PARKING WHICH INCLUDES PARALLEL PARKING:



Figure (1)<sup>[1]</sup>

Parallel parking means parking your car in line with the other cars parallel to the curb, front bumper to rear bumper. Parallel parking usually occurs on the side of streets where there are no parking facilities because it leaves enough room for the traffic to pass.

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## 2. OFF STREET PARKING WHICH INCLUDES MULTI-STOREY PARKING:



Figure (2)<sup>[2]</sup>

It is a building designed for car parking and where there are a number of floors or levels on which parking takes place. It is essentially an indoor, stacked parking lot.

### IV. SEVERAL CHARACTERISTICS THAT WOULD IMPACT THE PARKING ALLOCATION:

- (1) **Parking Accumulation:** It is defined as a number of parked vehicles at a specified time in a particular floor or space.
- (2) **Parking Duration:** total time for which vehicle uses that space.
- (3) **Parking Space:** It is defined as a number of floors and number of slots for parking the vehicles in a particular floor.

### V. PROBLEM IDENTIFICATION

At parking complexes, due to unhandled parking management, many of the vehicle drivers have to move to and fro finding a place to park. Even though helpers are provided, the information regarding parking slots availability is not passed instantly to helpers of other floors and causes wastage of time if the floor becomes whole occupied as the customer needs to migrate to another floor. Moreover, sometimes it creates traffic on the floors and no one can move their vehicles too.

### VI. PROBLEM SOLUTION

This algorithm also solves the problem of parking management at parking complexes. The manager will mark his complex's parking slot as empty or acquired. Based on the time required by the customer for parking, our project will find a suitable place to park the customer's vehicle. As the parking complexes are having multi-floors, we have built our logic as a combination of time and floor and checking availability. For example, if a customer wants to park for 2 hours and there are 6 floors at the parking complex, my project will allocate him the available slot on the 1st floor. Also, if the Nth floor is fully occupied, he will be allotted a slot at (N-1)<sup>th</sup> floor.

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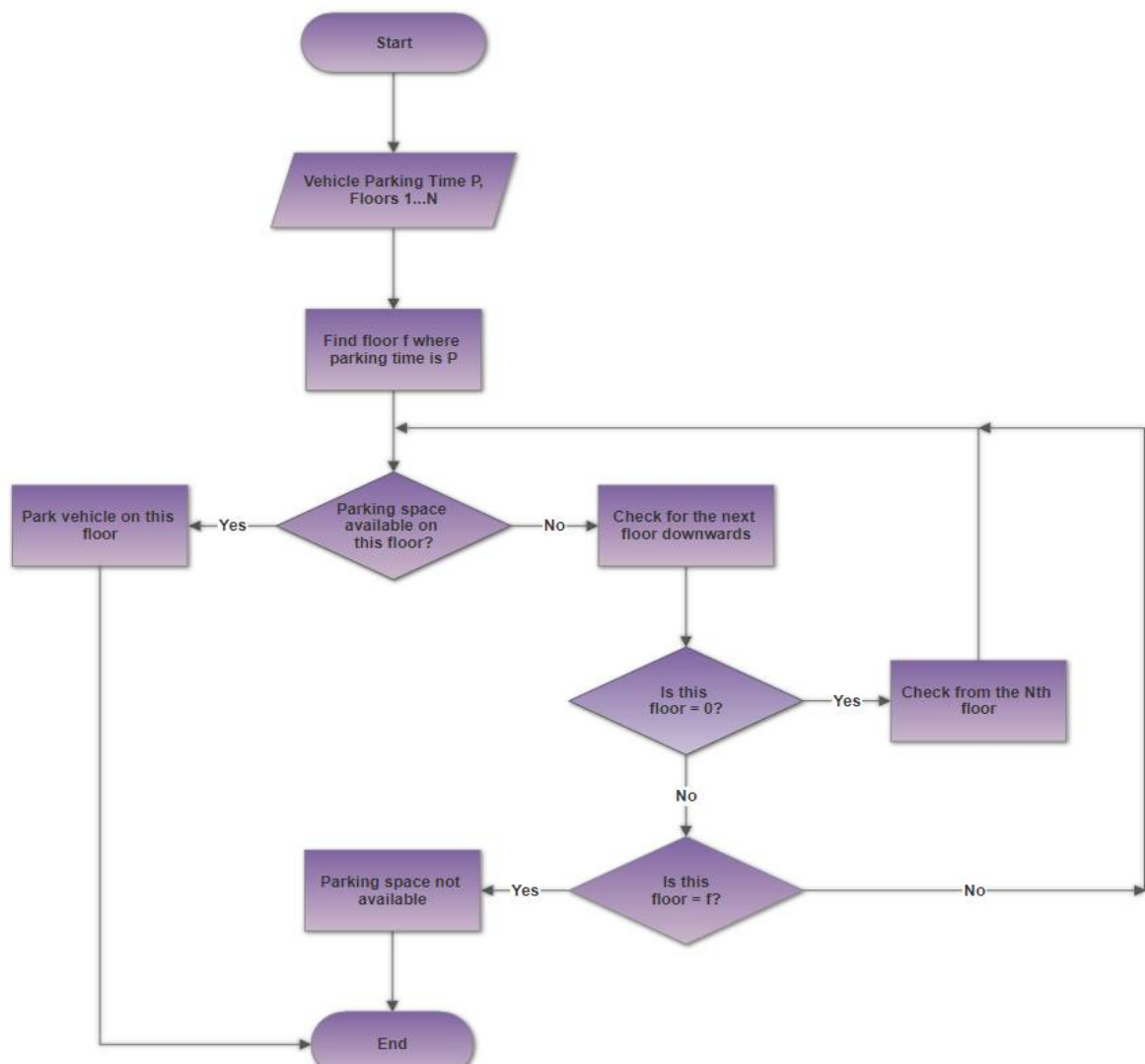
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## VII. FIELD IMPLEMENTATION/FIELD TRIAL OF THE SOLUTION:

We propose the solution to the problem of parking management at parking complexes. The manager will mark his complex's parking slot as empty or acquired. Based on the time required by the customer for parking, our project will find a suitable place to park the customer's vehicle. As the parking complexes are having multi-floors, we have built our logic as a combination of time and floor and checking availability. For example, if a customer wants to park for 2 hours and there are 6 floors at the parking complex, our project will allocate him the available slot on the 1st floor. Also, if the Nth floor is fully occupied, he will be allotted a slot at (N-1)<sup>th</sup> floor.

### VII. FLOW CHART OF AN ALGORITHM:

The flow-chart below represents the working procedure of whole algorithm in the Multi-Storey Parking Space Management System:





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## **ALGORITHM 1: Allotting parking hours to each floor**

1. Choose  $P$  as parking time for the vehicle at a multi-storeyed parking complex having  $N$  floors.
2. Calculate  $h = N/24$  as the number of parking hours allotted to each floor.
3. Iterate: for  $i = 1$  to  $N$ :  
hours corresponding to floor  $i = (i-1)*h + 1$  to  $i*h$
4. If  $P > 24$ , it's corresponding floor =  $N$

## **VIII. EXPLANATION: ALGORITHM 1**

Algorithm 1 is about allotting parking hours to each floor of a multi-storied parking complex. Every floor will be allotted a set of parking hours which depends on the total number of floors. To find the number of hours corresponding to every floor, the total number of floors is divided by the total number of hours in a day. Here, it is assumed that most customers will have parking time within 24 hours. The loop in the algorithm finds the set of hours to be assigned to each floor. So, when  $N=6$ ,  $h=4$ . Hence, customers having parking time between and including 1 & 4 will get to park on the 1st floor. Next 4 hours corresponds to the 2nd floor and so on. If a customer has parking time more than 24 hours, he will have to park on the last floor.

## **ALGORITHM 2: Finding parking space**

1. Start: Find floor  $f$  corresponding to  $P$
2. Iterate: with  $j = f$ , until  $j > 0$  do:  
if parking space is available on  $j$ , exit with floor number.  
else  $j = j-1$
3. If space is not available yet, iterate: with  $j = f+1$ , until  $j < N+1$  do:  
if parking space is available on  $j$ , exit with floor number.  
else  $j = j+1$
4. If empty space is not available, exit with negative response.

## **IX. EXPLANATION: ALGORITHM 2**

Algorithm 2 helps to find a parking space based on the parking time required by the customer. The floor  $f$  that corresponds to the parking time required by the customer is found from the result of Algorithm 1. Now an empty space availability is to be checked on that floor. If an empty space is available it is allotted to the customer. But if space is not available on that floor, two iterations may have to be performed. One iteration will find next empty space



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below the floor f and if empty space is not available on the below floors, other iteration will find the next empty space above the floor f. Yet, empty space is not found, the negative response is generated about the space unavailability.

## X. OUTPUT TO GET THE IDEA (IMPLEMENTATION):

### I. FIRST PAGE: ADD USER'S DETAIL AND SELECT THE TIME.

Diagram A:

The screenshot shows a web browser window with the address bar displaying 'localhost:8081/ParkingManagement/registration.html'. The page title is 'Parking | Admin'. On the left side, there is a sidebar menu with three options: 'View Allotted Slots', 'Allot Parking Slot', and 'Parking Details'. The main content area contains a registration form with the following fields: 'Customer Name' (text input), 'Car no' (text input), 'Mobile no' (text input), 'Email Id' (text input), and 'Timings' (dropdown menu). An 'Insert' button is located at the bottom of the form.

In Diagram A, the application is running on the localhost apache tomcat server. On the left side of the page there are three options:

#### I. View allotted Slots.

It shows the allotted slots of the parking so that admin can see where's the place is empty and full according to the diagram (C).

#### II. Allot Parking Slot.

It registers the user with their details and then allocates the parking slot and floor according to the time. Diagram (A) depicts parking allotment.

#### III. Parking Details.

According to diagram (B), admin can see what user's detail with floor id and parking slot so if admin wants to search any car with a particular detail can get the details easily.



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## XI. USER DETAIL AND ALLOTTED PARKING DETAILS

Diagram B:

Name	CarNo	mobileno	email	f_id	p_id	t_id	Delete
Jainish Ashishbhai Dabhi	GJ 01 KJ 1234	9925017540	jainishdabhi@gmail.com	6	1	24	
Ravi	GJ 01 AA 3198	99*****	ravipatel3551*****	1	1	1	
Shiven	RJ 023 RJ 2508	98*****	shivenparmar*****	3	1	11	

In Diagram B, it shows customer details name, car no, mobile number, email-id, floor number on which the car is parked, amount of time for which the car is parked(t\_id), parking slot number(p\_id) and delete the record.

## XII. PICTORIAL VIEW OF ALLOTTED PARKING SLOTS WITH FLOOR NUMBERS

Diagram C:



Diagram (C) shows the pictorial representation of floor number, slots on which car parked and the amount of time for which the car is parked.





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## XI. CONCLUSION

The parking management with this algorithm at parking complexes can reduce owner's expenditure on salaries of helpers as they will not be needed at each and every floor to guide the customers.

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