Automated Parking System For Mall Using Multi-Dimensional Array

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Abstract- *Nowadays there are plenty of vehicles in a mall during normal hours and a huge rush during peak hours. This causes a huge commotion amongst the visitors and results in a chaotic environment. To extenuate the chaos an automated parking system has been designed. Where the parking grids are considered a data in the from of multi- dimensional array. We transform the parking slots into our data and allot 0&1 for booked and empty respectively. The vehicle which comes into the mall is allotted a parking slot from the database and the offered slot is marked as 0. Similarly the subsequent vehicles take successive slots in the parking area and once they leave their slot is marked as 1.*

I. INTRODUCTION

There are so many vehicles in India these days and this humoungous amount of vehicle when converged to a single destination can cause a ruckus. A city like Chennai itself has 7.3 million unit of vehicles. From this magnanimous number,few are directed to a place like shopping mall, which itseld has a limited availability of parking slots. Parking area not only becomes crowded but motion of vehicles become difficult too.

It has been assumed traffic congestion in a confined place can cause a lot of chaos make it difficult for movement.of vehicles and also cause a lot of pollution in the parking areas. This leads to decrease in quality of atmosphere and create a dent on the quality of life as well. In a recent local survey'A Hazey view' it was shown that the residents live in an air quality below the standard level. Tonnes of Carbon Monoxide is generated in the city which causes impact on health.

In this paper, we have come with a Eco and Bio-Inspired solution that optimizes the issue and gives out an efficient solution by optimally assigning parking spaces in a mall and put an end to the chaotic unresolved situations. The Alogrithm of taking the parking grid into a multi-dimensional array form and then sorting out parking spaces from it and allot it to the incoming vehicle. Thus this provides an optimised approach and efficient result.

The rest of the paper is organised as follows: Section II briefly presents some of the most relevant approaches to the core problems. Section III outlines the approach we have used to reach the problem which was untapped and reach to an optimaL

II. RELATED WORK

Many work has been carried out in the past on the same topic.But none of them has been implemented on a small scale for malls hospitals etc.Their work was based on large scale parking spots across the city and used the concept of graphs or trees. Implementing these concept is complex and also increases the time complexity of the algorithm.They tend to provide parking spots to vehicles moving in the city and not at a particular parking lot.Their work is for the entire city.

On the other hand our algorithm will provide free parking lots inside a confined that will reduce or totally remove the chaos inside the parking levels of the malls or hospitals etc.

The work carried by Kui Zhao[1] from China uses greedy approach to solve the problem using vehicles as jobs and parking spaces as agents and they take the distance between the agents and the jobs as costs and hence they calculate the minimum cost using greedy algorithm.

The work carried by Javier Arellano-Verdejo[2] is based on a calculation of evolutionary algorithm to calculate the best allocation of available parking slots in a city. They have worked with SUMO Urban simulator to obtain optimized resultdddd for the area they have targeted.

But our work is different since we have selected a small confined space such as a parking space where there are lot of vehicles and needs an efficient and smooth approach to get the result.

One of the Approach which was based on the area pattern[3] was comparing two heuristic alogorithm, Pattern Search(PS) Algorithm and Particle swarm pattern search(PSwarm).

Another work[4] which was based on parking was comparing various alogorithms based on the parking movement strategies such as (i) a bounded number of in park movements, (ii) bounded and similar travel distances and (iii) small vehicle removal times.

Similarly various attempts were made to conquer the issue and reach an optimized solution but most of them consisted of comparing alogortihms.

III. PROPOSED WORK

Algorithm was started implemented by first preparing the front end of a website. Where we took various malls into the consideration and then considered the parking grid to be a multi dimensional array. Each mall has it's own parking slot structure. When a driver enters through the mall the structure is activated as a Multi dimensional array where the occupied slot gets a slot 0 and an unoccupied slot gets 1. The numbers indicate wether the slot is free or not.

Once any customer enters the parking lot, he/she will be generated a token or ticket where it will have a number of the parking slot where they can see and park their vehicle.

The given slot will now be marked 0.

Once the vehicle leaves the mall the occupied slot becomes 1 and then the slot becomes empty.

We started by preparing a website which will be having name of different malls. Each mall has its own parking structure. The Parking structure of the mall was prepared using php.

The parking structure was made using database.

The algorithm used the database of the sql as a multi-dimension array. The multi-dimension array represents the parking structure of a mall in the form of arrays. The parking spot can be found using linear search concept.

Each empty space is denoted by 0 and when the parking is occupied the 0 is replaced by a 1. 1 denoted the parking si full so the next nearest spot with value as 0 is allotted.

The time complexity to search for the free spaces throughout the mall uses O(n).

As the customer unparks the car the value again becomes 0 and hence it is available for parking again.

IV. DISCUSSION

As compared to other model it focuses on a complete new idea and vertical of area selection. Previous works focused more on large scale areas which involved a dense population spanning in that area. They focussed more on getting a optimized alogorithm to ensure an efficient approach and solution is obtained. The proposed model too focuses on those factors but for a small area. Mall parking is more confined than the sections used in previous works. The Algorithm used in the work which converts the data of the parking grid itself into an algorithm can be used for future purposes for solving issues related to parking system or management for a confined area or even for a dynamic area where the grid are in a organised manner.

Similar to the current model, area of the parking will be converted to a multi-dimensional array and then 0,1 digits allotted for parked and vacant position respectively. The previous model couldn't solve a small scale issue and the algorithm used were not of the best efficiency which could provide an optimized solution. Therefore here we overcame that issue and optimized the solution. This approach has the best time complexity of log(n). Another work[3] which came close to solve the issue was using two heuristic alogorithms,Pattern Search(PS) and Particle Swarm Algorithm.

A Similar approach was made[4] but it was mainly on campus parking management and did not have the ideal solution but compared various other factors of the parking system to obtain a suitable and viable solution.

The proposed model consists of carrying out the solving assessment by producing an approach to derive a new algorithm.

V. CONCLUSION

A mall with heavy movement of vehicles can create ruckus if the parking system is not organised in an efficient way. This causes a huge commotion in that area and it becomes difficult for everyone present there. And not mention the Carbon emission in a confined space like that can only make it worse for the environment and the human life present there.

This work represents an ecological yet efficient solution to minimize the chaos and ensure there is an ordered system maintained during the passage of vehicles. Also give the vehicles an ease in parking. The data itself is used as an algorithm and optimizes the solution. Various malls have been

accommodated in the output product of the work, therefore not limiting it to just one place but ensuring the development is carried out in various places so that the work can also get the most appropriate GCP(Good case practice).

There is a scope of further development to improve the technical display of the work but for the time being the solution presented in the model is the most efficient and optimized solution.

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