

Parking Management System – The Future Digitalization Parking System

Keshwani Pavan¹ Parmar Hitesh² Prajapati Dhruvil³ Patel Deep⁴ Prof. Jayesh Patel⁵

⁵Assistant Professor

^{1,2,3,4,5}Department of Mechanical Engineering

^{1,2,3,4,5}Sardar Patel College of Engineering, bakrol-388315, India

Abstract— A car parking system is a mechanical device that multiplies parking capacity inside a parking lot. Parking systems are generally powered by electric motors or hydraulic pumps that move vehicles into a storage position. There are two types of car parking systems: traditional and automated. In the long term, automated car parking systems are likely to be more cost effective when compared to traditional parking garages. Automatic multi-storey automated car park systems are less expensive per parking slot, since they tend to require less building volume and less ground area than a conventional facility with the same capacity. Both automated car parking systems and automated parking garage systems reduce pollution cars are not running or circling around while drivers look for parking spaces.

Key words: Image Processing, Automated Parking System, Secured Payment, Efficient Parking, Sensor System, Computer System

I. INTRODUCTION

A parking lot management system is used for managing the parking spaces for vehicles in parking lots. Today, the parking issue is becoming a serious for the vehicle owner in most of the cities. Aim of the work is to design automatic parking system which can help common people to park their vehicles in less space and secure environment. Due to dense population in modern era parking space has been one of the major issues whenever certain infrastructure is created. An availability of parking space result in traffic congestion, air pollution, fuel and time wastage as well as drivers frustration. The modern parking management system utilizes various technologies to efficiently manage and optimize the space are very useful to solve emerging parking problems. In this research work WSN technologies has attracted and increase attention of the user and are rapidly growing in various fields which expected to provide an efficient and cost effective solution for parking and space management system.

There are following types of automatic (advanced) car parking systems;

- 1) Stacker type car parking system
- 2) Puzzle type car parking system
- 3) Level type car parking system
- 4) Chess type car parking system
- 5) Rotary type car parking system
- 6) Tower type car parking system

But lift is used only in tower type car parking system.

II. WORKING

Automated car parking systems use a similar type of technology to that used for mechanical parcel handling and document retrieval. The driver leaves the car inside an entrance area and technology parks the vehicle at a designated area. Hydraulic or mechanical car lifters raise the vehicle to another level for proper storing. The vehicle can be

transported vertically (up or down) and horizontally (left and right) to a vacant parking space until the car is needed again. When the vehicle is needed, the process is reversed and the car lifts transport the vehicle back to the same area where the driver left it. In some cases, a turntable may be used to position the car so that the driver can conveniently drive away without the need to back up

A. Different mechanism involved in parking:

- Car lifting elevator as a hydraulic jack: To give a vertical motion to vehicle.
- Slider as a conveyer belt: To give sliding motion for removing or parking the vehicle.

III. COMPONENTS

The traction lift consists of following components which are either designed or selected from standard one.

- 1) Pallet
- 2) Push-pull mechanism
- 3) Turn table mechanism
- 4) Lift cart
- 5) Elevator rails
- 6) Geared machine
- 7) Travelling cable
- 8) Control system
- 9) Sheaves and Wire ropes
- 10) Motor
- 11) Counter weight
- 12) Hydraulic jack

By considering requirement of customer and space available following parking layout is made.

IV. OBJECTIVES

- To survey existing parking system
- To survey of existing lifts
- To select suitable lift mechanism
- To identify critical components of lift
- To design components of lift
- To analyze lift components by FEA.
- To test designed lift performance

V. MAINTENANCE AND SERVICES

Service intervals vary for automated car parking systems, depending on the type of machines used and their usage. Parking systems should be serviced at least once a year, and up to four times a year for high traffic areas or for valet parking. In addition, regular cleaning is mandatory to keep the car parking system in great working order, especially with the problems posed by weather (salton the road can spread to lifter platforms and cause severe damage if not removed. A reputable car parking company will regularly clean all critical elements of its automated parking system, including the car

lifters top and bottom, all concrete pits, all posts resting on the concrete, and the entire concrete floor in the parking area.

VI. PROTOTYPE

It is an original or first model of something from which other forms are developed.



Fig. 1: Prototype of parking system

VII. TYPES OF MECHANISM

A. Sensor System

The sensor system is responsible for sensing the presence of vehicles in the parking lot. It is composed of hardware components such as light sensors, cameras, multiplexers, power sources, etc. It can also identify some features of vehicles present in the parking lot. By attaching object detection sensors at each parking space, it is possible to track the occupancy status space available in the lot. This makes the job of a parking official easier, as he/she can just read the status of each sensor to check the status of each parking lot. Cameras can also be used to check the status of each parking space by processing each and every frame of the image. The sensor system basically consists of a network of devices that can extract details of vehicles in the parking lot. The sensing devices must be chosen carefully. Also, the network of sensing devices should be as efficient as possible, in terms of speed, reliability and accuracy.

B. Computer System

The computer system of a parking management system is responsible for managing all the computational operations taking place within the system. It comprises of a single computer or multiple computers, depending on the size information to be processed. The most important functionality of the computer system is to perform database manipulations. The databases are part of the database subsystem of the parking management system. The computer system is connected to both the sensor system and the database system. For the sensor side, the computer system is responsible for processing the signals coming in from the sensor system to obtain useful information, such as, mapping each signal to the status of each parking space, and grouping features of a particular vehicle. The information obtained after processing is then stored in the databases. The computer system must be entitled to be accessed by the parking officials

only and should be accessible within the premises of the parking lot.

C. Database System

The database system consists primarily of databases. The database collection must necessarily include a sensor database that monitors the occupancy of the parking lot, and a parking database that stores the details of vehicles coming in to park at the parking lot. The parking database contains the details that uniquely identify a vehicle and can be used to track the duration of parking at the parking lot. This database should be accessible by the parking officials of the parking lot. The parking database contains sensitive information of the parked vehicles, which can be misused. Thus, it must not be accessible by any outsider. However, the parking officials have the right to disclose it, if required, based on security reasons. Such a database is stored in a server located either locally within the premises of the parking lot, or in any online server, which the parking official can access securely. The sensor database has to be updated periodically, every minute or so. No outsider must be able to modify it, although the parking official can disclose certain parts of the database to the outsiders. If this information is not to be disclosed publicly, it is stored in a server local to the parking lot. Otherwise, it is stored in an online server, which can be accessed by anyone

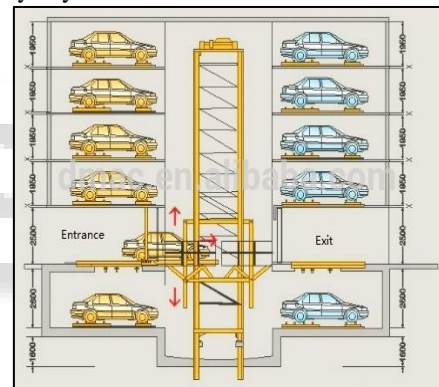


Fig. 2: Graphical representation

VIII. ADVANTAGES AND APPLICATIONS

- Reduce parking time
- Avoid accident
- Proper space utilization
- Better parking management.
- Used at industries, malls, hospitals in short where the rush of people take place.

IX. CONCLUSION

In this paper the development of an automatic parking system with license plate recognition, parking lots status and guidance parking system and electronic billing system is successfully implemented. The performance of the developed of algorithms for License Plate Localization and License Plate Recognition is acceptable range. The developed algorithms accurately localize and recognize in different location of the license plate. Electronic billing system performance is also acceptable and recommended for commercial use.

An image based method of detecting the availability of a park was modelled and tested with different occupancy

scenarios of car parks. The method of analysing an aerial view of the car park has been presented step by step. This consists of finding car park coordinates from an empty car park, acquiring an image with cars, converting the image to black and white for simple analysis, removing noise and determining whether car parks are vacant or filled. The current limitation in this paper is the weather conditions and it can be improved by filtering the image in a high quality transform, so the camera can detect the park lots in any weather condition

ACKNOWLEDGMENT

I am very grateful and would like to thank my guide and teacher Asst. Prof. Jayesh Patel for his advice and continued support without which it would not have been possible for me to complete this report. I am also very grateful and also like to thank Head of the Department Prof. Nilam Patel and entire Mechanical Engineering Department, faculty and staff, for helping me in every possible manner during my course of study for this subject. I would like to thank all my friends, colleague and classmate for all the thoughtful and mind stimulating discussions we had, which prompted us to think beyond the obvious. Last but not least I would like to thank my family members, who taught me the value of hard work by their own example. They provided me enormous support during this works directly and indirectly.

REFERENCES

- [1] J. Zhu and D. Sun, S. Tso, 2002, Development of a tacked climbing robot, *Journal of Intelligent and Robotic Systems*, 35 (4) 427-443.
- [2] S. Hirose, A. Nagakubo and R. Toyama, Machine that can walk and climb on floors, walls and ceilings, *Proceedings of 5th International Conference on Advanced Robotics*, 1 (1991) 753-758.
- [3] H. Choi, J. Park, and T. Kang, A self-contained wall climbing robot with closed link mechanism, *Journal of Mechanical Science and Technology*, 18 (4) (2004) 573-581.
- [4] Y. Wang, S. Liu, D. Xu, Y. Zhao, H. Shao and X. Gao, Development & application of wall-climbing robots, *Proceedings of IEEE International Conference on Robotics and Automation*, 1207-1212 (1999).
- [5] S. Kim, A. Asbeck, M. Cutkosky and W. Provancher, Spinybot, climbing hard walls with compliant microspines, *Proceedings of IEEE International Conference on Robotics and Automation*, 601-606 (2005).
- [6] S. Kim, M. Spenko, S. Trujillo, B. Heinemann, V. Mattoli and M. Cutkosky, Whole body adhesion, hierarchical directional and distributed control of adhesive forces for a climbing robot, *Proceedings of IEEE International Conference on Robotics and Automation*, 1268-1273 (2007).
- [7] B. Luk, D. Cooke, S. Galt, A. Collie and S. Chen, Intelligent legged climbing service robot for remote maintenance applications in hazardous environments, *Robotics and Autonomous Systems*, 53 (2) (2005) 142-152.
- [8] N. Elkmann, D. Kunst, T. Krueger, M. Lucke, T. Böhme, T. Felsch and T. Stürze, SIRIUSc Façade cleaning robot for a high-rise building in Munich, Germany, *Proceedings of the 7th International Conference on Climbing and Walking Robots*, 1033-1040 (2005).
- [9] G. Pahl and W. Beitz, *Engineering Design*, Springer-Verlag (1997).
- [10] A. Roth, *Vacuum Technology*, North-Holland, 3rd edition (1990).
- [11] G. Peace, *Taguchi methods: A Hands-on Approach to Quality Engineering*, Addison-Wesley Publishing Company (1995).
- [12] L. Zhao, H. Kim and J. Kim, Optimal design of smart panel using admittance analysis, *Journal of Mechanical Science and Technology*, 21 (4) (2007) 642-653.
- [13] H. Zhang, J. Zhang, R. Liu, W. Wang and G. Zong, Design of a climbing robot for cleaning spherical surfaces, *Proceedings of IEEE International Conference on Robotics and Biomimetics*, 375-380 (2005).