



# **iJRASET**

International Journal For Research in  
Applied Science and Engineering Technology



---

# **INTERNATIONAL JOURNAL FOR RESEARCH**

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

---

**Volume: 8**

**Issue: IV**

**Month of publication: April 2020**

**DOI:**

**[www.ijraset.com](http://www.ijraset.com)**

**Call:  08813907089**

**E-mail ID: [ijraset@gmail.com](mailto:ijraset@gmail.com)**

# A Mini-Review on Public Parking System

Eklovepreet Singh

Department of Mechanical Engineering, Punjab Engineering College, Chandigarh

**Abstract:** One of the primal effects of proliferation in the number of automobiles on road is the scarcity of car parking facilities [1]. Most of the parking system facility decisions are made on an ad-hoc basis and parameters of transport system analysis are not taken into account [2]. This paper presents a mini-review of various models of public parking systems available and their pros and cons based on operation and area. It then provides a stark difference between the conventional and mechanized parking system developed over time.

**Keywords:** Parking; Multilevel parking; On street Parking; rotary parking; puzzle parking; Tower parking

## I. INTRODUCTION

A study by Colliers International depicted that the major cities in India including Mumbai and Chennai have the least daily parking charges. On the other hand, while cities like Bangkok and Mexico City have parking charges four to five times that of major Indian cities, others like Tokyo and London City have charges sixty times higher [3]. Such lower rates of parking also encourage to use more of private cars as compared to public transport facility which leads to the crisis of parking system management [4].

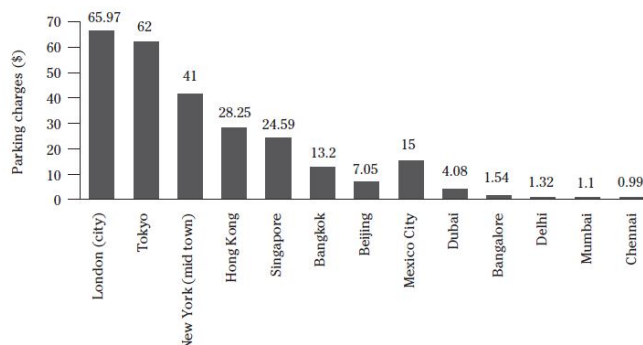


Figure 1-Colliers International (2011) - CBD daily parking charges (in US \$) [3]

The number of vehicles are increasing rapidly on roads with the growth in trade and commerce in the region. The above-mentioned areas, not limited to the same, attracts tremendous number of cars and two wheelers. Parking spaces were easily managed using human resources in the eighties, as the number of vehicles seen on road was meagre [5]. Nevertheless, from that point forward, the quantity of vehicle proprietors has expanded complex. The outright quantities of vehicles in Karnataka and different states like Punjab and Haryana have expanded from 3.06 lakhs in 1951 to 80.25 million out of 2009. Increment in vehicle population with the constrained street space utilized by a huge assortment of mechanized and non-motorized traffic has increased the need and desperation for a well thought-out strategy on the choice and design of public parking system [6]

## II. TYPES OF PARKING SYSTEM

The public car parking system can be categorized into two groups, which will form the foundation for selecting the parking system as per requirement. The objective is to review the parking systems based on their pros and cons to manage the parking space crisis with available resources and minimal investment.

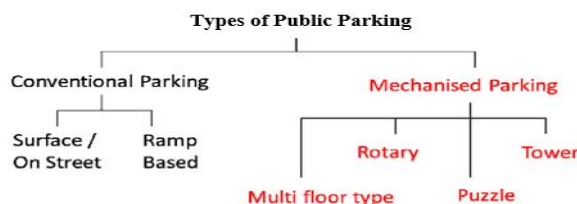


Figure 2 Types of System

#### A. Conventional Surface/ On Street

This type of parking is generally located on city streets for easy access to businesses situated in the ambit. It also serves well for multiple users to access same parking space at different times in a day [7]. On-street parking system consumes less land per unit area as compared to ramp based parking, which requires access ramps besides parking spaces [8]. However, studies have shown that in this system cruising drivers on streets looking for parking cause on an average 30% of traffic in congested urban areas [9].



Figure 3 On-street Parking [8]

#### B. Conventional Ramp Based

This type of parking system can be underground, above ground or both under and above ground structure. Usually Open-deck parking structures are preferred for above ground type parking system, which have at least two sides that are minimum 50 percent, open to the outside. To minimize the investment, open parking system above ground is preferable as the cost towards mechanical ventilation and specialized fire protection systems is saved [6]. This system leads to reduction of Traffic jams as compared to on street/ surface parking system with added ease of operation [10].



Figure 4 Ramp Based parking system [11]

#### C. Puzzle Type Parking System

This type of parking system enables stacking of cars on floors on top of each other and offers an ideal solution for parking with least amount of space as compared to conventional methods. The designing of this system includes steel structure pallets and supports which does not require any building. However, it requires high initial and maintenance costs, skilled workers for operation of the system. One of the major drawbacks of this system is it consumes a lot of electricity [12].



Figure 5 Real-time Interactively Predictive Model of Puzzle parking [12]

#### D. Tower Type Parking System

This type of parking system constitutes a tower type structure engaging an elevator system which hoists a pallet to move vehicles vertically; and then transfer the pallet horizontally left or right for parking [13]. One of the major pro of this system is that it can be constructed in residential areas where quietness is required as the operation with use of wire and ropes ensure reduction of noise and vibrations in the system [14]. In addition to high initial investment cost, system redundancy is also a tremendous drawback as only one mechanism is available to park and retrieve the vehicles in a tower i.e. elevator [15]



Figure 6 Real-time Interactively Predictive Model of Tower parking [12]

#### E. Rotary Type Parking System

This type of parking system consumes least per unit area for parking a vehicle as compared to any other type. It is specifically designed to park number of vehicles in a horizontal space of two. In addition, this system has an added advantage of easy operation without any human interference and can be easily managed without an attendant [16]. It has number of advantages such as maximum space utilization, least chance of vehicle damage; minimize pollution and eco-friendly structure etc [17]



Figure 7 Rotary parking system parking assembly [15]



#### F. Multi Floor Level Parking System

This type of parking system is constructed as a building with several floors depending on the capacity required for parking spaces. It is specifically designed to lift the vehicles from one point to transfer it to allotted parking space at different floor levels. This system can be designed for parking space to accommodate several thousand vehicles at once [18]



Figure 8 Multi floor level parking system [6]

### III.CONCLUSION

This paper reviews various types of public parking system developed over time ranging from conventional parking systems to mechanized automatic parking system such as on street, ramp based, tower type, puzzle type, rotary type etc. The inception of the review started from identification of parking crises, which led to description of each parking system based on its design. In addition, pros and cons of each system were reviewed depending on their area occupancy and ease of operation. The below pie chart shows the percentage share of each parking system discussed above in this paper [11].

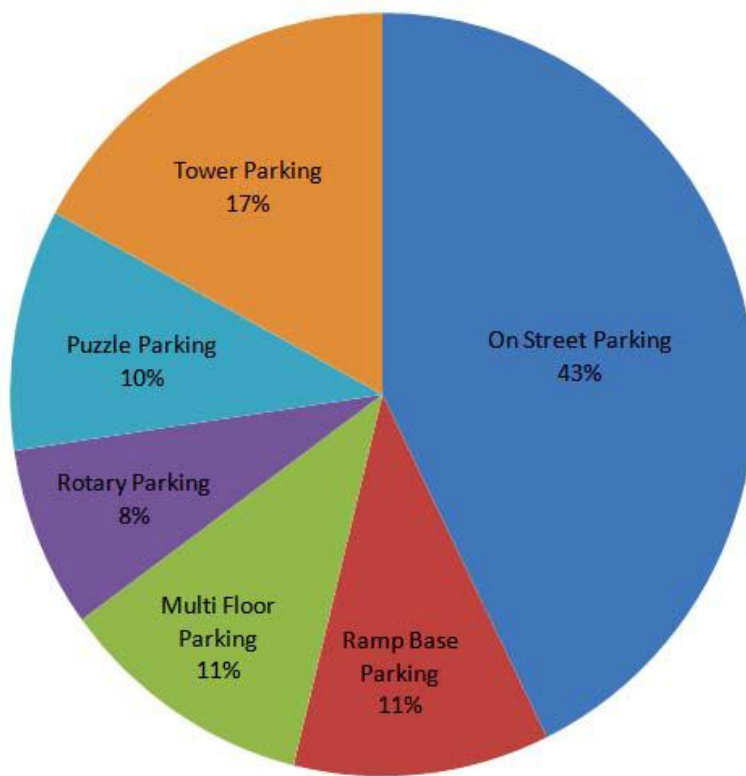


Figure 9 Pie chart describing the Percentage Share of different parking system [11]

#### IV.ACKNOWLEDGMENT

We wish to acknowledge the help provided by our project guide and our supervisors who helped us in completing and finalizing our work.

#### REFERENCES

- [1] M.Y.I. Idris, Y.Y. Ieng, E.M. Tamil, N.M. Noor and Z. Razak, "Car Parking System: A Review of Smart Parking System and its Technology," Inform. Technol. J. 8(2), pp. 101-113, 2009.
- [2] William Young, Russell G. Thompson and Michael A.P. Taylor, "A review of urban car parking models," Transport Reviews: A Transnational Transdisciplinary Journal, Vol. 11 No. 1, pp. 63-84, 1991.
- [3] CBD Parking Rate Survey, Colliers International, 2011.
- [4] Anumita Roychowdhury, "Parking: Multi-level dilemma lessons from Multi-Level Parking in Delhi," Centre for Science and Environment, 2012.
- [5] S D Prashanth, Suneeth Sathyanathan, Vaishak N Makam and Nagarathna, "Parking Management Systems and Their Technologies - A Review," International Journal for Research in Applied Science & Engineering Technology, Vol. 4 Issue IV, pp. 243-249, April 2016.
- [6] Development of MLCPs in Major Cities of Karnataka on PPP Basis, KSIIDC-IL&FS Project Development Company (KIPDC), 2009.
- [7] Allison L.C.-de Cerreño, "Dynamics of On-Street Parking in Large Central Cities," Transportation Research Record Journal of the Transportation Research Board, Vol. 1898 issue 1, pp. 130-137, Jan. 2004,
- [8] Wesley E. Marshall, Norman W. Garrick, and Gilbert Hansen, "Reassessing On-Street Parking," Transportation Research Record Journal of the Transportation Research Board, Vol. 2046 issue 1, pp. 45-52, Jan. 2008.
- [9] Nawaz, Sarfraz, Efstratiou, Christos, Mascolo and Cecilia, "ParkSense: A Smartphone Based Sensing System for On-Street Parking," Proceedings of the 19th annual international conference on Mobile computing & networking, 2013, pp. 75-86.
- [10] Ekta Soni, Karamjeet Kaur and Anil Kumar, "Design And Development Of RFID Based Automated Car Parking System," The International Journal of Mathematics, Science, Technology and Management, Vol. 2 Issue 2, pp. 6-8, April 2013.
- [11] Madhav Bhagdev and Nitika Agarwal, "Vertically Automated Rotary Parking System," 2017 2nd IEEE International Conference on Recent Trends in Electronics, Information & Communication Technology, 2017, pp. 126-131.
- [12] M. Riaz Khan, Luvai F. Motiwala and Pranav Joshi, "Global Parking Facility Management: Review and a Real-time Interactively Predictive Model," Journal of Business and Economics, Vol. 5, No. 11, pp. 1997-2021, Nov. 2014.
- [13] Tae-Weon Park, Oh-Yeong Kong, Seon-Sun Lee and Jae-Whan Kim, "Elevator Type Parking System," U.S. Patent 6 332 743 B1, Dec. 25, 2001.
- [14] ARAI Hiroyuki, "Fork Parking" IHI Engineering Review, Vol. 40 No. 1, pp. 46-48, Feb. 2007.
- [15] Abhishek Bansod and Atul pujari, "Static & Dynamic Analysis on Automated Car Parking Towers & Study Behaviour of the Building," International Research Journal of Engineering and Technology, Vol. 06 Issue 07, pp. 3723-3728, July 2019.
- [16] Chandni Patel, Monalisa Swami, Priya Saxena and Sejal Shah, "Rotary Automated Car Parking System," International Journal of Engineering Science and Innovative Technology, Vol. 4, Issue 2, pp. 408-415, March 2015.
- [17] Iim Nursalim, Hendri Maja Saputra, Nanang Ismail and Teddy Surya Gunawan, "Kinematic Analysis of Rotary Car Parking System Mechanism," Proc. of the 2017 IEEE 4th International Conference on Smart Instrumentation, Measurement and Applications, 2017, pp. 1-5.
- [18] Anisha Cotta, Shaikh Mohammed Ibrahim, Jason Antao and Adrain Fernandes, "Design and Fabrication of an Automated Multi-level Car Parking System," International Journal for Scientific Research & Development, Vol. 4, Issue 1, pp. 400-402, 2017



10.22214/IJRASET



45.98



IMPACT FACTOR:  
7.129



IMPACT FACTOR:  
7.429



# INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Call : 08813907089  (24\*7 Support on Whatsapp)