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"A Model for On-Street Parking Management for Khargone City"

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Abstract: *Khargone city (8,030 sq.km) which is a district headquarter is small urban area of Madhya Pradesh state with population of 106,454 lakhs. One of the problems created by road traffic in urban area is parking. It has impact on the overall transport development system .Vehicle requires sufficient street space to move and to park. With growing population of motor vehicle the problem of parking has assumed serious proportion. The availability of less space in urban area have increased the demand for parking space specially in central business area. A systematic study of parking demand and characteristics are done for controlling parking activities which would be of help to the traffic engineer and town planner. Four major centre in khargone city which have insufficient parking space namely Jhanda square to Post office carfax, Post Office carfax to Vegetable market, Radha Vallabh Market to Post Office carfax and Bus Station to Gour Petrol Pump. Extensive survey are being done at these four places to determine the demand and supply of parking, graph is also been plotted between cumulative parked vehicle and their parking duration. Parking demand model is also developed by regression analysis. To obtain higher value of* R^2*, linear and non-linear model are also used.*

Keywords*: Traffic management, parking arrangement, on street parking facility, parking demand model and traffic regulations.*

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I. Introduction

1.1 GENERAL

Parking are of two types one is on- street parking and other is off- street parking . **On- street parking** means parking a vehicle on the street along street curb. Many time we park our vehicle on the street, but sometime there are restriction . Some times we are allowed to park our vehicle only on one side of street and sometime we are not allowed to park vehicle anywhere on the street. **Off- street parking** means parking our vehicle anywhere but not on the street.

1.2 WHY ON-STREET PARKING SYSTEM

A number of ways by which on-street parking could be of importance. These are:

- **Higher efficiency:** Users of the downtowns consistently select on-street parking spaces over off-street surface lots and garage parking. The on-street spaces experience the most use and the highest turnover.
- **Better land use:** Medium-sized town centers can save an average of more than two acres of land by providing street parking. This efficiency can allow for much higher-density for commercial development than the center to rely solely on off-street surface lots.
- **Increased safety:** Drivers tend to travel at significantly slower speeds in the presence of features such as on- street parking and small building setbacks. Slower vehicle speeds provide pedestrians, cyclists and drivers more time to react, and when a crash occurs, the chance of it being life-threatening is greatly reduced.

1.3 COMMON METHODS OF ON-SREET PARKING

On-street parking is known for its efficiency in terms of land use and convenience to motorists as it allows them to park their vehicles nearer to their destinations.

Common methods of on- street parking are -

1) Parallel parking
2) Angular parking
3) Right angle parking

1) Parallel parking

The vehicles are parked one behind the other. The Parking lot is designed as per the area required if Parallel Parking is adopted. It has been surveyed that the area required for Parallel Parking is much lesser that required for Angular Parking. Therefore, more number of vehicles can be parked in this Parking System. For this reason, this Parking system is generally adopted.

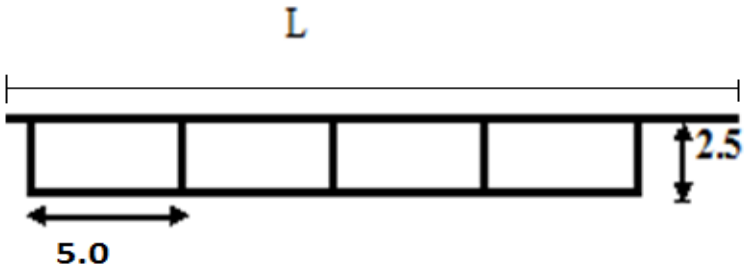


Fig. 1 - Parallel parking system

2) Angular Parking

The vehicles are parked at an angle. It may be a 30 degree angle or 45 degree. The vehicles can be easily reversed if parked at an angle. The major drawback of "Angular Parking System" is that it requires larger space for parking than required for Parallel Parking.

a) 30 ° parking:

In thirty degree parking, the vehicles are parked at 30 ° with respect to the road alignment. In this case, more vehicles can be parked compared to parallel parking. 30 ° parking shown in figure 2. From the figure,

AB = OBsin 30° = 1.25,
BC = OPcos 30° = 4.33,
BD = DQcos 60° = 5,
CD = BD – BC = 5 – 4.33 = 0.67,
AB + BC = 1.25 + 4.33 = 5.58

For N vehicles, L = AC + (N-1)CE =5.58+(N-1)5 =0.58+5N

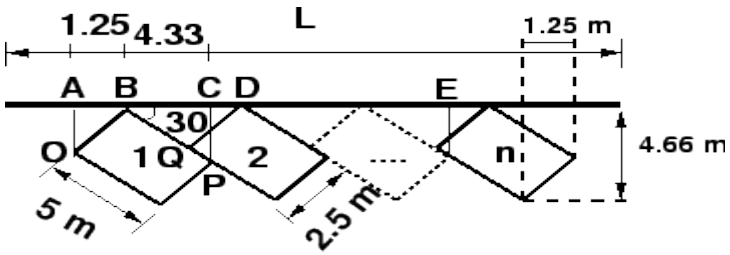


Fig. 2(a) - 30 ° parking system

b) 45° parking:

As the angle of parking increases, more number of vehicles can be parked. Hence compared to parallel parking and 30° parking, more number of vehicles can be parked in this type of parking. 45° parking system is shown in figure 3 .

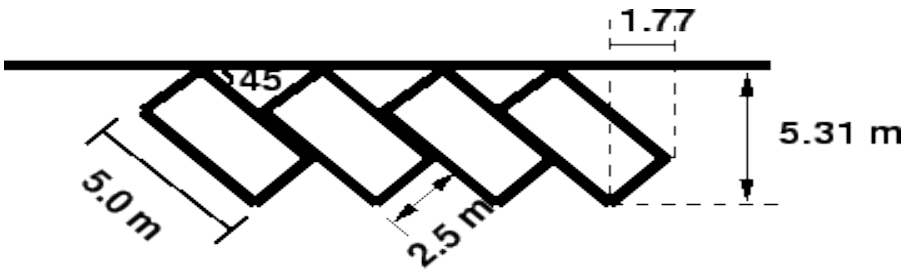


Fig. 2(b) - 45° parking system

c) 60° parking:

The vehicles are parked at 60° to the direction of road. More number of vehicles can be accommodated in this parking type. From the figure 4 , length available for parking N vehicles =2.89N+2.16.

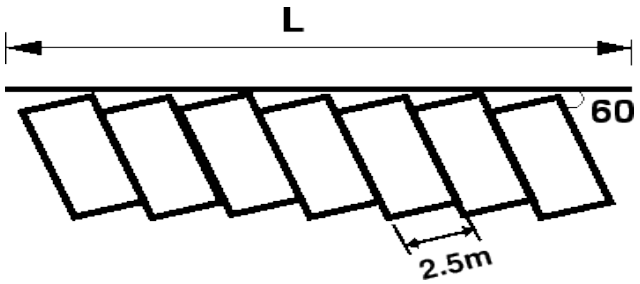


Fig. 2(c) - 60° parking system

3) Right angle parking

In right angle parking or 90° parking, the vehicles are parked perpendicular to the direction of the road. Although it consumes maximum width kerb length required is very little. In this type of parking, the vehicles need complex maneuvering and this may cause severe accidents. However, it can accommodate maximum number of vehicles for a given kerb length. An example of Right angle parking is shown in figure 5 . Length available for parking N number of vehicles is L= 2.5N.

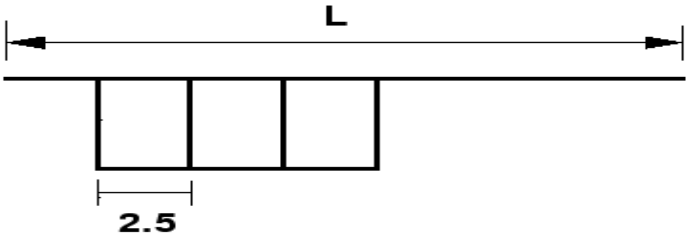


Fig. 3 - 90° parking

II. Objectives Of The Study

- To determine the parking demand and supply characteristics at selected area.
- To estimate mean parking time.
- To develop and validate the parking demand model.
- To assess the parking characteristics including parking duration and accumulation.
- Analyze the main street traffic flow condition.

Area Selection

Four major commercial places in khargone city were selected for the study. They were -

(a) Jhanda Square to Post Office Carfax
(b) Post Office Carfax to Vegetable Market
(c) Radhavallabh Market to Post Office Carfax
(d) Bus Station to Gour Petrol Pump

III. Methodology

3.1 Model Development

Parking demand model were developed for all selected areas – Jhanda square to Post office square, Post office square to Vegetable Market , Post office square to Radhavallabh Market and Bus station to Gour petrol pump with the help of Datafit-9 software. Both linear and Non-linear model were developed .

3.2 Survey

Surveys were carried out to identify the different land use pattern and to measure the area of each land use at the four places . From Janda square to post office carfax and post office carfax to Vegetable Market an extensive survey was conducted on either sides of road. At Radhavallabh Market ,two routes were considered for survey. These were post office square to old Radhavallabh Market route and Old Radhavallabh Market to new Radhavallbh Market. At near the Bus station two routes are considered for survey . one is Bus station to DPO route and other from Bus station to Gour petrol pump route.

3.3 PARKING SURVEY

The survey included counts of parked vehicles at regular intervals through a period , covering both the morning and evening peak period . The survey was carried out continuously from 10 AM to 7 PM at these four places .

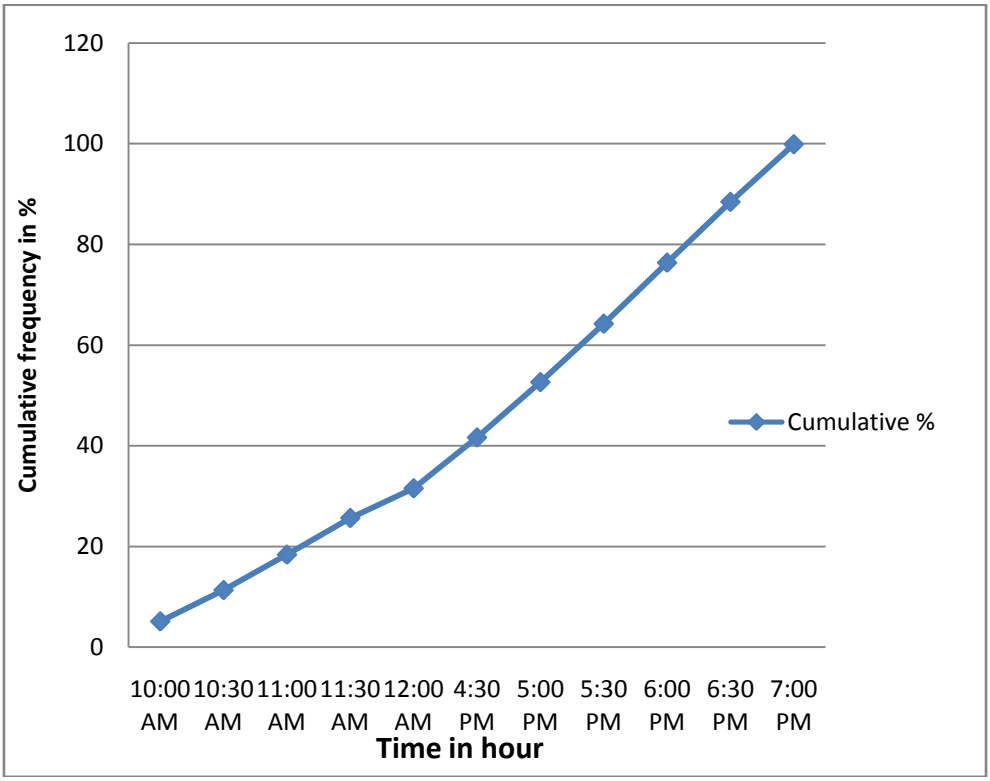
IV. Analysis Of Data

4.1 Cumulative Frequency Curve

In order to show the relationship between time and cumulative frequency in terms of the percentage of car and two wheelers at the four places , different graphs were plotted as shown in fig.

Table 4.1(a) - Cumulative Frequency % for Parking Duration of Two wheeler at Jhanda Square to Post Office Carfax

Duration (AM to PM)	Two wheeler	X %	Cumulative %
10:00 AM	180	5.08	5.08
10:30 AM	211	5.95	11.3
11:00 AM	259	7.31	18.34
11:30 AM	258	7.28	25.62
12:00 AM	212	5.90	31.52
4:30 AM	358	10.10	41.62
5:00 AM	390	11.00	52.62
5:30 AM	411	11.60	64.22
6:00 AM	430	12.13	76.35
6:30 AM	428	12.08	88.43
7:00 AM	406	11.45	99.88



Graph 4.1(b) – Cumulative Frequency Curve for Parking Duration of Two wheeler at Jhanda Square to Post Office Carfax

Similar cumulative frequency curve were plotted for cars and two wheeler for all other selected stretches.

Parking Demand Model

Table 6.- Parking Demand Model

Area	Model	R^2
Jhanda Square to Post Office carfax	$d= -3859 + C_c^{0.93} + C_n^{0.93}$	0.96
Post Office carfax to Vegetable Market	$d = 1.878\ C_c - 1.799\ C_n + 1.932HS + 2.535OB$	0.92
Post Office carfax to Radhawallabh Market	$d= -9988.17 + C_c^{0.935} + C_n^{0.749} + OB^{0.935}$	0.98
Bus stand to Gour Petrol Pump	$d= -2687.82 + C_c^{0.904} + C_n^{0.851} + OB^{0.904}$	0.97

Where,

d	=	demand for parking space in ECS.
C_c	=	area of Type I Commercial centers in m^2
C_n	=	area of Type II Commercial centers in m^2
OB	=	area of Type II Office Buildings in m^2
HS	=	area of health services in m^2

Model Validation

Model development for Post office carfax is validated using the data collected from another major commercial centre Bus station . Land use pattern at Bus station is similar to that of Post office carfax. Parking data from four nearby locations in Bus station were collected and was used to validate the model. The result are shown in Table 7.

Table 7 - CHI-SQUARE Test Result

Observed demand in ECS	**Calculated demand in ECS**	χ^2 **Observed**	χ^2 **Critical (df=3, =0.05)**
70	64	3.083	12.08
151	140		
569	600		
71	73		

V. Conclusions

I. The mean duration of two wheelers at jhanda square to Post office carfax route was 3 minute and Post office carfax to vegetable market route , Post office carfax to Radhavallabh Market and Bus station to Gour Petrol Pump route was 4 minute, 3 minute, and 2 minute respectively .
II. Two wheelers were found to possess less parking duration than that of cars.
III. Non-linear parking demand models possess higher co-efficient of determination than linear models.
IV. Type I commercial centres required 2.5 times more parking space than Type II centres with the same area.

VI. Future Scopes

Some future scopes are as –

i. Proper on-street parking management decrease the rate of accident.
ii. It will provide easy traffic flow and reduce time duration.
iii. It increase capacity of existing parking facility means that parking supply increase without using more land or major construction.
iv. Small parking spaces for motorcycles , allow and encourage motorcycles to share parking spaces where possible.

References

[1]. Koffi Ayadu Edwin, et. al.,(2014),"Examination of on-street parking and traffic congestion problem in lokoja", Vol.6, No.4.
[2]. Md. Kamrul Islam & Sudipta Chawdhury ,(2014), "Demand and Supply Analysis of parking in commercial Area: A Case Study Probortak More Area, Chittagong" , ISSN 2351-8014 Vol. 12 No. 1 Nov.
[3]. Young Woo Lee, (2014), "Study on Establishment of On-Street Parking Demand Model According to Total Building Floor Area", Vol.69.
[4]. Arjun C A ,(2014), " Studies on On-Street Parking Using License Plate Method In Basavangudi Bangalore", (IJETE) ISSN: 2348–8050.
[5]. Partha Pratim Sarkar & C. Mallikarjuna,(2013), "Effect of Land Use on Travel Behaviour: A Case Study of Agartala City".
[6]. T. SUBRAMANI, (2012), International Journal of Modern Engineering Research (IJMER) www.ijmer.com Vol.2.
[7]. Abdoulaye Diallo, (2012), "Methodology of parking analysis" Department of civil, geological and mining engineering École Polytechnique de Montréal, C.P. 6079.
[8]. S.K. khanna &C.E.G. Justo ,(2011), "Highway Engineering Book" .
[9]. Riddhima,(2011), "Management of Parking Spaces in the Walled City of Jaipur", CCS Working Paper No. 245 Summer Research Internship Programme , Centre for Civil Society.

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