

Study on the Variables for On-street Parking Demand Estimation through Parking Survey

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Abstract. A study to calculate precise demand for on-street parking should be carried out to establish and implement plausible and effective policy on it. Though there have been many studies on estimating parking demand so far, the studies focusing on on-street parking are not enough. Thus, this study surveyed parking conditions of the entire Dong-gu, Daegu Metropolitan City, Republic of Korea with focus on parking on the street and analyzed for the variables for on-street parking demand estimation for it based on the parking survey. This study adopted multi-unit housing, neighborhood facility, education research and welfare facility and detached housing that accounted for 85% of the gross area of all buildings in the subject region as the explanatory variables to analyze for variables for on-street parking demand estimation. As a result of this study, detached housing and neighborhood facility were adopted as the explanatory variables.

Keywords: On-street parking, parking survey, Parking demand, Total building floor area, Illegal Parking

1 Introduction

The residential areas nowadays suffer increasing illegal parking or temporary car stopping cases, which trigger traffic delay and inflict negative impact on traffic safety. This can also lead to a social conflict as disorderly parking on any local street interrupts passage of emergency vehicles and pedestrians and parking area shortage incurs discord in the neighbor.

Against this backdrop, a variety of policies are being carried out such as green parking, building a public parking lot using an idle land, Residential Parking Permit Program and designating sections that allow nighttime parking to address parking problem in the residential area. However, the effect is not satisfactory.

A study to calculate precise demand for on-street parking should be carried out to establish and implement plausible and effective policy on it. Though there have been many studies on estimating parking demand so far, the studies focusing on on-street parking are not enough. Most previous studies used regression analysis as a basic methodology and aimed to estimate parking demand at specific areas that have own purpose such as multi-unit housing and factories.

Thus, this study surveyed parking conditions of the entire Dong-gu, Daegu Metropolitan City, Republic of Korea with focus on parking on the street and analyzed for variables for on-street parking demand estimation based on the parking survey.

2 Data Collection

This study conducted on-site survey and analyzed the variables of on-street parking by involving 19 legal precincts in Dong-gu, Daegu, Republic of Korea to reflect the general characteristics of on-street parking. To analyze the on-street parking demand variables that reflected the on-street parking condition at both day and night, this study conducted the survey both at day and night.

Among a total of 43,393 parked vehicles, 4,885 vehicles (11.26%) were parked in legal parking zone, 23,678 vehicles (54.57%), were illegally parked on local streets, and 12,198 vehicles (28.11%) were illegally parked in parking prohibited zone. Table 1 lists the result of on-street parking survey.

Table 1. Result of parking survey

	Legal parking zone	Illegal parking			Total	
		Parking prohibited zone	Sidewalk	Set-back zone Local street		
Number of parking lot(ea)	4,885	12,198	732	1,900	23,678	43,393
Rate (%)	11.26	28.11	1.69	4.38	54.57	100.00
Number of parking lot(ea)	4,885		38,508			43,393
Rate (%)	11.26		88.74			100.00

3 Analysis of the On-street Parking Demand Variables

The study aimed to analyze for the variables for on-street parking demand estimation at a metropolitan area or district. Therefore, it applied the number of cars parked on the street collected through the on-site survey on the parking condition as object variables and total building floor area by purpose in the concerning region as explanatory variables.

Since this study was performed to analyze for variables for on-street parking demand estimation applicable to a metropolitan region, when the area that the explanatory variables account for in the subject region is very small, it cannot be explanatory enough to estimate the on-street parking demand that is object variables. Hence, it adopted top 85% out of the gross area of the building structures by purpose in the subject region that covered multi-unit housing, neighborhood facility, education re-

search and welfare facility and detached housing as the explanatory variables and excluded the rest 18 types of the building structures that accounted for the rest 15%.

The study carried out regression analysis on the decided object variables and explanatory variables, using SPSS Statistics 20.0. The regression analysis considered multicollinearity and employed stepwise method of the explanatory variables.

As a result of multiple regression analysis, with consideration of multicollinearity and introduction of stepwise explanatory variables, detached housing was selected as the most explanatory variable followed by neighborhood facility. Multi-unit housing unit and education research and welfare facility were removed after F analysis.

Table 2. Selected variables

Step	Selected variables	Method
1	Detached house	stepwise (criteria: enter F \geq 3.840, removal F \leq 2.710).
2	Neighborhood facility Detached house	stepwise (criteria: enter F \geq 3.840, removal F \leq 2.710).

Table 3. Removed variables

Step	Variable	β	t	Sig.	Partial correlation coefficient	Tolerance	VIF	Mimimum tolerance limit
1	Neighborhood facility	.372b	2.018	.061	.450	.437	2.290	.437
	Education research and welfare facility	.322b	1.821	.087	.414	.492	2.031	.492
	Multi-unit housing	-.006b	-.034	.973	-.009	.530	1.887	.530
2	Education research and welfare facility	.248c	1.422	.175	.345	.459	2.179	.351
	Multi-unit housing	-.357c	-1.774	.096	-.416	.323	3.098	.266

4 Conclusions

This study analyzed for variables for on-street parking demand estimation by parking surveying on-street parking cases of Dong-gu, Daegu City, Republic of Korea and performing multiple regression analysis.

The survey on on-street parking showed that there were quite many of such cases and 88.74% of them were illegal. Therefore, establishing a city parking management plan or such plan by district in the future will have to include on-street parking plan besides parking lots attached to buildings and off-street parking areas.

Out of parking on the street, illegal parking on local streets accounted for the greatest proportion at 54.57%, followed by on-street parking at parking prohibited zone at 28.11%.

The study adopted multi-unit housing, neighborhood facility, education research and welfare facility and detached housing that accounted for 85% of the gross area of all buildings in the subject region as the explanatory variables to analyze the on-street parking demand estimation. As a result of applying stepwise multiple regression analysis, detached housing and neighborhood facility were adopted as the explanatory variables.

Further studies will be needed that analyze the characteristics of on-street parking demand in the day and nighttime and estimate the on-street parking demand during both time periods.

References

1. Aan, W.Y., Lee, S.H.: A Study on Industrial Site Annexed Parking Unit Calculation Method by considering Facility Use and Scale Characteristics. *Journal of Korean Society of Road Engineering*, Vol.12, No.2, pp.129-136 (2010)
2. Lee, Y.W.: Calculation Methods of Parking Demand for Housing Using Parking Basic Units Analysis. *Journal of Korean Society of Transportation*, Vol.26, No.4, pp.149-157 (2008)
3. Lee, Y.W.: Study on Establishment of On-street Parking Demand Model using Data by Automatic Parking Survey System. *International Journal of Applied Engineering Research*, Vol.9, No.24, pp.24921-24931 (2014)
4. Lee, Y.W., Kwon, H.J.: A Study on Development and Utilization of Automatic Parking Survey System. *Journal of Korean Society of Transportation*, Vol.32, No.5, pp.452-461 (2014)
5. Park, J.H.: Parking Demand Estimation Model of apartments. Graduate school of Chonnam National University (2003)
6. Park, K.H., Hong, W.H., Ha, J.M.: A Study on the Parking Demand Analysis according to Housing Size and Locations in Multi-Family Housing Estates. *The Architectural Institute of Korea*, Vol.15, No.10, pp.121-130 (1999)