Review of Parking Problems in CBD Area of Urban Cities in Developing Countries

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Abstract

With the increase of the number of automobiles, the city parking demand occurred a rapid growth, and the city automobile parking had become a very serious traffic problem for Central Commercial District in cities. The parking demand forecast is the key of public parking planning and provides the basic data for the size of the parking lot. Understanding parking choice behavior is important in parking facility design and service evaluation. Lack of sufficient studies on parking choice behavior investigation has been an issue in parking facility. This paper studied the various methods used for parking problems studies and solution soughted for them.

Keywords: automobile parking, MNL model

I. INTRODUCTION

India, like other developing countries, is characterized by its rising population, mounting urbanization and motorization, and low per capita income. Its total urban population burgeoned over the past three decades, rising from 109 million in 1971 to 160 million in 1981 (+47%), 217 million in 1991 (+36%), and 285 million in 2001 (+31%).

Urbanization in India from last two decades has shown very steep rise in personalize transport mode particularly in two wheelers which has resulted in various transportation problems. And they are generally

- Parking
- Congestion
- Accidents
- Excessive fuel consumption
- Air pollution

These all problems have been reflected even in National Urban Transport Policy. Among these problems Parking is most disturbing problem in urban cities. There are two types of parking On-street parking and off-street parking. As a type of shared parking on street parking is an efficient means for providing more parking space and balancing the parking demand and supply. Businessmen and customers regard on-street parking as an essential service. Because on-street parking occupies less land per space than off-street parking and provides convenient access to destinations.

The urban Central Commercial District is a citywide and regional commercial area, where automobiles and pedestrians are concentrated, especially heavy shopping and sightseeing vehicle flow as well as stream of people; therefore, CCD faces the prominent regional traffic problems. Parking demand forecast and analysis in CCD have been a hot research topic for the experts. In 1988, U.S. Federal Transit Administration funded a joint research project called “The Policy of Car Owners Turning to Public Transportation”. Conducting research on 20 metropolitan, investigators showed that: parking fee is much more effective to decline in SOV (special orientation visit) commute and to increase public transportation utilization than to improve the availability and attendance of public transportation.

II. LITERATURE REVIEW

Daniel Bzldwin Hess (2001) made a forecast for traffic modes to Portland CBD (Central Business District): when parking fee is free, 62% of commuters will choose travel by car; 10% will choose to ride together; 22% will choose public transportation. When parking fee is up to 6 dollars, 46% of commuters will travel by car; 4% will choose to ride together; 55% will choose public transportation. Based on the investigation of periodically travel from Sydney to CBD, it has been showed by David A, Hensher, and Jenny King (2001) that parking fee rate in each hour at central district increase 1%, the person to park in this
district will decline 2.04%. Other scholars, such as Bianco, M.J (2000) , Richard Voith (1998) , Richard Arnott, John Rowse (2009) also conducting research on this issue, have revealed similar conclusion. About the method of parking demand forecast, Professor Yan Kefei (1994) established Static Parking Generation Rate Model based on land use and Linear Correlation Model based on vehicle travel; Professor Chen Jun(1999) established Static Parking Generation Rate Model and gave searching algorithm from analysis on the factors of urban parking lot demand; Guan Hongzhi(2006) established Parking Supply-Demand Forecast Model. According to construction indices from the planned land in all traffic areas, Zhang Jin(2003) set up improved Parking Generation Rate Model to calculate parking demand. Bai Yu, Xue Kun, and Yang Xiaoguang(2004) , under the limitation of network capacity and network service level, have modified the OD forecast method and set up a new method of parking demand forecast based on the capacity of network. However, this model cannot be widely applied to practice because of the difficulty in obtaining OD data in CCD.

A study that was undertaken in the Helsinki metropolitan area, also highlighted the effect that different parking measures can have on the share of car traffic in the modal split: (1) an increase in parking costs by 30% was found to lead to a decrease of car share of 8-10% while a doubling of parking costs would lead to a 21% decrease of car share,(2) If parking costs would always be at the same level as the fares of public transport, car share would decrease by 8% (de Wit, 2005). Spiess (1996) uses a logit model to model the parking lot choice in a park and ride context. Young (2000) distinguishes 5 types of parking models: parking design models, parking-allocation models, parking-search models, parking-choice models and parking-interaction models. Hess (2001) uses an MNL model to assess the impact of the availability of free parking on mode choice and parking demand for work related travel. Guan Hongzhi et, (2003) conducted a parking behaviour survey in Xidan area of Beijing. A parking lot choice model is provided with disaggregated method. According to the analysis, there is a great possibility in parking cost to adjust the parking lot choice behaviour. Stephane Hess (2004) uses a mixed multinomial logit (MMNL) model to analysis the parking choice behaviour. The model reveals important differences in parking behaviour with different journey purposes. Yao Sheng yong (2008) analyze the relationship between parking-charge and parking behaviour in CBD. Michele Ottomanelli (2011) etc. present a discrete choice model for evaluating parking users' behaviour. There are also other scholars using multinomial logit (MNL) model analysis the parking behaviour. (Bates,Bradley, 1986;Hensher and Button, 2000).

If car parking search time has to be taken into account so as not to favour the car in comparison with other modes, few models dealing with on-street car parking search time have been suggested in the literature, and even ever have been validated thanks to on-field data. Indeed, the car parking search time is the result of individual experiments and therefore depends either on individual strategies or on parking-related variables. As for individual categories, Polak & Axhausen (1990) have classified them in seven categories, with five of them dealing with on street parking. The strategy in which drivers are supposed to circle around their destination to find a vacant on-street space is often admitted to be the most used strategy when on-street parking is full (Spitaels & Maerivoet, 2008), and the longer the driver searches, the greater the radius of the circle goes (Gantelet & Lefauconnier, 2006). Other strategies, such as looking for an on-street space next to the destination before going to an off-street facility or hoosing illegal parking are other strategies in use (Polak & Axhausen, 1990). The driver's knowledge of the strict, the destination and the trip purpose (Spitaels & Maerivoet, 2008) (Hualiang et al, 2002) also have an influence on the on-street parking strategy and search time. On-street parking search time may also depend on parking-related variables, such as the occupancy ratio, the parking capacity (i.e. the number of parking spaces in the vicinity of the destination), the turnover rate and the place fee (Spitaels & Maerivoet, 2008). As suggested by Polak & Axhausen (1990) but also by Hualiang et al (2002), these variables are dynamic, depending on the time and the day of arrival of a driver, and therefore quite difficult to measure in practice (Spitaels & Maerivoet, 2008). Other parameters may influence the search time, such as traffic conditions (Polak & Axhausen, 1990), but a few studies show that the average search speed is nearly constant at about 10 to 12 km/h (Benenson et al, 2008) (Levy et al, 2012). On-street parking space search also differ from off-street parking space search in at least two ways. First, and even if a few experiments have recently been carried out, there is seldom information given to drivers about vacant spaces in the street: drivers have therefore to find a vacant space by themselves quite always, and according to Hualiang et al (2002), this lack of information influences significantly the parking search time. Second, illegal parking is to be considered since it is noticed in practice in surveys (Gantelet & Lefauconnier, 2006) (Benenson et al, 2008) and considered as a strategy (Bifulco, 1993), especially for short stays (Spitaels & Maerivoet, 2008).

III. Conclusion

In this paper, with the consideration of the average turnover rate of parking spaces, the utilization of lot, the service level of parking, parking fees and automobile growth rate were reviewed. To get on-street parking search time, and from models suggested in the literature, the exponential congestion model seems the most relevant. Indeed, the consideration of the congestion ratio rather than the occupation ratio brings out better results.

REFERENCES


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