IV − 12　　An overview of trip generation model and future perspectives : Focus on the freight transportation

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1. Introduction

Even though there has been, in the recent past, an ever increasing interest in freight transportation problems and an attempt to seek solution to these problems through newly developed analytical techniques. This paper presents the techniques used in the trip generation model to estimate freight movement and an overview of the techniques used in the trip generation model to build realistic forecasts that allow setting of freight transportation system plan priorities.

2. Trip generation analysis techniques

The trip generation analysis techniques are usually grouped into one of five categories. Five categories, to estimate and forecast freight movement in trip generation model, are showed in following figure.
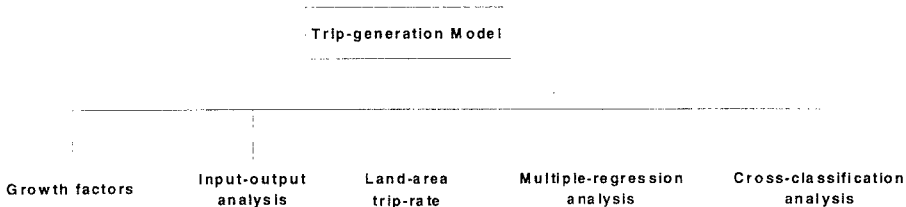
Trip-generation Model

Growth factors | Input-output analysis | Land-area trip-rate | Multiple-regression analysis | Cross-classification analysis

Fig.1 Classification of trip generation analysis techniques

3. Merit and demerit of trip generation analysis techniques

The applications of each of these approaches to trip generation analysis are varies but certain techniques have been more widely used than others. The following table shows the merit and demerit of freight generation analysis techniques respectively.

Table.1 Merit and demerit of five categories

Trip generation analysis techniques	Merit	Demerit
Growth factors (Zavattero, 1976)	1. It is simply calculated from forecasts of personal income and earnings and result of commercial national input-output model. 2. Estimation time would be shorter than the other analysis, because of the data collection.	1. The difficulty of forecasting regional economic development is one of the inherent problems of freight forecasting. 2. It is became less stable and reliable as the geographic level of aggregation and the classification of commodities become more detailed or smaller. 3. As a result. Very few freight forecasts made to data span than 10 years into the future because technology and the state of economy are so difficult to predict.
Input-Output analysis (Smadi and Maze, 1996)	1. We can understand the impact of economy, what is happening to the area's economy and identify some of the national and global trends that will affect future area growth, from this analysis, which quantifies interactions among economic sectors.	1. Industry sectors included in the analysis and their sub-industries must be matched with commodity classification in the input-output tables. 2. It is difficult to compare with results from the different areas using this analysis, because of characteristics of regional economy.
Land-area trip-rate (Brogan, 1979)	1. The short-run tactical planning area on local level and may prove valuable in the analysis of the impact of major truck trip-generation activities in localized sections of an urban area 2. To evaluate the truck traffic impact of land use decisions when specific establishment functions are not yet known. 3. No estimate of the variance of each land area truck trip rates among the study areas is possible, because the land area truck trip rates in each of the case study cities were developed using areawide land use total.	1. Not so much in long-range strategic planning on a region-wide, urban, or even network-wide basis. 2. The use of borrowed rates, at least for the present time, seems rather risky, because of the great variation in land-area truck-trip rate among the different urban area studied. 3. Interpretation of the stability of the trip rates across urban areas is difficult because of the wide variety of land-use categories employed.

Trip generation analysis techniques	Merit	Demerit
Land-area trip-rate (Brogan, 1979)	4. The level of detail for this type of analysis would be more refined than that associated with the regression analysis. 5. Implementation time would be shorter than the regression analysis, because of the data collection and model development and the possibility of using borrowed rates previously developed for similar urban situations.	
Multiple-regression analysis (Hutchinson, 1974)	1. Usually, associated with large-scale areawide forecasting relates zonal trip ends to various socioeconomic and demographic characteristics of a traffic analysis zone; which could not be forecasted by land-area truck trip rate; through a mathematical modeling procedure. 2. Easily, we can understand the relationship between dependent variable and independent variable.	1. Often quite complex and involve a variety of independent variables, some with possible high inter-correlation: collinearity. 2. The equations have tended to be so complex and unwieldy as to make forecasting extremely difficult. 3. Coefficient value of regression model to forecast perfect estimates should not be changed when time has passed.
Cross-classification analysis (Starkie, 1974)	1. The raw data obtained from interviews may be directly used. 2. The effects of the socioeconomic characteristics of trip makers are directly reflected. 3. Goods movement is simulated more realistically at the industry-type level. 4. This method is independent of the zone system of a region. 5. It does not require prior assumption about the shape of the relationships (which do not even need to be monotonic, let alone linear) 6. Relationships can differ in form from class to class of any one variable. 7. This model does not permit extrapolation beyond its calibration classes, although the highest or lowest class of a variable may be open-ended.	1. There is no well-established way of choosing among classified variables or the best groupings for such variables.

4. Summary

From the trip generation analysis techniques, these techniques could be showed merit and demerit respectively. Using these techniques, very few freight transportation forecasts made to data span more than 10 years into the future because technology and the state of the economy are so difficult to predict. In addition, freight transportation forecasts become more detailed and smaller. From the above reason, the trip generation technique is needed to develop alternative methodology for the freight transportation forecasting. The alternative methodology has to conceptualize freight transportation to understand how freight affects and is affected by economic activities, sensitive to important state economic activities in the study zone by identifying major industry sectors, and estimate freight transportation using the statistical characteristics.

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