COMPARATIVE ASSESSMENT OF ROAD NETWORK TRIP DISTRIBUTION USING GROWTH FACTOR AND GRAVITY MODELING TECHNIQUES

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DEDICATION

To my beloved mother and father
(FATTANEH PAKSHIR AND ALI REZA PAKSHIR)
ACKNOWLEDGEMENTS

I would like to express my deep gratitude for the constant guidance and support from my supervisor, Professor Johnnie Ben-Edigbe, during the course of my graduate study. His insight, suggestions and criticism contributed in large measure to the success of this research.

Finally, my greatest thanks and appreciation go to my family. A thousand thank to my parents. I thank my father, Ali Reza Pakshir for his unfailing wisdom and guidance, my mother, Fattaneh Pakshir, for her caring and strength, and my sisters, Tannaz Pakshir and Mastaneh Pakshir, for their friendships.
ABSTRACT

Growth factor and gravity model techniques are useful in sequential forecasting of travel demand on any road network. Both have commonalities in terms of independent parameters, however, growth factors relies on historic growth rate for prediction while gravity model relies on socio-economic variables or friction factor. Trip distribution is an iterative procedure. Based on the data from recent trip generation study in Skudai town, Malaysia, the number of trips generated by one zone and attracted to another zone would be computed using both the growth factor and gravity model techniques. The outcomes would then be compared and contrasted. It is hoped that the project would shed light on the advantages and disadvantages of these technique, in essence point to the appropriate method employable in a given situation.

Keywords: Trip Distribution, Growth Factor, Growth Rate, Gravity Model, Friction Factors, Socio-Economic Variables.

Kata kunci: Trip Edaran, Faktor Pertumbuhan, Laju Pertumbuhan, model graviti, Faktor Gesekan, Variabel Sosial-Ekonomi.
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CHAPTER 1

INTRODUCTION

1.1. Background

Urban congestion is one of the most significant and critical problems that is happened in most of large cities especially in developing countries. This may include the high urbanization and increase in the number of vehicles, quickly population growth, enhancing income, inefficient public transportation, and etc especially in most Asian developing countries that is lead to affect of increasing urbanization and motorization. Delay, congestion, environmental pollution and vibration are some of the problems.

Transportation has played a major function in the human race. The first necessary for transportation has been financial, travel to search food or work, travel for exchange of goods, exploration, personal fulfillment, and to make better of a populace or a country.

Mobility is a permanent change in the term of both amount and spatial models. The process of transportation planning involves establishing a transportation schedule for an urban region. It is a continuous process that pursues to address the transport requirements of residents of the area, with the help of a process of advising
with all relevant groups, and struggle to identify and implement a suitable plan to meet these needs.

Two important factors which influence the Modern Civilization are urbanization and industrialization. Urbanization attracts the extra labor from rural areas and uses it runs the various services which are critical for the living of city.

With the development of cities, the need for a sufficient and adequate transport network also increases. The responsibility of transport network to the high demand goes to shifting of activities at the edges of the city where load is still favorable and transportation capacity is available for any movement of people and goods. Therefore, the performance of transportation can be distinguished, but as mentioned above, it develops worried about over congestion, physical deteriorating, accident and etc. current raise momentous issues for transportation planners.

Accordingly, urban transportation planning is a series of acts that drive to the future of the region travel in the terms of environmental resources, policy and program that is directly dependent on the prediction of future of travel demand. Transportation planning process can be lead to arrange supply for the long-range transportation pattern and transportation planning is used to all area that has the population over 50,000. By focusing travel characteristics, exactly identify to forecast how many trips will be produced, where they will attract, with which mode of transport system and also by which specific route. Therefore, travel demand determines quantity of travel on transportation system and provides useful information on the amount and location of future activity. In addition travel demand could say the amount of the reduction in car use which would happen in response to a new taxation policy of Central Parking Area. On the whole, transportation planning can be affected by population, land use, travel, economic activity, financial and transportation system value.

Furthermore, in Malaysia, the car ownership has being rising quickly everywhere in recent year. The similar location has happened in the Skudai town which is located in Johor state. This orientation appeared to be enduring in the future
if the condition also remains expanding in progression as before. In addition, increased accordingly, as a developing country, the growth of the economy of the country in terms of technology, engineering and other developments, requirements of experts are necessary in the direction of population, facilities, equipment and infrastructures that including transport and transport networks.

However, proportionately attentions to parking and transportation issues were placed in Skudai town. Such issues are necessary as future guideline in transportation are exposed to and affected by these transport systems. Therefore, in this study, Skudai town is selected because it is one of the fastest growth cities in Malaysia.

1.2. Need Of the Study

The critical affects of developing urbanization and increasing traffic, is congestion on street. The requirement results in focus traffic demand, both in time and space. Space is unbearable in some areas of city. Congestion results in delay and time losses which lead to driver stresses. In fact, the need for transport planning largely taken for granted.

Descriptions of where the trip will be attracted are one of the important and necessary part especially in Asian countries because of the supply is unmatched with demand among these countries. New construction can affect the people’s daily activity for distribution of travel from one place to another place. Therefore, trip distribution is an important part for the planner in the term of new constructed such as residential, commercial, industrial, political, school, mosque and church. The determination on particular purpose is directly related to the accessibility and rate of attractiveness of destination area. Therefore, the functional of forecasting trip
distribution is depended on trip production, trip attraction, travel time, travel time factors, socio-economic variables and growth rate.

As mentioned above, trip distribution model is used to predict where the trip will be attracted. Modeling trip distribution is a challenging task, because Different modeling technique often results in different outcomes, so it is important to assess the merits and demerits of the two well established modeling techniques for trip distribution (average growth factor and gravity model) and one that is required for rational planning and evaluation of transportation systems in the area of study. Without a proper planning of distribution trips among the zones will cause of a lot unwanted transport issues such as delay, lack of parking space and green zones, environmental pollution might be raised.

This study focuses on two techniques of analyzing trip distribution: growth factor which is related to historic growth rate to prediction and gravity model that is depended on socio-economic variables and friction factor.

1.3. Purpose Of the Study

The purpose of the study is to compare average growth factor and gravity modeling techniques of distributing trips on a network.
1.4. Objectives Of the Study

The purpose of the study is to assess comparatively growth factor and gravity modeling methods based on trip generation data from Skudai Town Malaysia. In order to achieve that, the following objectives are set:

1. Determine Trip Distribution Matrix of Skudai town based on Growth Factor using historic growth rate from previous studies.
2. Determine Trip Distribution matrix of Skudai town based on Gravity Model Method.
3. Compare Outcomes from both Methods

1.5. Scope Of the Study

The main focus of this study is on the considering of distribution production and attraction of Skudai town based on the growth factor technique and gravity model. Furthermore to accomplish the foregoing objectives, the scope of the study is defined to include following:

- To provide valid knowledge of land use and number of population growth;
- To provide current traffic and transport system available and policy establishment;
- To verify trip distribution among the zoning areas within the boundary of study area based on the growth factor that is depended on the historical growth rate and origin-destination trip matrix;
- To verify trip distribution among the zoning area based on the gravity model which is depended on the trip production, trip attraction, spatial separation between zonal interchange.
1.6. Significance Of the Study

Trip distribution is one of the important parts in transportation planning process. It can be used to forecast the land use, economic, travels, growth rate, travel time, socio-economic variable and impedance factor. By forecasting trip distribution can forecast the modal choice and trip assignment.

1.7. Proposed Research Methodology

This proposed study intends to consider the distribution of trips that are produced in one area (origin zone) and attracted to another zone (destination zone) in the terms of trip production, trip attractions, population growth, travel time, accessibility, travel times factors and socioeconomic variables.

Methodology of this study based on the four fundamental steps which consist of data collection, survey, analysis and model building phase; a forecasting phase, and an estimation phase. In order to form of a transportation model, there is a usual fundamental approach which can be implemented to all forms of transportation planning, involving planning for local transport policy.

This study concentrates on the first phase of the process, the survey, analysis and model building phase. The description of the methodology of this study is discussed in Chapter Three.
References


Johnnie Ben-Edigbe (2009). *Traffic and Transport Planning, MAP 1043* Department of Geotechnics and Transportation, Faculty of Civil Engineering, Universiti Teknologi Malaysia.


