

Modelling Multi-Mode Transportation Networks in Kuala Lumpur

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Abstract

The role of urban transportation becomes increasingly important. An efficient transportation network can stimulate economic transformation, physical development and improve mobility activities. In urban domain, people tend to use more than one mode of transportation to travel from origin to destination. Development in the application of Geographical Information Systems (GIS) to urban transportation problems represents one of the significant areas of GIS-technology and urban planning field nowadays. To prove how GIS can be used in assisting urban network analysis, this paper aims to highlight the determination of the best route in highly developed complex transportation system in the metropolitan city of Kuala Lumpur based on multi-mode transportation concept. More essentially, it integrates urban transportation including facilities such as Light Rapid Transit (LRT), Kereta api Tanah Melayu (KTM) Komuter, Express Rail Link (ERL), KL Monorail, bus, road driving as well as pedestrian mode into a single intelligent data model. To expedite and implement such analysis, ArcGIS's Network Analyst is adopted. As the compliment to the model, closest facility and service area analysis are also taken into consideration. With the advancement of GIS software, the final output will allow users to have a better interpretation of results in terms of visualization, total distance, total travelled time and directional map produced to find the optimal route based on either time or distance as impedance. Hence, the developed data model will facilitate policy makers and transportation planners to have a reliable decision effectively, and produce high quality geospatial information to the end users.

Keywords: Urban transportation, Multi-mode, GIS, Network analysis, Optimal route.

1. Introduction

As an important part of infrastructure, the transportation network plays a decisive role in urban development. Transportation serves people with mobility and accessibility to workplace, health facilities, community resources, and recreational areas across the country. In certain location such as an urban area, human mobility usually happens over a multi-mode transportation network. Because of that, when performing, analysing and studying transportation systems, people should not simply consider each mode of transport separately but should look at it as a multi-mode system with relationships and dynamics between components. There are works done beyond the urban territory such as reported by Frederic et al. (2008) who highlight the development of databases at the level of territories whereby multi-modes transport databases are being setting up around the world. These databases are not only to be used for integrated mobility information services, but also for new analysis to improve the global multi-mode transportation over a territory. Multi-mode mobility combines both private and public transport modes, thereby capitalizing on the benefits of various systems. Lili et al. (2008) highlight multi-mode transportation is a complex network, in which all the components should be seamlessly linked and efficiently coordinated.

With the development of GIS, route network analysis within GIS environment has become a common practice in many applications. Preven et al. (2005) reveal GIS allows large data to be effectively processed, stored, logically associated, and graphical displayed thus provides a convenient and powerful tool for storing and graphical representation of information, which can be useful to the users. This is of a particular importance when more people are getting mobile with the availability of new public transportation options that connects the routes. In fact, Matthew (2013) reports that transportation planners and decision-makers are increasingly considering multi-mode urban transportation strategies to support sustainable transportation associated with urban development. Sustainable transportation is a key aspect of sustainable development.

2. Problem Background

As the population of people is increasing from year to year, so does the demand for transportation. More and more traffic is on roads, which in turn creates more and more mobility-related problems such as congestion, air pollution, noise pollution, and accidents; especially in city centres where the level of human activities is high (Reza et al., 2013). Government should play a vital role in planning an efficient network transportations as well as controlling