

A TIME-SPACE NETWORK MODEL FOR PEAK SPREADING OF MRT PASSENGER FLOWS

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ABSTRACT

A Mass Rapid Transit (MRT) system is an important component for urban development and residents' daily commuting. With the expansion of urban development, not only the MRT network and routes are more and more complex but also they attract more passengers, resulting in overcrowded passenger flows concentrating at some interchange stations or main lines. The highly concentrated phenomena have caused serious congestion problem in peak periods and possible traffic accidents. To resolve this problem, this study develops a time-space network model to investigate the temporal and spatial distributions of passenger flows and potential traffic bottlenecks, which is aimed for peak spreading of passenger flows and reducing the number of accidents due to overcrowded. Thereby, the purpose of this study is to investigate the effects of transportation demand management tools on transferring over-concentrated travel demands and accordingly reducing the severe congestion problem in specific temporal periods and spatial locations so as to increase the level of service of a MRT system. For the research target, passengers' route switching behaviors are analyzed by an extended time-space network, in which time penalty for the degree of crowdedness in train, transfer walking time, train running time, and train schedule are accounted for the MRT passengers in the choice of departure times and transport modes. In the empirical study, we analyze the demand-and-supply conditions and identify potential bottlenecks by using the Taipei MRT's timetable and demand data to examine the effects of the respective management tools on peak spreading of passenger flows. The empirical study results can provide a reference for the Taipei MRT Corporation in preparing effective peak spreading strategies of passenger flows, while reducing crew, vehicle and scheduling costs at peak time.

Keywords: Congestion, Mass Rapid Transit System, Time-space network, Route switching, Peak spreading