ABSTRACT

Several techniques ranging from simple gravity formulation to multiobjective goals optimisation have been proposed for the estimation of travel demand (Tij matrix), using inexpensive data, such as the Link Volume Counts. However, these techniques have yet to gain acceptability among transportation planners due to the lack of practical support from real life. One of the aims of this thesis is to conduct experiments in the use of secondary data (such as statistical entries in Bus Conductor's Records - CSR entries) to simulate Spatial and Temporal travel demands in urban areas for public transport system.

The literature review carried out in this context has suggested that if such experiments have to be useful to the developing nations, due cognition has to be given to the following realities:

i) Since the majority of travel in such environment is by public transport, the effort should be concentrated towards simulating travel demand for public transport through inexpensive data inputs.

ii) Since the travel by such public transports are conditioned by the transport supply, the models developed should give due recognition to the zone to zone supply accessibility.
iii) Since the demand for travel by such public transport varies during the different hours of the day, the estimation procedure adopted must provide confidence band rather than point estimates for temporal demands.

The objectives of this thesis are tailored to cover the above demands on modelling and to develop a user friendly software. The thesis reports the results of the experiments conducted in the city of Trivandrum in India. Apart from the usual census data, many travel characteristics of this city have been reported in published documents. Over and above this, a home interview O-D studies with one percent sample size also has been conducted for validation.

Pilot experiments carried out with the data from Trivandrum indicated that successful simulation of travel demands are possible using a combination of Gravity formulation and Entropy maximisation approaches, provided, good seed matrices are generated reflecting the land use-transportation interactions.

Taking cue from this, a computer program called EDETUSS has been developed for the ESTIMATION OF DEMAND THROUGH URBAN STRUCTURE SPECIFICATIONS. Urban structure specifications are supplied by the use of activity, non-activity classification of zones, density gradient
functions, trip length frequency distributions, etc. Appropriate travel hypotheses are generated to formulate the seed matrices in this study. The program updates the generated seed matrices using Entropy Maximisation, extracting as much information as are available in a set of link volume counts.

The experiments conducted through EDETUSS have demonstrated that accurate description of city structure and supply accessibility are the key to the successful simulation of spatial demands closer to the reality.

The studies conducted have also demonstrated that in order to simulate the temporal travel demands, the static urban structure description would be of little use. Instead, pulsating characteristic of the traffic attractions of the activity system have to be specified through a certain dynamic measure.

In this study a measure called 'Demand ratio' has been introduced for this purpose. This is defined as the ratio of the travel demand at any instant to the demand at a chosen base period. These demand ratios at different time periods have been found to follow rhythmic patterns with respect to the distances from the traffic generators. The curves so developed have been designated as 'Dynamic Urban Structure Specification' in this study.
Models developed using the above specification with Bayesian approach have demonstrated that temporal travel demand simulations are possible using the estimated travel demands at any one instant of time (say peak hour), thus establishing credibility to the suspicion raised by Litinas and Ben Akiva (1982) that such simulations may be indeed possible.

The indications of the probable applications of the EDETUSS and the limitations of the study are the other highlights of this thesis.


The following publications have been prepared from this thesis:

