SYSTEMS MODELLING AND ANALYSIS OF URBAN TRANSPORTATION PROCESS IN AN INTEGRATED FRAMEWORK

BY

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THESIS SUBMITTED IN FULFILMENT
OF THE REQUIREMENTS FOR THE AWARD OF THE
DEGREE OF DOCTOR OF PHILLOSOPHY

TO THE

DEPARTMENT OF ELECTRICAL ENGINEERING
INDIAN INSTITUTE OF TECHNOLOGY, DELHI

1980

C E R T I F I C A T E

Certified that the thesis entitled "Systems Modelling and Analysis of Urban Transportation Process in an Integrated Framework" which is being submitted by Shri Ashok Kumar Sinha for the Degree of Doctor of Philosophy in Electrical Engineering of the Indian Institute of Technology, Delhi is a record of the student's own work carried out by him under my supervision and guidance.

The matter embodied in this thesis has not been submitted for the award of any other degree or diploma.

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ACKNOWLEDGEMENT

The author expresses his deep sense of gratitude to his supervisor Prof. P. S. Satsangi for his valuable guidance and encouragement throughout the period of the research work.

The author is also thankful to the Delhi Transport Corporation, New Delhi and all other agencies mentioned herein for providing necessary facilities for access to data and giving needed cooperation in this task.

Thanks are due to the Principal, Muzaffarpur Institute of Technology for sparing him during the research programme at I.I.T Delhi.

Thanks are due to his parents and friends for their constant well wishes and encouragement. The author is very much thankful to his wife, Usha for her care and patience during entire research schedule at I.I.T Delhi.

Thanks are also due to Mr. Asit K. Ganguly and Mr. R.P. Jaswal for fine typing of the manuscript.

Ashok K. Sinha
7.7.80

7th July 1980 (ASHOK KUMAR SINHA)

ABSTRACT

The thesis introduces desirable refinements in the existing procedures followed by conventional urban transportation planning models which are found to be wanting in several ways. The chief weakness of the prevailing models is their inability to consider interaction between the transport system and the land use system within an integrated framework.

The existing integrated land use transport models fail to account for the technological interactions among different land use sectors within a zone. Besides they do not account for the inter-zonal goods transaction while generating person trips between zones. The integrated land use transport model developed in the present research study overcomes these problems and it explicitly allocates the outputs produced by the three sectors viz. (i) the household sector, (ii) the basic sector and (iii) the service sector, in different zones of the Delhi Urban area.

The traffic distribution model developed in the thesis obviates the usual problem associated with the calibration of the gravity model and it employs the two-stage least squares technique of Parameter identification.

A system model of the transport sector is developed in the present thesis for the multipath assignment of the total travel demand on a multimodal network. Such a unified model of modal split and traffic assignment possesses the desirable feature that the inter-modal interaction is reflected in the

equilibrium assignment. The model outputs in terms of assigned link flows are explicitly determined using a graph-theoretic framework of physical system theory.

Also the conventional assignment models are essentially time-stationary and assume implicitly that the travel demands are largely fixed and insensitive to changes in the service attributes of the transport system.

With a view to overcoming these problems a multiphase assignment model for three time phases of daily operation, is developed which also avoids the intermediate step of generating inter-zonal demands. The trip-ends are directly assigned on the traffic links. The model is further used to estimate the marginal profit sensitivities of the system as a whole with respect to the operating frequencies of the constituent bus routes which furnishes a multi-phase optimal scheduling model of the transport sector.

The thesis also discusses further avenues of explorations in the field of urban transportation modelling.

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