A Stochastic Dynamic Traffic Assignment Model

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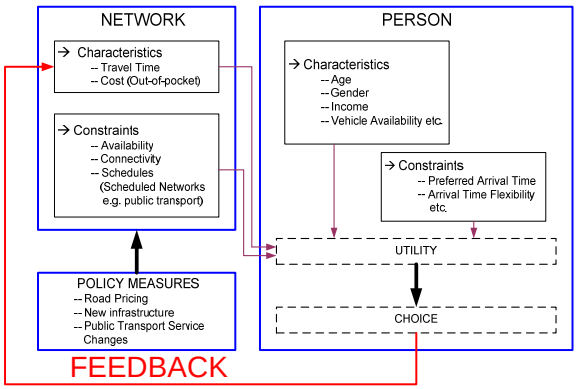
Key words: Dynamic Traffic Assignment, Route Choice, Departure Time Choice

Background

To find the spatial and temporal equilibrium distribution of passenger flows on the transport networks in response to different policy instruments is important. Passenger choices about network usage are affected by network performance in addition to personal attributes while in turn network performance is affected by passenger choices. This necessitates the use of some iterative feedback methodology to establish equilibrium as shown in the figure.



Purpose

This research aims to develop a theoretical model for the stochastic dynamic traffic assignment for combined route and departure time choice in the networks with many-to-many origin destination flows. An algorithm is proposed and applied to solve sample network for many-to-many OD flows and different factors affecting the convergence are discussed.

Method

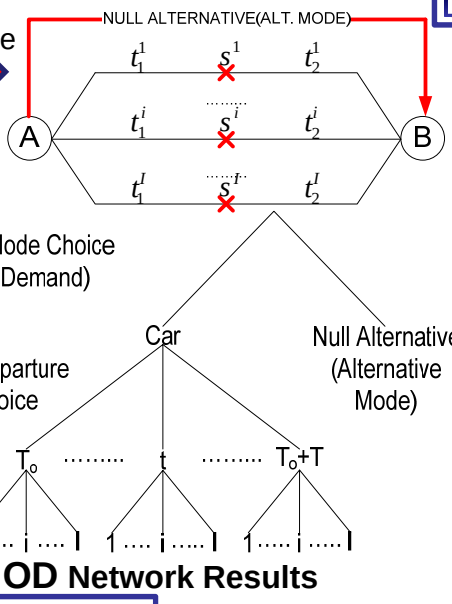
Day-to-Day Learning

MAIN MODULES
- Delay Evaluation
- Utility Evaluation
- Day-to-Day Transition

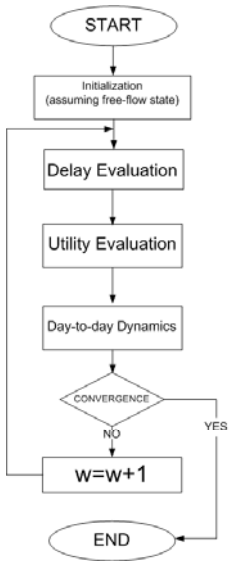
BASIC ASSUMPTIONS
- Bottlenecks have constant capacity
- Queue discipline is First-In-First-Out
- Delay at the queue is deterministic
- Time is discrete

Sample Network: Mode and route choice

Hierarchical Choice: Mode, Departure Time and Route Choice



LEARNING ALGORITHM



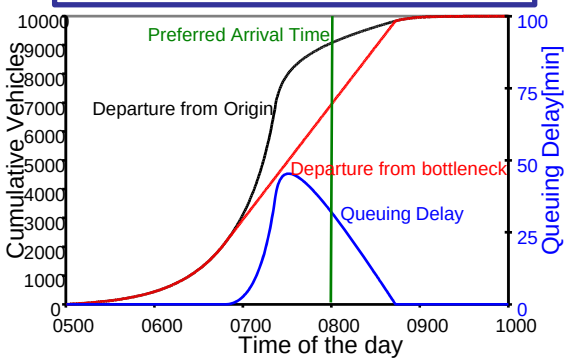
Application

To check the applicability of the proposed algorithm, the method has been applied to solve a simple single OD network and results are shown in the accompanied graph.

PARAMETERS
Demand, N = 10000 vehicles
Capacity, s = 4000 veh/hr
Choice Review Rate, R = 20%
Parameter, $\mu = 1$
Convergence tolerance, ε= 0.005

Single OD Network Results

EQUILIBRIUM FLOW DISTRIBUTION



The method has also been applied to simple many-to-many OD networks with route choice. In future, we intend to extend this methodology for real-world transport networks.

Conclusion

A stochastic dynamic traffic assignment model is proposed for route and departure time choice of the users in the network. The proposed formulation and algorithm were applied to a simple network. The algorithm was found to converge to a steady state. The sensitivity of the final steady state to the initial conditions, choice parameter and review rate was also investigated.

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