A Stochastic Dynamic Traffic Assignment Model

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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

Sample Network: Mode and route choice

Hierarchical Choice: Mode, Departure Time and Route

Stage 3: Mode Choice (Elastic Demand)

Stage 2: Departure Time Choice

Stage 1: Route Choice

NULL ALTERNATIVE (ALT. MODE)

LEARNING ALGORITHM

START

Stage 1: Route Choice

Stage 2: Departure Time Choice

Stage 3: Mode Choice (Elastic Demand)

NULL ALTERNATIVE (ALT. MODE)

EQUILIBRIUM FLOW DISTRIBUTION

Preferred Arrival Time

Departure from Origin

Departure from Bottleneck

Queuing Delay

Queuing Delay [m]

Time of the day

Cumulative Vehicles

0500 0600 0700 0800 0900 1000

0 10 20 30 40 50 60 70 80 90 100

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.

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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