Using Dynamic Traffic Assignment models to Represent Day-to-day Variability

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This paper considers alternative applications of a microscopic model of route choice (demand) and road network conditions (supply) such as DYNAMEQ where the important role of day-to-day variations in traffic conditions is recognised and modelled. Thus, in place of a single "equilibrium" state which constitutes "the solution", we propose to generate a series of possible day-to-day states whose average is used as the basis for analysis and assessment.

All drivers will recognise from their own personal experiences that traffic conditions do change, sometimes wildly and not necessarily predictably, between days. There are many reasons for this, including: (1) a different mix of drivers making different O-D trips, (2) drivers choosing different routes for the same trip, (3) differing departure times, (4) differing road conditions (caused by weather, incidents, road works, changes in traffic signals, etc. etc). Clearly, taken together, these effects lead to a day-to-day distribution of O-D travel times. However, an important PhD dissertation by Mutale (1992) at the Institute for Transport Studies, University of Leeds demonstrated that the resulting travel times are not simple symmetric and random distributions spread about an "equilibrium" but that the distributions are skewed towards higher travel times and lower speeds with the consequence that the "true" average travel time may be significantly greater than its mode or median. Tests on one particular network using "best" estimates of day-to-day variabilities gave an increase of 14% over the comparable equilibrium solution

The proposal for DYNAMEQ is therefore that, instead of using each iterative run as a stepping stone towards an ultimate single "equilibrium" point, each assignment (after a suitable "warming up period") is viewed as a representation of a different single day. Each "day" would differ from the previous "day" by the introduction of an appropriate level of randomisation of certain key variables, e.g., the trip matrix, the distribution of departure times, individual route choices, link "supply" characteristics such as speeds, etc. etc. The ultimate solution would therefore be an average of all the simulated days.

While clearly this would lead to an increase in the model complexity and the loss of a single "definitive" solution it is felt that the increased realism introduced by an explicit recognition of the effects of day-to-day variability would more than compensate. Equally it should not lead to heavy increases in run times.