A disaggregate pseudo-dynamic assignment for the activity-based model of the Greater Copenhagen Area - DTU Orbit (03/01/2019)

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The COMPAS (Copenhagen Model for Person Activity Scheduling) model being developed for the Greater Copenhagen Area recognizes the limitations of traditional approaches to transport planning, and embraces the active stream of research focusing on the activity-based paradigm for predicting travel demand and supply. On the demand side, the COMPAS model proposes a micro-simulation approach to the representation of activity and travel patterns of Copenhageners as individuals and household members. On the supply side, the COMPAS model proposes a disaggregate pseudo-dynamic approach to the assignment of Copenhageners to the multimodal network of the Greater Copenhagen Area. This paper focuses on the development of the framework for the supply side of the COMPAS model.

The framework is developed by considering that using an activity-based paradigm with a static traffic assignment negates much of the advantages of predicting travel patterns at the disaggregate level in continuous time. Accordingly, the proposed traffic assignment is individual-based, pseudo-dynamic, and multi-modal. Firstly, the assignment loads onto the network activity and travel patterns of the individuals between parcels. Secondly, the framework uses a pseudo-dynamic approach able to capture the dynamic nature of the travel pattern of the individuals and hence the building of congestion. Last, the framework loads onto the network car users, public transport users and the important share of cyclists commuting in the Greater Copenhagen Area.

The framework proposes interesting insights from a behavioral and a time perspective. From a behavioral perspective, the framework allows representing individual preference structures depending on individual attributes (e.g., value-of-time, income, age) and incorporating non-linear terms in the utility functions. The calculation of level-of-service for non-chosen alternatives (e.g., non-chosen routes, non-chosen modes, non-chosen destinations) may be solved with ghost probes running (but not loading) the network. From a time perspective, the proposed framework has a complexity similar to the static assignment. While adding the time dimension to a matrix-based assignment increases the calculation complexity significantly, proposing an individual-based approach requires only some more updating of speed-flow and flow-density functions is required. The advantages are the complexity similar to static assignment, the absence of loss of information on the trips from the demand model, the increase in explanation and prediction abilities, and the avoidance of aggregation bias of the level-of-service variables in the feedback to the demand models.

The disaggregate pseudo-dynamic traffic assignment allows: (i) capturing time-dependent interactions of travel demand and network supply of the network; (ii) representing the network at a disaggregate level; (iii) representing congestion build-up and dissipation; (iv) evaluating the effect of traffic management measures and traffic policies. When considering the main policies discussed in the Greater Copenhagen Area (e.g., measures of traffic control management, adoption of intelligent transport systems, adoption of road pricing policies), a state-of-the-art instrument such as an activity-based model with an individual-based pseudo-dynamic traffic assignment will prove highly valuable to decision makers.

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