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ADVANCING ANALYTICS

VACANCY: multimodal traffic assignment with availability and dropoff/pickup constraints

INTRODUCTION

Mobility-as-a-Service (MaaS) is a new concept that allows travelers to plan, choose, and pay for their journeys via a single service provider, regardless of the (combinations) of modes and services they use for a journey. To assess the effects of different MaaS operationalizations, its implications on the usage of the mobility system need to be included in strategic transport models. For instance, because MaaS reduces traveler-effort for combining different modes, it is expected that usage of shared services and so called mobility hubs will increase.

PROBLEM DESCRIPTION

Few strategic transport models include the features required to accurately describe behavior of travelers when confronted with MaaS as an alternative way of travelling. In (Voorhorst, 2021), three important features required to accurately model the effects of MaaS where identified (see also the figure below):

1. composite modes on tour level: the ability to change mode during a tour
2. drop off / pickup constraints: the need to return to a specific location within a tour (to e.g. return a hired bike or car)
3. availability constraints: the fact that a shared mode or service may or may not be available at a given point at a given time.

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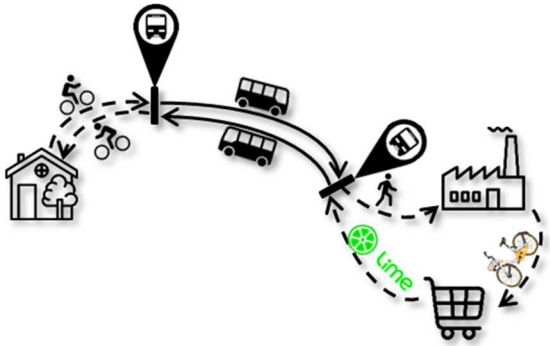

Figure: example of a home>work>shopping>home tour with multimodal trips ((shared) bike and bus), a satisfied availability constraint at the shopping location and a satisfied dropoff/pickup constraint at the left bus stop.

(Voorhorst, 2021) developed methods that successfully added these features to a microscopic strategic travel demand model describing the frequency and type of tours along with their origins, destinations and mode. (Georgiou, 2022) sketches a proof-of-concept in which he adopted the Multistate Super Network approach from (Arentze and Timmermans, 2004) to add these features to the network supply model (on which route-, stop- and line choices are modelled), but it is unclear to what extent the approach is sufficiently scalable.

RESULT / OBJECTIVE

The goal of this research is to identify or develop and test a traffic assignment model that, given travel demand, accurately models route-, stop-, and line choices of travelers on multimodal networks taking composite modes on trip level as well as availability and drop off / pick up constraints into account.

ASSIGNMENT

The student is encouraged to come up with his/her own approach, but an obvious rough work break down would be:

1. conduct literature research on multimodal traffic assignment models (e.g.: Liao, 2013) and availability and drop off/pick up constraints (e.g.: Voorhorst, 2021)
2. derive a mathematical problem formulation for the multimodal traffic assignment model for composite modes including drop off / pick up and availability constraints
3. identify / adapt / develop a solution algorithm in prototypical form
4. demonstrate the capabilities of the solution algorithm on theoretical and real life networks

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INFORMATION

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References

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