

The importance of choice set generation and selection for public transport route choice model estimation and parameter stability

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Short abstract: The generation of relevant routes and the estimation of discrete choice models are important components for modelling route choice behaviour. Literature shows increasing importance of the route choice generation technique and the size of the choice sets. This paper focuses on the choice set generation and the composition of the choice sets for use in route choice model estimations in large scale multimodal public transport networks. We describe the generation of route choice sets for passengers in the public transport system of the Greater Copenhagen Area by applying a doubly stochastic path generation algorithm and we use information of 5,742 observed choices collected in the Danish Travel Survey, the TU Survey. The importance of the techniques used to define the final choice set from the large number of routes generated is tested by comparing choice set of different sizes and created from the full choice set by using different rules. This paper adds to existing research by applying a variety of selection rules to large and exhaustive choice sets in a large scale multimodal network and by using actual choices of public transport passengers for evaluation.

The paper consists of four steps: generating universal route choice sets for the large-scale multimodal public transport network, implementing various methods for selecting objective and subjective choice sets and consideration sets (following the definitions from Hoogendoorn-Lanser, 2005), estimating mixed path size logit models based on the choice sets and observed routes and finally using the model parameter estimations based on the various choice sets to assess the importance of the sizes and compositions of the choice sets.

In Larsen et al. (2008) we presented a method to generate public transport route choice sets using a doubly stochastic path generation technique which take into account the variety in the travellers' perception of network attributes and the value of the attributes. When generating choice sets by varying in 100 iterations the parameters for the error-term and for the parameters we obtain choice sets with up to 96 unique routes for the OD pair of specific travellers. For public transport assignment the setting of the choice set composition is somewhere between discrete choice models (with a finite number of alternative routes) and a road assignment model (which in theory has an infinite number of alternative routes). Since in public transport route choice time-tables and transfers play a large role the number of reasonable options is restricted quite a lot and many alternatives are dominated by other alternatives in terms of number of transfers, in-vehicle time etc.

In random utility models we assume that a traveller maximises his utility by choosing the alternative from the choice set with the highest utility. The composition and the size of the choice set have proven to also be important for the estimation of route choice models using

such a choice set (see for an overview Bovy, 2009; Prato, 2009). In this paper we investigate the importance of the definition of the choice set, of the cleaning the choice set, the size of the choice set, the presence of dominated alternatives by estimating route choice models using the different choice sets and 5,742 observed routes from the multimodal public transport network of the Greater Copenhagen Area.

The paper shows a great significance in the parameter estimates for especially the size of the choice set. The importance of having a sufficient number of attractive alternatives in the choice set is underlined and we also see that the presence of redundant alternatives (e.g. dominated alternatives) in the choice set is not critical for the model parameter estimates. The result suggests to include if possible large choice sets in the model estimation to ensure to include all alternatives relevant and attractive to the traveller.

Keywords: Path generation, Route choice model estimation, Behavioural modelling, Multimodal transport, Large-scale network, Parameter stability

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