VACANCY INTERNSHIP PROJECT

We are looking for students interested in carrying out their internship project at DAT.Mobility

Implementation of an optimization method for OD-Matrix estimation into OmniTRANS

Problem description

In traditional 4-step transport models the fourth step is the assignment of traffic over the network links. Within strategic transport models, transport demand is described using origin-destination (OD) matrices. An OD matrix contains the number of trips per OD pair for all OD pairs defined in the model, which can then be translated into link flows using a traffic assignment model.

Traditionally, OD matrices are constructed by combining data from an estimated á priori OD matrix (e.g. from a gravity, discrete choice or activity based demand model) and observed link flows yielding a matrix that is as consistent as possible with both data sources. This is known as the (OD) matrix estimation problem which is often formulated as a bi-level optimization problem where in the upper level differences between observed and modelled link flows and OD-demands are minimized, while in the lower level the relation between link flows and (current) OD demands is derived using a traffic assignment model.

Because ever more (types of (big)) data is becoming available to modelers (e.g. gsm/gps data, Bluetooth data, wifi data), the heuristic matrix estimation method currently implemented into OmniTRANS needs to be replaced by an optimization based method that provides more flexibility in terms of types of data that can be used, whereas scalability of the method needs to be maintained (or improved) to allow for estimations using larger datasets.

Internship assignment

Earlier research [1] has shown that the OD matrix estimation used by OmniTRANS can be improved by extending the existing software with several enhancements. These are:

- Eliminate the order dependency on the vectors that influence the OD matrix.
- Apply a gradient descent method to minimize the errors between the prior matrix and the final OD matrix, modelled and observed link and/or screenline flows and modelled and observed link speeds.

The first of these proposed solutions is in development at the moment. However, the second method has not been implemented yet, and it is to be expected that the combination of both proposed methods yield the best results. Therefore, the goal of this internship assignment is to:

- Gain more insight into the gradient descent method and other similar methods
- Implement the proposed gradient descent method in the OmniTRANS transport planning software
- Study the performance and tweak the implementation to maximize performance
- Perform a case study using (big) data.

Preferably the implementation should be created using the Ruby scripting language [2], which is used by OmniTRANS to allow users to write their own extensions. The existing matrix estimation method used by OmniTRANS serves as a reference model, which allows for a comparison with the proposed gradient descent implementation.

Research group

DAT.Mobility

Daily supervisor: Geert Tasseron, software engineer DAT.Mobility

Secondary supervisor: Luuk Brederode, consultant DAT.Mobility, PhD candidate Delft University

Information

When interested in this internship assignment on implementation of an optimization method for OD matrix estimation, please contact Geert Tasseron gtasseron@dat.nl / +31629518227

References

[1] Smits, E. (2011). *Origin-Destination Matrix Estimation in OmniTRANS*. Master Thesis. Utrecht University.

[2] https://www.ruby-lang.org/en/