

Abstract

Mirsad Tulic

The lecture is going to deal with the modelling of route travel times (including their associated uncertainty) in urban networks based on taxi floating car data. The model decomposes observed link travel speeds into the expected speed (modelled using daily and seasonal profiles) and deviations thereof. The latter are shown to be strongly heteroskedastic by providing an explicit model for the time varying variance. Additionally temporal and spatial correlations are taken into account by using a vector autoregression (VAR) framework.

Modelling is supported by automatic model selection methods in order to identify the relevant effects and provide one-step ahead predictions. The potential of the proposed model are investigated using taxi floating car data from a real world test site near the core city of Vienna which exhibits a rich variety of urban traffic conditions. Different specifications of the VAR model are tested and compared. Furthermore, it was examined whether modelling travel times by using travel speeds is indeed more appropriate in comparison to using travel times directly.

The main findings of our analysis are as follows: Taxi floating car measurements of local speeds are strongly heteroskedastic and this has to be taken into account for the estimation of models for the expected travel speeds. The modelling of the mean suggests no remaining daily or weekly patterns while being superior to simple models explaining travel speeds as a linear function of the travel speeds in the last time period. The variance model successfully captures the heteroskedasticity.

The more complex models for link travel speeds including temporal and spatial correlation do not increase prediction accuracy consistently. This indicates that a sampling frequency of fifteen minutes for floating car data in urban settings appears too low to allow for temporal dependencies to be exploited for prediction. In addition to predicting route travel times, a method for computing route-travel-time uncertainty is introduced which evidently shows variability over the day for a highly frequented route. For one proposed prediction accuracy measure modelling of travel times by using travel times directly yields better results than using travel speeds, whereas a scale-independent measure suggests the usage of travel speeds.