A new approach to speed-flow curves

Fosgerau, Mogens; Hjorth, Katrine; Jensen, Thomas Christian

Publication date:
2014

Document Version
Peer reviewed version

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Authors: Mogens Fosgerau, Katrine Hjorth, Thomas Jensen

Abstract:

We develop a simple model of travel time as a function of travel demand, using loop detector data of travel times and traffic flows on a Danish motorway. Our goal is a model that avoids the potential endogeneity problems related to modelling travel time as a function of observed traffic flow. Instead, we employ the assumption that observed traffic flow is exogenous (and equal to demand) *before* congestion sets in, such that it can be used to predict when this happens. We model a single-peak scenario (morning/afternoon) with two traffic states: Uncongested and congested. We refer to the times of transition between the states as breakdown time (T_B) and recovery time (T_R). We estimate a simple distribution of travel times for each state, and we model T_B and T_R using duration models with exponential hazard rates depending on observed traffic conditions. The model predicts travel times by first predicting T_B and T_R and then applying the estimated travel time distributions.