A new approach to speed-flow curves

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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.