

Observations of Dynamic Traffic Flow Phenomena on a German Autobahn

A seminar by

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Abstract

Traffic conditions were examined along a 30-km section of northbound Autobahn 5 near Frankfurt, Germany, using archived inductive loop detector data recorded at one-minute intervals. By focusing on the spatio-temporal evolution of traffic between freely flowing and queued conditions, it was possible to identify bottleneck activations and characterize reproducible features related to their formation, discharge and dissipation. This was accomplished by systematically probing the excess vehicle accumulation (spatial) and excess travel time (temporal) that arose between measurement locations. It is shown that bottlenecks became active in the vicinity of on-ramps and off-ramps. Further, the evolution of a several shocks of low flow, low velocity, and relatively short duration were traced over an approximately 16 km distance. It is shown that once a bottleneck became active, its measured outflow was reproducible across multiple activations and across multiple days. The analysis tools used in this study were transformed curves of cumulative vehicle count and cumulative time-mean velocity, using loop detector data in their most raw form. These cumulative curves provided the resolution necessary to reveal the spatial and temporal aspects of dynamic freeway traffic flow phenomena. With increasing availability of reliable freeway sensor data, it is important to continue the systematic empirical analysis of freeways in different countries with varying geometric configurations. This research complements other research conducted by Portland State University's Intelligent Transportation Systems Laboratory on highways in the U.S., Canada, Germany, and the U.K. The results of this kind of research program will assist with all aspects of traffic flow modeling, operations, and control.