Determination of the traffic state based on speed information in urban areas

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Motivation
In a lot of small and medium-sized cities there are hardly any detection devices or other information sources that can determine the present traffic state or permit the operation of dynamic traffic management. The use of currently available sensor types is not cost-effective because large numbers of individual detectors have to be installed and service/maintenance of the devices has to be regularly performed. Therefore, most municipalities are not capable of managing traffic detectors on a large scale either financially or in terms of personnel. Hence, it is reasonable to look for alternative cost-effective methods that can be used for the determination of traffic states.

Challenge
In this context, the determination of traffic states using navigation units in vehicles offers a new approach. In this process the data of vehicles’ movements (FCD: Floating Car Data) is recorded by means of a mobile connection to a server. Hence, the speed as well as a corresponding quality index for a road segment can be determined.

The accurate calculation of current traffic volumes or degrees of saturation out of speed based information represents the main challenge since there is no simple analytical correlation between these two parameters. Therefore, as a basic idea for the calculation, a statistical model should be developed where primarily the delivered speed information serves as an input parameter.
Approach
Speed-flow equations have been developed for use in travel demand models to accurately predict the speed of traffic on urban roads. However, as already indicated above, in urban environments the corresponding correlations are quite complex since they are influenced by relatively short road segments and signalized intersections resulting in interrupted traffic flow. Hence, networks, traffic and control strategies represent influencing factors with respect to the speed-volume relationship. In this context, the adequate length of a lane is a basic condition for a lane to realize its full capacity. Thus, this study focuses on the investigation of the impact of different lengths of urban road segments on the speed-volume relationship by means of a simulative approach.

Simulative Scenario Analysis
The impact of both reductions and extensions of an urban road segment with respect to statistically significant changes in speed values under undersaturated and saturated traffic conditions will be investigated.

References


