

# On the value of relative flow data

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## Abstract

Traffic State Estimation (TSE) is an important element in road traffic operations and planning. Traffic sensing data plays a crucial role in TSE. In this study we consider a specific type of sensing data, i.e., relative flow data. These data provide observations of the flow over a path in space-time. The flow relative to an observation path does not describe the traditional flow variable, but it does describe the change in cumulative flow over the path. Automated vehicles could be used as moving observers to collect relative flow data. However, to make decisions related to the collection and the application of relative flow data, we need a fundamental understanding of the strength and weaknesses of these data. We argue that the variable observed in relative flow data (the change in cumulative flow) in combination with the potential spatial-temporal characteristics are highly suitable in TSE. The main strength of the data is that the observers which collect relative flow data (e.g., automated vehicles) can move with different speeds through space and time. This allows for intersecting observation paths. We explain that intersecting observation paths help us to limit the errors in information and to deal with the remaining errors in information assimilation. The main weakness of the data is that moving observers do not directly observe the boundary conditions of individual links. This weakness can be addressed by combining data from moving and road-side observers and/or by using data from other elements of the road network. This study should be an incentive to design TSE methodologies which benefit from the strengths of relative flow data, while dealing with its weaknesses. Furthermore, it should be an incentive to start collecting these data. Combined, the availability of the data and TSE methodologies can make relative flow data an important data type in road traffic operations and planning.