

Bird's Eye Perspective on Traffic Flow – New Insights from observing traffic from a helicopter

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Abstract:

In order to truly advance traffic flow theory, information regarding the spatio-temporal characteristics of macroscopic traffic flow characteristics is necessary but not sufficient. In fact, detailed accounts of the time-space behavior of all individual vehicles in a region of interest are needed. The seminar work of Treiterer (1974) already indicated the potential of these data, showing asymmetric acceleration and deceleration and the hysteresis phenomenon.

Since then, different initiatives have been started in order to collect extensive data sets of vehicle trajectories, such as NGSIM project and the 'Tracing Congestion Dynamics' project (Hoogendoorn and Van Zuylen, 2004). In the former, vehicle trajectory data are collected from fixed locations (high-rise buildings). In the latter, these data are collected using a mobile platform (a helicopter), the main advantage of which is the increased flexibility of the data collection location.

This contribution provides a review of these new approaches to microscopic traffic data collection. We briefly describe the observation technique, as well as the algorithms used to derive the vehicle trajectory data from the camera images collected. We will show a couple of examples of data analysis techniques and review the main new findings of applying these to the gathered trajectory data. This includes new insights from model identification at the individual driving level, such as inter-driver heterogeneity, multi-leader behavior, lane-changing and overtaking. Furthermore, we will present results of collecting and analyzing trajectory data to study driving behavior under specific circumstances (i.e. driving behavior during incident conditions).

Finally, we will discuss some of the remaining open questions and how these questions might be answered in the near future. In particular, we will discuss the need to fly along with the traffic for a prolonged period of time to investigate intra-driver differences, as well as intensifying the empirical research on driving behaviour under special circumstances.

References

1. Treiterer, J. and J. Myers (1974). The hysteresis phenomena in traffic flow. In: D. Buckley (ed) *Proceedings of the Sixth Symposium on Transportation and Traffic Flow Theory*. 13-38, Elsevier.
2. Hoogendoorn, S. P. and H. J. van Zuylen (2004). Tracing Congestion Dynamics with Remote Sensing. Management and Information Systems 2004, Malaga, Spain, WIS