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Generation and Analysis of a Large-Scale Urban Vehicular Mobility Dataset

Abstracts:

The surge in vehicular network research has led, over the last few years, to the proposal of countless network solutions specifically designed for vehicular environments. A vast majority of such solutions has been evaluated by means of simulation, since experimental and analytical approaches are often impractical and intractable, respectively. The reliability of the simulative evaluation is thus paramount to the performance analysis of vehicular networks, and the first distinctive feature that has to be properly accounted for is the mobility of vehicles, i.e., network nodes. Notwithstanding the improvements that vehicular mobility modeling has undergone over the last decade, no vehicular mobility dataset is publicly available today that captures both the macroscopic and microscopic dynamics of road traffic over a large urban region. In this paper, we present a realistic synthetic dataset, covering 24 hours of car traffic in a 400-${\rm km}^{2}$ region around the city of Köln, in Germany. We describe the generation process and outline how the dataset improves the traces currently employed for the simulative evaluation of vehicular networks. We also show the potential impact that such a comprehensive mobility dataset has on the network protocol performance analysis, demonstrating how incomplete representations of vehicular mobility may result in over-optimistic network connectivity and protocol performance.