Data Infrastructure for Connected Vehicle Applications

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Abstract

Ann Arbor Connected Vehicle Test Environment (AACVTE) is the world’s largest operational, real-world deployment of connected vehicles (CVs) and connected infrastructure, with over 2500 vehicles and 74 infrastructure sites, including intersections, midblock, and highway ramps. The AACVTE generates a massive amount of data on a scale not seen in the traditional transportation systems, which provides a unique opportunity for developing a wide range of CV applications.

Our work introduces a data infrastructure that processes the CV data and provides interfaces to support real-time or near real-time CV applications. There are three major components of the data infrastructure: data processing, performance measurements generation, and visualization. The data processing algorithms include SPaT data compression, lane phase mapping identification, trajectory data map matching, and GPS coordinates conversion. Simple performance measures are derived from the processed data, including the time-space diagram, vehicle delay, and observed queue length. Finally, a web-based interface is designed to visualize the data.

This data infrastructure provides a solid foundation in developing further CV applications. There are a lot of potential CV applications regarding traffic state estimation, traffic control, and safety, can be built upon this connected data infrastructure.