

# Urban Traffic State Estimation Problems from Bluetooth Data

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## Abstract

The application of the Bluetooth (BT) technology to transportation has been enabling researchers to make accurate travel time observations, in freeway and arterial roads. The Bluetooth traffic data are generally incomplete, for they only relate to those vehicles that are equipped with Bluetooth devices, and that are detected by the Bluetooth sensors of the road network. The fraction of detected vehicles versus the total number of transiting vehicles is often referred to as Bluetooth Penetration Rate (BTPR). The aim of this study is to precisely define the spatio-temporal relationship between the quantities that become available through the partial, noisy BT observations; and the hidden variables that describe the actual dynamics of vehicular traffic. To do so, we propose to incorporate a multi-class traffic model into a Sequential Montecarlo Estimation algorithm. Our framework has been applied for the empirical travel time investigations into the Brisbane Metropolitan region. The results are compared against taxi data and some problems using BT to reconstruct traffic states will be discussed.