EXIMIUS: A Measurement Framework for Explicit and Implicit Urban Traffic Sensing

Zhou Qin
Dept. of Computer Science

4/30/2019 at 10:00 am
CoRE B (305)

Abstract

Urban traffic sensing has been investigated extensively by different real-time sensing approaches due to important applications such as navigation and emergency services. Basically, the existing traffic sensing approaches can be classified into two categories, i.e., explicit and implicit sensing. In this paper, we design a measurement framework called EXIMIUS for a large-scale data-driven study to investigate the strengths and weaknesses of these two sensing approaches by using two particular systems for traffic sensing as concrete examples, i.e., a vehicular system as a crowdsourcing-based explicit sensing and a cellular system as an infrastructure-based implicit sensing. In our investigation, we utilize TB-level data from two systems: (i) vehicle GPS data from 3 thousand private cars and 2 thousand commercial vehicles, (ii) cellular signaling data from 3 million cellphone users, from the Chinese city Hefei. Our study adopts a widely-used concept called crowdedness level to rigorously explore the impacts of various spatiotemporal contexts on real-time traffic conditions including population density, region functions, road categories, rush hours, etc. based on a wide range of context data. We quantify the strengths and weaknesses of these two sensing approaches in different scenarios, then we explore the possibility of unifying these two sensing approaches for better performance. Our results provide a few valuable insights for urban sensing based on explicit and implicit data from transportation and telecommunication domains.

Examination Committee: Prof. Desheng Zhang (Chair), Prof. Richard Martin, Prof. Yongfeng Zhang, Prof. Konstantinos Michmizos.