Call for papers

IEEE Transactions on Intelligent Transportation Systems

Special Issue
on

Real-Time Traffic State Estimation

MOTIVATION AND SCOPE

The term traffic state estimation refers to measuring or inferring values of the key traffic state variables, such as density, flow, speed, and delay, by using a combination of observed and derived traffic-related data.

Due to recent advances in vehicular networking and sensor technology and by exploiting existing and emerging computer and communications paradigms, the task of estimating traffic state parameters in real-time has become technically feasible but remains a very challenging task. Real-time traffic state estimation is of fundamental importance to ITS since it plays a key role in dynamic route guidance, incident detection, short-term travel time prediction, and various Measures of Effectiveness parameters. Not surprisingly, the topic has received a good deal of well-deserved attention in the recent literature.

The past decade has seen a rapid convergence of systems that exploit vehicles' ability to communicate with each other and with surrounding infrastructure, promising to revolutionize the way we drive by creating a safe, secure, and robust computing environment that will eventually pervade our highways and city streets. Inspired by the increased sophistication of present-day vehicles and motivated by advances in vehicular networking, the US-DOT has started promoting the Connected Vehicles (CV) initiative. By using dedicated wireless connectivity between the vehicles participating in the traffic, the CV technology aims to promote an increased awareness of real-time traffic conditions and to reduce the number and severity of crashes. As it turns out, one of the benefits of the CV initiative is that decentralized real-time estimations of various traffic parameters, including traffic density, can be derived without the need to involve pre-deployed infrastructure. An attractive feature of decentralized protocols is that both traffic data collection and the computation are performed locally by the vehicles involved in the traffic, rather than remotely in the cloud. This saves time without sacrificing computational accuracy, a definite plus. In addition, the CV technology ensures that the dissemination of the results occurs in real-time using some flavor of Vehicle to Vehicle or Vehicle to Infrastructure communications.

Several researchers have suggested that one can go well beyond the CV initiative by taking advantage of the latest information, networking, and communication technology applications to collect traffic data, estimate in real-time traffic conditions and develop and disseminate route

guidance to drivers. For example, Connected Autonomous Vehicles (CAV) are expected to enable new real-time traffic parameter estimation mechanisms, and as a result, better strategies for allocating roadway capacity. This will revolutionize the driving experience making it safer, more enjoyable, and more environmentally friendly.

Similarly, the phenomenal success and adoption rate of the Internet of Things (IoT) is poised to create opportunities for the efficient collection, management, and dissemination of real-time data collected and aggregated locally by the vehicles participating in the traffic. Importantly, we are witnessing an exciting development where, for the first time, the vehicles participating in the traffic are collecting and aggregating traffic data without any need for pre-existing infrastructure that is expensive to deploy and maintain.

The use of machine learning techniques integrated with traffic data, has triggered several researchers' interest. It is essential to consider these techniques when looking at traffic data.

One of the stated goals of this special issue of IEEE Transactions on ITS is to explore ways in which the latest development in CAV and IoT technology can help with real-time traffic state parameter estimation both under current conditions where our roadways see a mix of driven and automated vehicles and the near future where virtually all vehicles will be fully autonomous.

LIST OF TOPICS: Topics of interest to this special issue include, but are not limited to:

1. Advances in legacy methods for estimating traffic state parameters
2. Probe vehicle-based traffic parameter estimation methods
3. Mobile observer-based methods
4. CAV-based real-time traffic state estimation methodologies
5. AI techniques for traffic state estimation
6. Use of IoT devices for traffic data collection
7. Use of mobile clouds and edge computing for traffic data collection and parameter estimation
8. Use of vehicular crowdsourcing for traffic data collection
9. Environmental aspects of traffic-related applications
10. Algorithms for macroscopic traffic parameter estimation
11. Effect of penetration rate on the accuracy of data collection and parameter estimation
12. Information security and privacy
13. Implementations and prototypes
14. Support for Smart Cities

PAPER SUBMISSION GUIDELINES

Paper submission must conform to the information for authors available on the IEEE Transactions on Intelligent Transportation Systems webpage.

TIMELINE

Deadline for paper submission:	November 1, 2021
Notification of first decision:	February 28, 2022
First revision submission:	April 1, 2022
Notification of final decision:	August 1, 2022
Final manuscript (camera ready):	September 1, 2022
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