

ABSTRACT

Li, Howell, Purdue University, May 2013. Traffic Signal Performance Measures using High-Resolution Data. Major Professor: Darcy Bullock.

Traffic signal management as it is practiced has great potential for improvement by leveraging the already-mature modern communication and software technologies so commonly in use today. Wireless networks, file buffering and data transfer scheduling, Relational Database Management Systems (RDBMS), and Web-Application technologies allow transportation agencies that cover a wide geographic area to monitor their infrastructure effectively and efficiently with limited resources. This is aided by defining monitoring thresholds for assessing communication quality that can allow agency personnel to better prioritize goals and objectives for improving signal infrastructure operation. In addition, based on previous work by Purdue, high-resolution signal controller event data is revisited with a more simplistic approach for looking at intersection operation based on phase termination activity. This method is aimed at producing a practice-ready, non-computationally intensive performance visualization for engineering practitioners. The dashboard view provides a quick way to evaluate intersection capacity redistribution opportunities between different conflicting movements at an intersection. A case study of a 12-signal corridor at State Route 37 in central Indiana ties together the concepts of (i) how to assess and troubleshoot signal controllers in an active traffic management system using data analytics, (ii) how to adapt new data structuring and storage techniques to improve the flexibility of a pre-existing link-optimizing algorithm for signal re-timing, and (iii) how to evaluate signal re-timing results as a feedback component to agency objectives using large-scale, crowd-sourced vehicular speed information.