ABSTRACT

Freije, Richard S. M.S.C.E., Purdue University, May 2014. Graphical Performance Measures for Practitioners to Triage Split Failure Trouble Calls. Darcy Bullock.

Detector occupancy is commonly used to measure traffic signal performance. Despite improvements in controller computational power, there have been relatively few innovations in occupancy-based performance measures or integration with other data. This thesis introduces and demonstrates the use of graphical performance measures based on detector occupancy ratios to verify potential split failures and other signal timing shortcomings reported to practitioners by the public. The proposed performance measures combine detector occupancy during the green phase, detector occupancy during the first five seconds of the red phase, and phase termination cause (gap out or force off). These are summarized by time of day to indicate whether the phase is undersaturated, nearly saturated, or oversaturated.

These graphical performance measures and related quantitative summaries provide a first-level screening and triaging tool for practitioners to assess user concerns regarding whether sufficient green times are being provided to avoid split failures. In addition, they can provide insight about whether a split adjustment would be an appropriate course of action, and they can provide outcome-based feedback to staff after making split adjustments to determine whether operation improved or worsened.

This thesis also includes two case studies that demonstrate how the performance measures can be used to identify phases experiencing several oversaturated splits and compare the number of oversaturated splits before and after reallocating green time to mitigate the oversaturation. Oversaturation was reduced at the intersection of US-31 and 126th St. north of Indianapolis and at the intersection of River Rd. and the US-231 bypass of West Lafayette.