ABSTRACT

Smaglik, Edward J. PhD, Purdue University, May, 2005. Evaluation of Vehicle Flow Rate Detection at Signalized Intersections. Major Professor: Darcy Bullock

State of the practice signal timing techniques used at isolated actuated controlled intersections often result in sub-optimal operation. This thesis proposes two new tactical control algorithms and two new strategic procedures. The first tactical control algorithm implements gap out logic on a lane by lane basis. In comparison with traditional shared lane detection, observed green times were reduced by 5% with a 51' stop bar detection zone and 2.4% with a 6' advance detector. A second tactical control algorithm integrated real time stop bar presence detection with real-time flow rate information to identify a downstream flow restriction. If a flow restriction was identified, a phase with a constant call could be terminated earlier than the specified maximum or split time. This algorithm was validated by using the real-time data to predict downstream bottleneck conditions and then viewing the archived video for confirmation of the condition. In 88% of the cases, visual inspection confirmed the algorithm made the appropriate choice.

The real-time flow rate information was also used to estimate real-time volume-to-capacity (v/c) ratios that could be used as input into a strategic control algorithm. Data was collected to confirm public reports of a short left turn phase and identify during which time periods this occurred. As a result, a 5 second split reallocation was implemented. Graphs illustrating before and after performance document the impact of this change.