Abstract

Hainen, Alexander M., Ph.D. Purdue University, May 2014. Offset and Sequence Optimization of Diamond Interchanges Using High-Resolution Event-Based Data. Major Professor: Darcy Bullock

Signalized diamond interchanges are pairs of intersections characterized by interlocked left turns and relatively close spacing between ramps. Indiana has 166 signalized interchanges and there are approximately 10,000 signalized interchanges in the United States. This dissertation describes a series of performance measures derived from high-resolution signal controller data that can be used to 1) qualitatively and quantitatively assess the progression of the interior movements; and 2) optimize the internal offset and sequence to improve traffic flows within diamond interchanges.

The first part of the dissertation examines an offset optimization sweep conducted and validated at the signalized diamond interchange at I-465@SR-37S on the south side of Indianapolis, IN. The second part of the dissertation uses high-resolution field data as input to a model developed for identifying the optimal sequence. This model is applied at the signalized diamond interchange at I-69@96th Street in Fishers, IN. The third part of the dissertation extends the offset optimization principles to diverging diamond interchanges using high resolution data from the diverging diamond interchange at SR-201@Bangerter Highway in Salt Lake City, UT.

The dissertation concludes by recommending that the optimization techniques and graphical performance measures be integrated into both central signal management software and the controller front panel displays to assist engineers in monitoring and maintaining efficient operation of diamond interchanges.

Source Video: http://dx.doi.org/10.4231/R7VD6WCH

Alternate: http://youtu.be/B4qGZo2_0q4