Reductions in capital expenditure revenues have created greater demands from users for quality service from existing facilities at lower costs forcing agencies to evaluate the performance of projects in more comprehensive and “greener” ways. The use of Adaptive Traffic Controls Systems (ATCS) is a step in the right direction by enabling practitioners and engineers to develop and implement traffic optimization strategies to achieve greater capacity out of the existing systems by optimizing traffic signal based on real-time traffic demands and flow pattern.

However, the industry is lagging in developing modeling tools for the ATCS which can predict the changes in MOEs due to the changes in traffic flow (i.e. volume and/or travel direction) making it difficult for the practitioners to measure the magnitude of the impacts and to develop an appropriate mitigation strategy. The impetus of this research was to explore the potential of utilizing available data from the ATCS for developing prediction models for the critical MOEs and for the entire intersection.

Firstly, extensive data collections efforts were initiated to collect data from the intersections in Marion County, Florida. The data collected included volume, geometry, signal operations, and performance for an extended period. Secondly, the field data was scrubbed using macros to develop a clean data set for model development. Thirdly, the prediction models for the MOEs (wait time and queue) for the critical movements were developed using General Linear Regression Modeling techniques and were based on Poisson distribution with log linear function. Finally, the models were validated using the data collected from the intersections within Orange County, Florida. Also, as a part of this research, an Intersection Performance Index (IPI) model, a LOS prediction model for the entire intersection, was developed. This model was based on the MOEs (wait time and queue) for the critical movements.

In addition, IPI Thresholds and corresponding intersection capacity designations were developed to establish level of service at the intersection. The IPI values and thresholds were developed on the same principles as Intersection Capacity Utilization (ICU) procedures, tested, and validated against corresponding ICU values and corresponding ICU LOS.

Major: Civil Engineering

Educational Career:
Bachelor of Civil Engineering, BS, 1983, NED University of Engineering and Technology
Master of Civil Engineering, MS, 1989, Arizona State University

Committee in Charge:
Essam Radwan, Chair, Civil, Environmental, & Construction Engineering
Hatem A. Abou-Senna, Civil, Environmental, & Construction Engineering
Mohamed Abdel-Aty, Civil, Environmental, & Construction Engineering
Qipeng Zheng, Industrial Engineering & Management Systems

Approved for distribution by Essam Radwan, Committee Chair, on March 1, 2018.

The public is welcome to attend.