Toll plazas are becoming an essential part of the highway system, especially within the state of Florida. Many crashes reported on highways occur at toll plazas. A primary reason for many vehicle collisions happening at these facilities is the fact that each toll plaza agency has different design, signage and marking criteria. This, in turn, causes driver confusion and possible last minute weaving maneuvers. Even though the varying design of toll plazas is a clear highway safety factor, research in the field is very limited but expanding. This study focuses on one toll plaza, in particular the Dean Mainline Toll Plaza, located in Orlando, Florida. The toll plaza is located directly between two roads that are in close proximity of each other. Because of this, the toll plaza is very close to the on- and off- ramps which can be even more confusing and stressful for a driver entering or leaving the highway. The purpose of this study is to evaluate the safety and efficiency of the Dean Mainline Toll Plaza in order to make recommendations to improve or maintain the current toll plaza design, as well as potentially contribute to a nationally set design standard for toll plazas. Using the NADS miniSimTM Simulator, 72 subjects were recruited, and each subject was asked to drive 3 scenarios which were randomly selected from a pool of 24 scenarios. The following factors were changed in order to study the drivers’ behavior: signage and their location, pavement markings, distances between the toll plaza and ramps, and traffic conditions. All of these factors were altered and observed on five of the eight possible routes than can be taken through the toll plaza. The subjects were asked to complete questionnaires before and after all of the scenarios, as well as in between each driving scenario. These questionnaires included demographic characteristics, such as age, education, income, SunPass/E-Pass ownership, etc. The data collected through the driving simulator and questionnaires were analyzed by ANOVA and multinomial logistic regression models. A positive relationship was found between non-urgent lane changing and the current real-world sign conditions prior to the toll plaza. Relationships were also found between the participants’ speed in various locations and signage before the toll plaza and segment length after the toll plaza. Along with specified recommendations for future research in toll plaza safety, recommendations for the Dean Mainline Toll Plaza include maintaining the current signs and pavement markings, as they were found to be beneficial in drivers performing safe lane change maneuvers.

Major: Civil Engineering

Educational Career:
Bachelor's of Civil Engineering, BS, 2014, University of Central Florida

Committee in Charge:
Mohamed Abdel-Aty, Chair, CECE
Naveen Eluru, Associate Professor, Department of Civil, Environmental and Construction Engineering
JaeYoung Lee, Assistant Professor, Department of Civil, Environmental and Construction Engineering

Approved for distribution by Mohamed Abdel-Aty, Committee Chair, on December 21, 2015.

The public is welcome to attend.