Internship Report

Spring 2014
Florida International University
Rodney Carrero-Vila

My name is Rodney Carrero-Vila. I am an undergraduate student in the College of Engineering at Florida International University (FIU) working towards a Bachelors of Science in Civil Engineering. My expected graduation date is December 2014 after I finish my final semester. During my spring internship at Florida Department of Transportation (FDOT) District VI (D6), I worked under the supervision of Alejandro Motta, ITS Special Projects Coordinator at the SunGuide Transportation Management Center (TMC).

When I first began at FIU, I knew I wanted to become a civil engineer. I always loved to build and understand reasons as to why everything works the way it does. It wasn't until the fall of 2013 semester when I took the Introduction to Transportation Engineering (TTE 4201) course at FIU, where I found my interest in transportation and traffic. I met Dr. Albert Gan towards the end of that same semester and heard about his work in Intelligent Transportation Systems (ITS). He gave me the opportunity to work with the FDOT ITS Department at the SunGuide TMC.

I'll never forget the moment I had my interview with Dr. Gan when he asked me if I knew the difference between transportation engineering and traffic engineering. I only had a vague idea at the time so he clarified it for me. He explained that not many students understood the difference and students believe that transportation only has to do with roads and infrastructure. He also described how the most unpredictable thing in traffic engineering is not traffic signal timing but rather the human factor introduced as the motorist. No drivers are the same but traffic systems must be managed and tailored to the majority of drivers and not a small percent. He explained how ITS brought an intellectual way of managing roads and the motorists that drive them to create an efficient and safe roadway for all. After I left his office I knew that ITS was something I was fascinated in understanding and being a part of.

Before meeting Dr. Gan, I wasn't sure on how ITS affected me and my community, but I was sure to learn quickly at FDOT. When I got to the TMC my first day, Alejandro gave me a tour of the center and showed me the many great things the TMC does. He showed me how operators managed traffic and resolved multiple types of events. The operators at the TMC manage lane-blocking, non-lane-blocking, and congestion events that occur on ITS managed roadways. He showed me how all the traffic data was collected and disseminated to the public and other TMCs. He showed me how efficient and accurate the TMC is when managing events and giving out information to other motorists. It was a long first day of my internship but it was insightful to say

the least. I was in awe of how technology improved roadways the way it did and how the implementation of interoperable ITS technology through multiple traffic engineering studies could improve travel times and reduce congestion.

The goal at the TMC is to enhance the safety and security of motorists by formulating the appropriate responses to events as to minimize delays and maximize mobility. Everything is about speed and doing things precisely the way it needs to be done. To do that, the TMC requires a lot of technology to increase its capabilities while keeping errors to a minimum.

The first task given to me was to read and learn the TMC's Standard Operating Guidelines (SOGs). These guidelines were meant to teach me the ins and outs of everything an operator had to do when handling any type of event. The SOGs covered from what an operator had to do when there is a car accident happening on I-95 up to debris found on the road on US-1 down in the Keys. When I was done reading the SOGs and had a good understanding of the different processes an operator had to complete when I handling an event, I was given the task to complete a quality control study on a random 10% check of all lane-blocking events from a previous month. As part of the daily activities of the operators, if there is an traffic event that occurs on an ITS managed highway, they must respond quickly and effectively to clear the problem and to reduce the possibility of secondary events from occurring in cause of the primary event.

FDOT uses a state-wide software called SunGuide Software which allows the operators to manage and record traffic events in real-time as they are happening. There is also a software used to check for procedural errors an operator makes when managing traffic events. After taking a couple of weeks to understand the SOGs, I began the quality control study to validate the results given by the quality control software.

The quality control process consists of checking over a random 120 lane-blocking events from a previous month for operator errors and comparing that to the software. I manually reviewed over all the lane-blocking events and determined the errors I found based on the SOGs. The objective of the quality control process was about enhancing the software so that it may match SOG requirements. So I took it a step further and went into the system's programming to see exactly what it was checking for. If any checks were not included in the programming of the system, I had to determine the complexity of the work required to match SOG requirements. Some of the

enhancements were easy to fix but others required a more detailed and complicated programming solution. This overall process allowed me to find the root of a problem and to come up with a way to fix it from the bottom up.

My next task was to complete a semi-annual travel time study. Again, the TMC relies on technology to manage traffic effectively and so validation of ITS devices used to manage traffic effectively must be performed frequently. For this study, the ITS detectors will record average speeds of all the vehicles on ITS managed roadways every 20 seconds and sent to the SunGuide software. The data is then processed by the SunGuide software and travel times are generated. These travel times are then relayed to the motorists through Dynamic Messaging Signs (DMS) and published on the 511 Website. This is called travel time messaging which provides motorists with estimated travel time information and placed on DMSs to provide motorists with information about travel conditions such as lane blockages and also to displays travel times. The 511 website publishes real-time information of events and travel times so motorists are able to make educated decisions when choosing their routes.

The travel time validation study takes actual ground time to travel a roadway through GPS technology and is called a “floating car study”. I was given a budget to work with and planned the most efficient way to complete the study. Before the study began, I looked up the past travel time study to find which travel times were different from the data generated from the ITS detectors. To perform an optimal study, the roadways that had differing results with the devices were chosen to be a part of this study. Drivers were recruited from FIU to have available drivers throughout the week to perform the study. So throughout out a single day the research vehicle would be driving 10 hours of each day. I collected the data for the travel times on I-195. The study was completed and the data for I-95, SR 826, I-195, and I-75 highways is being compiled and analyzed. When that is completed, the data will be compared to the travel times developed from the ITS detectors. There on, the detectors will be inspected and fixed to collect accurate data.

My final task at the TMC is to plan and prepare the annual Ramp Metering Measure of Effectiveness (MOE) study in the summer. Ramp metering/signaling is a method used to reduce bottle-neck congestion and accidents near entrance ramps resulting in a more free-flowing highway. The study will consist of collecting data encompassing ramp backup, waiting time on

the entrance ramp, maintenance of ITS devices and much more. With the data taken we will be able to determine the level of service (LOS) for that corridor thus measuring the ramp signal's effectiveness. In planning the study, the ramp meters that have to be monitored will be chosen based on last year's MOE study.

My experience here at FDOT has been encouraging because I feel as if I'm going in the right direction. I have been able to learn about the importance of the work done by the ITS department in moving South Florida into the future of traffic engineering. I have been able to acquire knowledge not only from the classroom setting but from the actual work field. I have been through schooling all my life and with a practical approach like this experience, it has motivated me to want to understand more and make things more effective. As a young engineer, I hope to grow into a quick learning and always determined engineer. I believe the future of traffic engineering is in ITS. It is an exciting time to be a part of this innovative approach to one of the oldest practices there is. I hope to continue in this field and to hopefully make a difference in it. I am grateful to Dr. Gan and Alejandro Motta who gave me this opportunity to be a part of this great program.