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Data Analytics and Evaluation of the Gainesville Trapezium Connected Vehicle Signal Phasing and Timing (SPaT) Deployment Project

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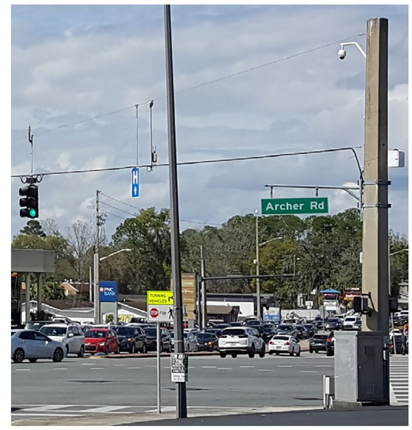
Current Situation

Radio waves are the basis of most wireless communications, which can be long-range like cell phones or short-range like Bluetooth. Dedicated short-range communications (DSRC) is another type of communications that "connected" vehicles can use to talk to each other or to transportation infrastructure, e.g., traffic signals. Because these communications operate using different radio frequencies and different "languages," they do not interfere with each other. DSRC can be used in systems that measure the flow of traffic and adjust signals in real time in response to heavier or lighter traffic or possibly an incident such as a crash. In this way, traffic data transmitted via DSRC can help to improve the safety and efficiency of roadways. This requires rapid data transfer and fast processing to turn the data into useful information.



A fisheye camera (upper right) collects video at the intersection of 34th St and Archer Rd in Gainesville, FL, a part of the Trapezium network used for this project.

Research Objectives

University of Florida researchers evaluated the efficacy of connected vehicle (CV) technologies in improving efficiency and safety within a network of signalized intersections.

Project Activities

The researchers installed various sensing equipment, including loop detectors and video cameras, as well as the roadside units (RSUs) that collect and process data from the sensing equipment, along four connecting Gainesville roads and intersections called the Trapezium. The RSUs used DSRC to receive data from connected vehicles, which are equipped with on-board units (OBUs). The RSUs also sent traffic data from the traffic signals to the OBU where the data were displayed to aid the driver. The sensing technologies were the first layer of this system. In this project, the researchers focused on the second layer of the system that collects and processes the traffic data. The second layer consisted of the RSUs (edge computation), local servers, and cloud-based components, each of which performed specific data processing tasks.

The researchers studied traffic behavior before and after the implementation of the CV system. The "before" study used existing data for crash statistics, operational studies of several intersections, and detector data to provide a baseline of both traffic operations and safety on seven Trapezium intersections. In the "after" study, the researchers collected traffic data from Trapezium sensors and the CVs to test the performance of the traditional and CV data collection pipelines to determine the efficacy of the CV system. Some comparisons were not possible because the before and after studies were impacted by the emergence of COVID-19, which had a strong effect on traffic patterns. However, many valuable observations were made, including the successful operation of the CV system and the responses of CV drivers. Drivers' comments pointed researchers to many possible improvements in the system.

Project Benefits

Successful implementation of the CV system on the Trapezium is an important step in developing methods which can lead to safer and more efficient roadways.

For more information, please see www.fdot.gov/research/.