Florida Department of Transportation Research

Feasibility Analysis of Real-time Intersection Data Collection and Processing Using Drones

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Current Situation

The ability to manage and process raw data about traffic into insightful information continues to progress in parallel with the ability to collect data in the field, with the trend toward greater volumes of data that are more detailed. With modern computers and data analysis techniques, these data give traffic engineers new insight into how traffic moves through roadway systems. Data collection at intersections is of special interest because operations at intersections are often critical to efficient traffic flow. Transportation agencies have been seeking more efficient methods of collection data on traffic in general and intersections in particular. Video images of traffic captured by drones offer a new tool to agencies because computers can be used to extract useful and highly detailed information from video.

Understanding the complex movements of traffic at intersections is critical to improving safety and efficiency.

Research Objectives

Florida State University researchers examined the feasibility of extracting detailed intersection traffic data from drone videos using computer vision applications.

Project Activities

The researchers reviewed the relevant literature and analyzed the state-of the-practice for using drones with video and image processing techniques for conducting traffic studies that meet state standards. Through their analysis, they developed guidance and recommendations on legally and safely using drones for video capture as well as best practices, strategies, and potential barriers. They also identified the types of data and computer processing elements that would be needed to support traffic studies.

The researchers then focused on a pedestrian safety task: they developed a system to use drones for automated crosswalk detection and mapping to create a statewide crosswalk inventory. This would replace the current manual system, which is expensive and time-consuming, while improving accuracy. The automated system was tested in three case studies. The researchers also collected pedestrian crash locations from historical data to identify where pedestrian crashes occurred. The analysis was limited by the scattered nature of the crashes, but it revealed the types of locations where these crashes occur, such as left-turn lanes.

Field tests were conducted with the aid of a drone service contractor. These tests were conducted at five Florida locations. Video data were collected at each site and subjected to a computer analysis that attempted the very complex task of extracting the trajectories of all individual vehicles in the images.

Finally, the researchers compared the costs of traditional methods and drone-based traffic data. Even in the worst-case scenario, the new methods that exploit drone and computer technologies had significant cost advantages compared to traditional methods. The researchers concluded the report with guidelines and recommendations to help move toward adoption of the use of drones for collecting traffic data at intersections.

Project Benefits

This project demonstrated the feasibility of a traffic data collection alternative that is safer and less expensive while offering greater accuracy and usefulness.

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