TRAFFIC FLOW MONITORING FROM AIRBORNE LIDAR/CCD DATA

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Abstract: This paper provides a summary review of a 3-year research program on the feasibility of using airborne LiDAR (Light Detection and Ranging) and imagery data collected simultaneously over transportation corridors for estimation of traffic flow parameters, such as (1) vehicle counts, (2) vehicle classification, (3) vehicle velocity per vehicle category, and (4) intersection movement patterns. This work is conducted by The National Consortium for Remote Sensing in Transportation-Flows (NCRST-F), led by The Ohio State University, supported by the U.S. Department of Transportation and National Aeronautics and Space Administration (NASA). The major focus is on improving the efficiency of transportation systems by integration of remotely sensed data with traditional ground data to monitor and manage traffic flows. Our research effort is focused on vehicle extraction and traffic pattern modeling based on airborne digital data, collected by frame cameras and LiDAR systems.

The two primary areas of the research activities, presented in our earlier publications, were the required performance of the sensor geolocation/georegistration, and the automated algorithms for image processing and object modeling. This paper is a summary overview of the NCRST-F research accomplishments over that past three years. The emphasis is on the demonstration of the operational/processing capabilities, while the algorithmic developments and implementation were published earlier.

Based on actual data collected over the transportation corridors, it is demonstrated that if LiDAR data of sufficient spatial density are available, vehicle extraction and their classification can be effectively performed together with the road surface modeling. It is shown, however, that for better accuracy and reliability, a fusion of LiDAR with frame image data is desirable. The examples of the vehicle extraction and the road surface modeling are based on two high-density (2-4 points/m^2) LiDAR datasets collected on February 19, 2004 over downtown Toronto area and on December 2, 2004 over Road 40 in the Madison County, OH calibration range, respectively with the Optech ALTM 30/70 LiDAR system. High-accuracy georegistration of the LiDAR data was provided by the Applanix POS AV system (http://www.applanix.com/).