

Sensing Methodology for Intelligent Traffic Sign Inventory

Enhanced traffic sign detection methodology to improve the productivity of an image-based sign inventory for state DOTs

Based on the need to inventory signs and manage them more effectively, Yi-Chang (James) Tsai from the School of Building Construction at Georgia Tech has developed an enhanced traffic sign detection methodology to improve the productivity of an image-based sign inventory for state DOTs. This method includes two enhanced algorithms: a) a lighting dependent statistical color model (LD-SCM)-based color segmentation algorithm that is robust to different image lighting conditions, especially adverse lighting and b) a partial differential equation (PDE)-based shape detection algorithm that is immune to discontinuous sign boundaries in a cluttered background. Inventors have also explored a new traffic sign retroreflectivity condition assessment methodology to develop a mobile method that uses emerging computer vision and mobile light detection and ranging (LiDAR) technologies to assess traffic sign retroreflectivity conditions. The invention includes three components: 1) a feature-free image-LiDAR registration method employing camera calibration and point co-planarity to register the 3D LiDAR point cloud with the 2D video log images 2) a theoretical-empirical normalization scheme to adjust the magnitude of the LiDAR retro-intensity values with respect to LiDAR beam distance and incidence angle based on the radiometric responses, and 3) a population-based retroreflectivity condition assessment method to evaluate the adequacy of a traffic sign retroreflectivity condition based on the correlation between the normalized LiDAR retro-intensity and the retroreflectivity values.

Summary Bullets

- Ability to measure signs faster and safer

Solution Advantages

- Ability to measure signs faster and safer

Potential Commercial Applications

- Measuring the amount of reflectivity off of road signs

Background and More Information

Traffic signs, which transportation agencies must inventory and manage, are one of the most important roadway assets because they are used to ensure roadway safety and provide important travel guidance/information. Traffic sign inventory and condition assessment are two important components that are essential for establishing a cost-effective and sustainable traffic sign management system. Traditionally, state departments of transportation (DOTs) have conducted traffic sign inventory and condition assessment manually, a process that is labor-intensive, time-consuming, and sometimes hazardous to field engineers in the roadway environment. Methods have been developed to automate sign inventory and condition assessment using video log images in previous study. However, the performance of these methods still needs to be improved.

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