Image–Based Registration Method for Terrestrial Laser Scanner Data

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Key words: Laser scanning; Photogrammetry; 3D point clouds, registration, digital images, 3D similarity transformation

SUMMARY

The registration of point clouds forms the first task associated with building 3D models from laser scanner data in cases where multiple scans are required for complete coverage of the scene or object being recorded. This paper presents an image-based registration method for terrestrial laser scanner (TLS) data in which the transformation parameters of one data set with respect to another are determined via 3D similarity transformation. Digital images of the object are recorded using a calibrated digital camera, rigidly attached to the laser scanner. These images are used to identify, measure and label manually in the imagery from each TLS station feature points which can be served as common points between overlapping TLS data. The spatial position and orientation of the camera within the TLS coordinate system, along with the well known collinearity equation of close range photogrammetry, are then used to automatically find the feature points in the laser scanner point clouds. Finally, the identified feature points in the scan data serve as common or 'tie' points for the 3D similarity transformation which registers one point cloud with another overlapping data set. The proposed method provides a simultaneous registration of overlapping TLS point clouds. Test results obtained with the approach are presented to highlight its practicability and accuracy.