



Automated processing of point cloud data for rockfall frequency analysis

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Rockfalls along highways in mountainous regions are a common and costly hazard. As a result, previous studies have used terrestrial laser scanning (TLS) in an attempt to better understand the mechanisms that drive rockfall and develop monitoring techniques. However, collection of high temporal resolution LIDAR data can be cumbersome both in terms of the quantity and the time it takes to process point clouds. We implement a method to automate the processing of TLS data for rockfall frequency analysis.

Previous studies have used TLS to analyze rockfall on a monthly or yearly basis. However, in order to employ this remote sensing method in a way that is useful for transportation agencies and to better understand how changes in weather affect the frequency of rockfall, scans must be collected at a higher frequency. We examined two roadcuts along Interstate 70 in Colorado where rockfall has been historically observed by the Colorado Department of Transportation. Scans were collected at these sites on a biweekly basis during the winter months in an attempt to better understand the correlations between temperature, precipitation, and rockfall. Collecting scans at this frequency required the development of an automation algorithm.

We implement a method that provides an automated rough and fine alignment of point cloud data using a combination of code written in C++ and algorithms provided by Point Cloud Library (<http://pointclouds.org/>). Our method uses automated parameter picking for voxel grid filtering and feature based alignment, based upon the attributes of the collected point cloud. We show results of this algorithm applied to the two aforementioned sites, compared to a manual workflow. Furthermore, work is being performed to automate the creation of volume change maps and frequency magnitude curves.

The implementation of this algorithm has potential ramifications for use by the scientific community and those who wish to implement terrestrial laser scanning in their monitoring schemes. The ability to automate processing of large quantities of point cloud data saves time that can otherwise be used for analysis of rockfall hazards.