Geophysical Research Abstracts
Vol. 16, EGU2014-4035-1, 2014
EGU General Assembly 2014

Automating slope monitoring in mines with terrestrial lidar scanners

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Static terrestrial laser scanners (TLS) have been an important component of slope monitoring for some time, and many solutions for monitoring the progress of a slide have been devised over the years. However, all of these solutions have required users to operate the lidar equipment in the field, creating a high cost in time and resources, especially if the surveys must be performed very frequently.

This paper presents a new solution for monitoring slides, developed using a TLS and an automated data acquisition, processing and analysis system. In this solution, a TLS is permanently mounted within sight of the target surface and connected to a control computer. The control software on the computer automatically triggers surveys according to a user-defined schedule, parses data into point clouds, and compares data against a baseline. The software can base the comparison against either the original survey of the site or the most recent survey, depending on whether the operator needs to measure the total or recent movement of the slide.

If the displacement exceeds a user-defined safety threshold, the control computer transmits alerts via SMS text messaging and/or email, including graphs and tables describing the nature and size of the displacement. The solution can also be configured to trigger the external visual/audio alarm systems. If the survey areas contain high-traffic areas such as roads, the operator can mark them for exclusion in the comparison to prevent false alarms.

To improve usability and safety, the control computer can connect to a local intranet and allow remote access through the software's web portal. This enables operators to perform most tasks with the TLS from their office, including reviewing displacement reports, downloading survey data, and adjusting the scan schedule.

This solution has proved invaluable in automatically detecting and alerting users to potential danger within the monitored areas while lowering the cost and work required for monitoring. An explanation of the entire system and a post-acquisition data demonstration will be presented.