Advances in Pit Wall Mapping and Slope Assessment using Unmanned Aerial Vehicle Technology

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Abstract

As mining in open pits progresses deeper, keeping slopes stable becomes more complex. Multi-bench scale instabilities can result in significant economic loss. To address this concern, systematic documentation and evaluation of the performance of benches in open pit mines is essential for pit slope assessment. This includes collecting structural and geomechanical data for rock mass characterization as well as information on the geometry and configuration of the benches. The collected data allow evaluating if the excavated slopes comply with the design specifications and enable assessing the factors contributing to the bench geometry, slope failure mechanisms and observations of blast damage.

Advances in technology have made the use of unmanned aerial vehicles (UAV) for photogrammetry data collection more feasible. This thesis presents methodologies to integrate the UAV technology in open pit mine operations for collecting high quality data. Experiments were carried out at four different operating mines. The collected data was processed and useful information was extracted for design compliance audits, blast optimization studies, and slope stability analysis. This research aims to demonstrate the advantages and limitations of using this technology to collect and process field data.