Rock slope discontinuity extraction from 3D point clouds: Application to an open pit limestone quarry

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Abstract: Discontinuities dominantly play a key role in the mechanical, hydraulic and deformational behavior of rock masses, frequently having a considerable influence on the stability of rock slopes. Thus, it is importance to have a profound knowledge about the discontinuity network in rock engineering. Meanwhile, quarry is a common place for instability of the rock slope happens due to the activities on site such as excavation and blasting. These activities eventually create fractures, faults, and joints. Traditional measuring techniques are prone to human bias and provide only a rough knowledge about the discontinuity network. To increase the reliability of discontinuity models, digital mapping techniques such as Structure from motion (SfM) using data from Unmanned Aerial Vehicle (UAV) and remote sensing, like Close-Range Terrestrial Digital Photogrammetry, were developed. This paper focuses on the plane identification within 3-D point clouds using Discontinuity Set Extractor (DSE) in MATLAB® (The Mathworks Inc.). The 3-D point cloud is generated with the program Agisoft PhotoScan Professional digital photogrammetry software (version 1.1.6) from photos using UAV method. To verify the plane identification with MATLAB® the results were compared with manual mapping. Rosette plot of both methods show the same direction but different in quantity of the discontinuities set. The most dominant direction is N330˚ - N340˚ on NNW-SSE. While, the least dominant discontinuities orientation happens to occur at E-W with the direction of N080˚-N090˚.

Keywords: Open pit quarry, discontinuity, point clouds, UAV

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