Proposed session theme: Response of rock massif to human impact

Application of metric 3D images of rock faces for the determination of the response of rock slopes to excavation

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ABSTRACT:

High quality discontinuity data acquisition requires extensive mapping efforts. Several restrictions complicate the field mapping. High rock faces inhibit the required access or the access is threatened by rock falls. Also time limits restrict a complete data acquisition. Slope stability analyses therefore are based on an incomplete amount of data. Usually they treat only general kinematics. In order to remain on the safe side support measures are often overdesigned.

The application of panorama scanners to generate highly detailed 3D images of improves the quality of discontinuity data, provides a complete image of the rock mass and shortens mapping time. This paper describes a method for the analysis of rock slopes including data acquisition and evaluation with the *JointMetriX3D* documentation and measurement system, and improved keyblock analysis.

The core of the *JointMetriX3D* system is the generation of high resolution digital images using a calibrated imaging system. Using a panoramic scanner, images of up to 360° field of view are taken. Main advantage besides its high resolution (100 Megapixel) is the ability to control the field of view in the two image directions independently. For the generation of a 3D model two images of the rock face are necessary. The process follows the principles of photogrammetry, computer vision and image processing.

Once the 3D image is generated, it can be evaluated using the assessment tool *JointMetriX3D Analyst*. This software allows the geologist identifying discontinuities as lineaments or aerial traces. Measurements of orientations and lengths can be taken in the 3D images. By discriminating different discontinuity sets statistical parameters can be determined for orientation, spacing or persistence. The evaluation results in the determination of the trace network of a rock face.

The evaluated discontinuity network is used to perform slope stability analysis based on keyblock theory. The steps of the analysis include identification of blocks, test of removability, mode analysis and stability assessment. An example illustrates the above described method. The example highlights the analysis steps including the establishment of a geometrical model for rock mechanics analyses. The geometrical model serves for the prediction of block instabilities and the design of excavation geometry, support measures, and optimisation of excavation sequences in quarries.