Graz University of Technology
Institute of Rock Mechanics and Tunnelling

Master's Thesis (MA, 30 ECTS)

Determination of the Persistence from Point Cloud Data

Description

To estimate the persistence of joints within a rock mass is one of the most challenging tasks in rock mass characterization. However, it is also one of the most important factors influencing the overall stability of a jointed rock mass as well as the possible in-situ block size distribution. A non-persistent joint exhibits intact rock bridges between the single joint planes, which can act similar to bolting and can stabilize the global rock mass [1, 2]. However, recent developments in 3D rock mass mapping enable the quantification of the persistence of single discontinuity planes at least referring to the trace length and spatial extension along the rock face [3].

In this thesis, several 3D surface models (point clouds) shall be investigated focussing on the detection of co-planar but spatially distinct discontinuity planes using the Software tool DSE (Discontinuity Set Extractor). For this, the following questions shall be treated:

- Can the definition of joint persistence be expressed by trace length and intersecting gaps and the percentage distribution?
- Are these factors determinable by analysing 3D point clouds of blocky rock masses?

Methodology

- Literature research on discontinuity characterization with focus on persistence and trace length
- Elaboration of a tool to detect co-planar discontinuity planes in a 3D point cloud (Matlab, Discontinuity Set Extractor, CloudCompare)
- Writing a technical report with the found results

Templates for the scientific report can be found on the institute's homepage. There is also a guideline for scientific writing free downloadable at the homepage, whose compliance is mandatory. The language for the report can either be in English or in German.

References

[1] Diederichs & Kaiser (1999) Tensile strength and abutment relaxation as failure control mechanisms in underground excavations, Int. J. of Rock Mechanics and Mining Sciences (36), p. 69-96; doi:10.1016/S0148-9062(98)00179-X

[2] Kim, Cai & Kaiser (2007) Rock Mass strength with non-persistent joints, in: Eberhardt, Stead & Morrison (eds.) Rock Mechanics: Meeting Society's Challenges and Demands, ISBN 978-0-415-44401-9

[3] Riquelme et al. (2015) Discontinuity spacing analysis in rock masses using 3D point clouds, Eng. Geol 195, p. 185-195; doi: 10.1016/j.enggeo.2015.06.009

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