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3D surface roughness recreation and data processing of granitic rocks and claystones, potential host rocks for radioactive waste disposal

Ildikó Buocz, Ákos Török, and Nikoletta Rozgonyi-Boissinot

Department of Engineering Geology and Geotechnics, Budapest University of Technology and Economics, H-1111, Budapest, Hungary

The determination and modelling of the stability of rock slopes, tunnels, or underground spaces, i.e. radioactive waste disposal facilities, is an important task in engineering. The appropriate estimation of the mechanical parameters for a realistic description of the behaviour of rocks results in higher safety and more economic design. The failure of stability is primarily due to the shear failure of the rock masses along fractures and joints: therefore the correct determination of the shear strength is crucial. One of the most important parameters influencing the shear strength along rock joints is their surface roughness. Although the quantification of surface roughness has been an open question during the past century, several attempts have been made, starting with 2D and continuing with 3D measurements, to provide engineers with a method for determining shear strength numerically. As technology evolved, the 3D methods became more popular and several scientists started to investigate the surface properties through laser scanning and different photogrammetrical methods.
This paper shows a photogrammetric method for the 3D digital recreation of joint surfaces of granitic rock and claystone, both potential host rocks for radioactive waste disposal. The rocks derived from Bátaapáti (South Hungary) and Mont Terri (North Switzerland) respectively. The samples are laboratory scaled specimens with an areal size of 50x50 mm. The software used is called ShapeMetrix3D, developed by 3GSM GmbH in Austria. The major steps of the creation of the 3D picture are presented, as well as the following data processing which leads to the quantification of the 3D surface roughness.