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Development of a Methodology for Estimation of In-Situ Rock Block Sizes from Two Dimensional Measurements Using Digital Image Analysis Technique

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Abstract

Rockmass properties are important considerations while dealing with civil engineering projects or deciding on stability of excavations and even breakage characteristics. In most of the cases, joints in rockmass are somewhat regular in nature and an intersection of three or more joints creates blocks of rock of variable sizes. The size of the blocks thus formed depends upon the spacing and orientation of the joints and have significance in mining and civil engineering projects. It is a difficult task to define the block volumes as in most of the exposures in excavations, only one or two joints are exposed in surface. Also, physical measurement of joint spacing and length is a tedious process by conventional means. This paper presents a methodology to use Digital Image Analysis Technique to derive the information of length and spacing of joints from calibrated high-resolution images of rock faces. It is possible to determine the area of such exposed blocks and the shape factors thereof. Such information can be used for 3D rendering of the 2D information and hence determination of the block volumes. An example of the method from a limestone mine in India has been provided with basic statistics of the data, advance ANOVA modeling and the model for block volume calculations. The efficacy of such model is also presented.

Keywords: Rockmass, Joints, Shape Factor, 3D rendering, In-Situ Block Volume