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Applicability of digital photogrammetry technique to quantify rock fracture surfaces

H.K. Seo (1), Y.H. Noh (1), J.G. Um (1), Y.S. Choi (1), and M.H. Park (2)

(1) Department of Energy Resources Engineering, Pukyong National University,Busan, Republic of Korea, (2) E&P Technology Institute, Korea National oil Corporation, Anyang, Republic of Korea

Several automatic recording mechanical profilographs have been used to perform fracture roughness measurements. The previous studies indicated that for accurate quantification of roughness the fracture roughness measurements should be obtained at a much higher resolution than that possible using the mechanical profilographs. With laser profilometers, roughness can be measured at very small step spacings to a high degree of precision. Laser profilometer, however, is limited to laboratory measurements, and only small scale roughness is represented. Waviness or large-scale roughness can be considered using a digital photogrammetry technique through in situ measurements. Applicability of the digital photogrammetry technique for roughness estimation of fracture surface is addressed in this study. Measurements of fracture surface have been performed for three rock fracture specimens using the laser profiler and the digital photogrammetry technique. The conventional roughness parameters, such as Z2, SDSL, SDH and Rp, as well as fractal roughness parameters have been estimated for roughness data obtained from each method. Obtained results showed that there were considerable amount of discrepancy on each of estimated conventional roughness parameter based on the laser profilometer and the digital photogrammetry technique. On the other hand estimated fractal roughness parameters based on both methods were found to close each other. It is very important to note that the estimated fractal roughness parameters obtained from the digital photogrammetry technique were lower than that based on the laser profilometer, even though a high degree of correlation exist between them. To perform the accurate estimation of fracture roughness, values obtained from the digital photogrammetry technique have to be corrected. The conducted research in this study have shown that the digital photogrammetry technique have strong capability to quantify the roughness of rock fracture accurately.

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