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Close-Range Remote Sensing Techniques for Analyzing Rock Discontinuity Properties

Authors : Sina Fatolahzadeh, Sergio A. Sepúlveda

Abstract : This paper presents advanced developments in close-range, terrestrial remote sensing techniques to enhance the characterization of rock masses. The study integrates two state-of-the-art laser-scanning technologies, the HandySCAN and GeoSLAM laser scanners, to extract high-resolution geospatial data for rock mass analysis. These instruments offer high accuracy, precision, low acquisition time, and high efficiency in capturing intricate geological features in small to medium size outcrops and slope cuts. Using the HandySCAN and GeoSLAM laser scanners facilitates real-time, three-dimensional mapping of rock surfaces, enabling comprehensive assessments of rock mass characteristics. The collected data provide valuable insights into structural complexities, surface roughness, and discontinuity patterns, which are essential for geological and geotechnical analyses. The synergy of these advanced remote sensing technologies contributes to a more precise and straightforward understanding of rock mass behavior. In this case, the main parameters of RQD, joint spacing, persistence, aperture, roughness, infill, weathering, water condition, and joint orientation in a slope cut along the Sea-to-Sky Highway, BC, were remotely analyzed to calculate and evaluate the Rock Mass Rating (RMR) and Geological Strength Index (GSI) classification systems. Automatic and manual analyses of the acquired data are then compared with field measurements. The results show the usefulness of the proposed remote sensing methods and their appropriate conformity with the actual field data.

Keywords : remote sensing, rock mechanics, rock engineering, slope stability, discontinuity properties
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