Geophysical Research Abstracts
Vol. 20, EGU2018-17074, 2018
EGU General Assembly 2018

Innovative low cost FOSS solution to generate 3D modelling of rock blocks

Marco Piras (1), Nives Grasso (1), Emanuele LIngua (2), Matteo Garbarino (3), Milan Kobal (4), Frédéric Berger (5), and Maria Angela Musci (1)

(1) Politecnico di Torino, DIATI, Torino, Italy (marco.piras@polito.it), (3) Dept. DISAFA, Univ. di Torino, Largo Paolo Braccini 2, I-10095 Grugliasco (TO) , (2) Dept. TESAF, Univ. di Padova, viale dell'Università 16, I-35020 Legnaro (PD), , (4) Dept. Forestry, Univ. of Ljubljana, Večna pot 83, Sl-1000 Ljubljana, (5) IRSTEA, Mountain Ecosystems Research Unit, rue de la Papeterie 2, F-38402 Saint Martin D'heres (Grenoble)

Rockfall hazard can be assessed using different approaches, depending on the characteristics of investigated areas. Often the hazard is estimated by using field data collection and databases of past rockfall events. The analysis of an occurred rockfall event is, therefore, the knowledge base for researchers and practitioners dealing with the design of rockfall protective structures and on the risk evaluation. The observation of the geometrical properties of the detached blocks, such as weight, size, volume, shape and principal fracture planes are fundamental inputs to run numerical simulation models of rock stability analysis. This contribution focuses on the approach and low-cost methods for generating geometrically correct three-dimensional models of rock blocks, in order to limit the costs of field data collection and guarantee high repeatability of the survey. Terrestrial laser scanner is currently available, but it is expensive and not flexible to be used anywhere. For these reasons, it is necessary to investigate alternative technologies and methodologies which are able to offer a faster data collection, cheaper and easy-to use, even by non-expert operators. A possible solution derive from the use of terrestrial digital photogrammetry, using "mass market" technologies for image acquisition and 3D models generation. The proposed methodology allows to estimate the sizes, volumes and shapes, to identify the fracture planes and to visualize the rock blocks in 3D. The data processing was realized using SfM-based approaches for 3D model generation. In order to give an idea of the most useful methodology that could be employed for the managing of terrestrial photogrammetric acquisition, different dense image-matching algorithms implemented in some commercial and freeware software (such as Agisoft Photoscan, VisualSFM, DGAP, etc..), some of them operating in smartphones apps in almost-real time (such as SCANN3D and 3D Creator), were analyzed. To define the methodology, we have analyzed the limits according to sizes of rock blocks and their position, as the distance among the blocks can influence time of acquisition and processing.
The described approaches were appropriately tested through a real case. The models generated by photogrammetry were compared in order the main discrepancies and differences between the generated models and to understand the capability and the limits of thedifferent approaches in terms of accuracy and computational cost. Finally, the tests conducted, have also allowed to define the operating strategies that allow to detect the object in its entirety and to optimize the generation of the 3D model from images acquired by smartphones, taking into account the acquisition distance from the object and the orientation and number of images. Part of this research is included in the Alpine Space project called ROCKTHEALPS.