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Structure from motion multi-source application for landslide characterization and monitoring

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Remotely piloted aerial vehicles (RPAS) can be considered a valuable solution for the acquisition of high-resolution dataset useful for the identification and characterization of active landslides. Usually, RPAS are equipped with RGB cameras used for the acquisition of a sequence of images, subsequently processed by a dedicated algorithm called Structure from Motion (SfM). SfM is a powerful tool able to obtain a 3D point cloud from a sequence of images taken from different points of view. The use of this approach for capturing of RGB images is only a possible solution, but many other low-cost possibilities can be adopted, i.e. smartphone.
In the presented case study, we apply SfM to process three different datasets for the study of the evolution of the Champlas du Col landslide, a complex slide reactivated in spring 2018 in Piemonte Region (north-western Italy). The reactivation of Champlas du Col landslide was principally due to snow melting at the end of a winter season, characterized by a large amount of snow accumulation. This landslide interrupted the main national road used to reach Sestriere, one of the most famous ski resort of north-western Italy.
We decided to test how SfM can be used to process high-resolution dataset to carry out the study of the landslide evolution. We use this algorithm to process different datasets: i) two RPAS RGB images sequence of the landslide taken in different moments, ii) an RPAS multi-spectral image sequence iii) terrestrial sequence of most representative kinematic elements due to the evolution of the landslide.
Using these datasets, we reached the following goals: i) we defined the boundary of the landslide, ii) we recognized the main water springs that have a direct influence in the activation of the landslide, iii) we assessed the displacement occurred between the two RGB acquisitions.