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Geomatic Techniques to Filter Vegetation from Point Clouds

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Abstract : More and more frequently, geomatics techniques such as terrestrial laser scanning or digital photogrammetry, either terrestrial or from drones, are being used to obtain digital terrain models (DTM) used for the monitoring of geological phenomena that cause natural disasters, such as landslides, rockfalls, debris-flow. One of the main multitemporal analyses developed from these models is the quantification of volume changes in the slopes and hillsides, either caused by erosion, fall, or land movement in the source area or sedimentation in the deposition zone. To carry out this task, it is necessary to filter the point clouds of all those elements that do not belong to the slopes. Among these elements, vegetation stands out as it is the one we find with the greatest presence and its constant change, both seasonal and daily, as it is affected by factors such as wind. One of the best-known indexes to detect vegetation on the image is the NVDI (Normalized Difference Vegetation Index), which is obtained from the combination of the infrared and red channels. Therefore it is necessary to have a multispectral camera. These cameras are generally of lower resolution than conventional RGB cameras, while their cost is much higher. Therefore we have to look for alternative indices based on RGB. In this communication, we present the results obtained in Georisk project (PID2019-103974RB-I00/MCIN/AEI/10.13039/501100011033) by using the GLI (Green Leaf Index) and ExG (Excessive Greenness), as well as the change to the Hue-Saturation-Value (HSV) color space being the H coordinate the one that gives us the most information for vegetation filtering. These filters are applied both to the images, creating binary masks to be used when applying the SfM algorithms, and to the point cloud obtained directly by the photogrammetric process without any previous filter or the one obtained by TLS (Terrestrial Laser Scanning). In this last case, we have also tried to work with a Riegl VZ400i sensor that allows the reception, as in the aerial LiDAR, of several returns of the signal. Information to be used for the classification on the point cloud. After applying all the techniques in different locations, the results show that the color-based filters allow correct filtering in those areas where the presence of shadows is not excessive and there is a contrast between the color of the slope lithology and the vegetation. As we have advanced in the case of using the HSV color space, it is the H coordinate that responds best for this filtering. Finally, the use of the various returns of the TLS signal allows filtering with some limitations.

Keywords : RGB index, TLS, photogrammetry, multispectral camera, point cloud
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