EGU21-15776, updated on 08 Jun 2021
https://doi.org/10.5194/egusphere-egu21-15776
EGU General Assembly 2021

Computer vision model for detecting block falls at the martian north polar region.

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Dynamic changes of Martian north polar scarps present a valuable insight into the planet's natural climate cycles (Byrne, 2009; Head et al., 2003)[1,2]. Annual avalanches and block falls are amongst the most noticeable surface processes that can be directly linked with the extent of the latter dynamics (Fanara et al, 2020)[3]. New remote sensing approaches based on machine learning allow us to make precise records of the aforementioned mass wasting activity by automatically extracting and analyzing bulk information obtained from satellite imagery. Previous studies have concluded that a Support Vector Machine (SVM) classifier trained using Histograms of Oriented Gradients (HOG) can be used to efficiently detect block falls, even against backgrounds with increased complexity (Fanara et al., 2020)[4]. We hypothesise that this pretrained model can now be utilized to generate an extended dataset of labelled image data, sufficient in size to opt for a deep learning approach. On top of improving the detection model we also attempt to address the image co-registration protocol. Prior research has suggested this to be a substantial bottleneck, which reduces the amounts of suitable images. We plan to overcome these limitations either by extending our model to include multi-sensor data, or by deploying improved methods designed for exclusively optical data (e.g. COSI-CORR software (Ayoub, Leprince and Avouac, 2017)[5]). The resulting algorithm should be a robust solution capable of improving on the already established baselines of 75.1% and 8.5% for TPR and FDR respectively (Fanara et al., 2020)4. The NPLD is our primary area of interest due to it's high levels of activity and good satellite image density, yet we also plan to apply our pipeline to different surface changes and Martian regions as well as on other celestial objects.

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