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Image inputs in Structure-from-Motion Photogrammetry: optimising image greyscaling

James O'Connor (1), Mike J. Smith (1), and Mike R. James (2)

(1) School of Natural & Built Environments, Kingston University, London, United Kingdom (k1454695@kingston.ac.uk), (2) Lancaster Environment Centre, Lancaster University, Lancaster, United Kingdom

Structure-from-motion (SfM) photogrammetry is an emerging technology receiving much attention within the geoscience community due to its ease of use and the lack of prior information required to build topographic models from images. However, little consideration is given to image inputs considering image sharpness and contrast both have an effect on the quality of photogrammetric outputs. This task is made more challenging across natural image sequences due to the presence of low-contrast surfaces which are often at oblique angles to input images.

As most feature detectors operate on a single image channel, monochrome inputs can be pre-processed for input into SfM workflows and relative accuracy measured. In this contribution we process two sets of imagery from both a real world, close range scenario (Constitution Hill, Aberystwyth) and a controlled dataset in laboratory conditions simulating a UAV flight with convergent viewing geometry. With each, we generate greyscale subsets comprised of weighted combinations of the spectral bands of the input images prior to executing SfM workflows. Output point clouds are measured against high-accuracy terrestrial laser scans in order to assess residual error and compare output solutions.

When compared with untreated image inputs into a commonly used commercial package (Agisoft Photoscan Pro) we show minor improvements in the accuracy of photogrammetrically derived products.