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RADIOMETRIC CORRECTION
OF AERIAL/UAV IMAGERY

A technology for the radiometric correction of aerial/UAV imagery by fusing with satellite imagery
BRIEF DESCRIPTION

A technology for the radiometric correction of high spatial resolution imagery (aerial or UAV). The imagery is calibrated to approximate surface reflectance by fusing with concurrent and collocated satellite imagery. The technique allows the production of seamless mosaics corrected for coarse scale atmospheric and bidirectional reflectance distribution function (BRDF) effects and does not, like many existing methods, require the manual acquisition (or provision) of ground reflectance references.

UNIQUE CHARACTERISTICS

Unlike other radiometric correction techniques, this technology does not require manual field reflectance measurements, placement of targets of known reflectance, or detailed knowledge of atmospheric conditions. Coarse BRDF adjustments can be made implicitly. The method is relatively computationally efficient and can be applied to large mosaics of imagery consisting of thousands of images.

TARGET MARKET

Remote sensing/earth observation. Scientific/quantitative analysis of aerial and UAV/drone imagery. Agriculture, forestry, conservation, climate change.

VALUE PROPOSITION & BENEFITS

Use of high spatial resolution aerial/UAV imagery is limited by radiometric variations caused by atmospheric and BRDF effects. These variations create unsightly discontinuities and gradients between and within images, and inhibit their use for quantitative analysis. This method compensates for these unwanted variations, creating a visually appealing mosaic that is calibrated to approximate surface reflectance.

TECHNICAL DESCRIPTION

The technique requires a collocated, concurrent and well-calibrated satellite image as surface reflectance reference to which the aerial images are calibrated. The bands of the reference satellite sensor should be spectrally similar to those of the aerial sensor. Satellite programmes such as MODIS make such surface reflectance products freely available. A spatially varying model is used to approximate the relationship between the surface reflectance of the reference image and the digital numbers of the aerial images. The model parameters are estimated inside a small sliding window. The model is then inverted and applied to the aerial images to estimate surface reflectance. The proposed method avoids the need to perform atmospheric and BRDF corrections explicitly. It also does not require the placement of known reflectance targets or field spectral measurements, which can be impractical (especially for historical aerial imagery), error-prone and time-consuming in many instances. The accuracy of corrections is limited by the resolution of the reference image, which is generally coarser than that of aerial imagery. The method cannot correct for small scale BRDF or other variations not captured at the reference resolution.

INNOVATION STATUS

A proof of concept was developed and tested for high resolution (50cm) multi-spectral aerial imagery by calibrating with (500m) MODIS satellite data. The result was published as a peer-reviewed scientific article in the International Journal of Remote Sensing. The technology was implemented in C++ programming language. An application programming interface (API) needs to be developed to make the technology more accessible and easier to use. Further testing and development is required to extend its use, and evaluate on UAV imagery and other satellite data.

The technology is patent pending under national phase applications of WO 2018/035546 in South Africa, Australia and the USA.