A FLEXIBLE VIEW ANGLE BRDF COMPENSATION SYSTEM USING AIRCRAFT ORIENTATION INFORMATION

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ABSTRACT

The influence of sun-object-viewer geometry on the interpretation of airborne multispectral imagery has long been a problem. Solutions have included theoretical, empirical, pragmatic and unsatisfactory approaches. The objective of most, is to build correction factors which can be applied to pixels within the imagery with similar sun and viewer geometry such that the resulting image intensities is reasonably invariant with illumination and view geometry. However, the nature of these corrections is object dependent and also dependent on the ultimate use of the corrected image.

A system was developed that can be tailored to specific suites of objects and end uses. It is tested with high resolution multispectral (Casi) imagery of forest terrain and with analysis of tree and stand parameters. Unlike most current methods it is designed to work on imagery after geometric correction. This is useful because of the need for applications specific corrections and logistical problems in conducting corrections within a production stream of commercial data acquisition and geometric correction. It is an empirical system which averages pixels of a certain object type at similar view geometries, then builds a regression relationship of object radiance to view orientation which forms the basis of pixel correction offsets. The view angle is recovered from an additional channel of data added to the spectral imagery in the geometric correction process. In the case of forest areas, an algorithm based on valley following is used to isolate trees. These are then classified into general categories such as healthy conifer or deciduous. Because this classification can be influenced by bidirectional reflectance effects themselves, an iterative classification approach can be invoked where successive classifications and corrections are conducted. This produces a good correction for, say, conifer trees. However, the radiometrics of other objects, shaded areas for example, is corrupted. An adaptive correction can be applied which incorporates multiple correction curves for different surface types.