OPTIMIZATION OF IMAGE PARAMETERS USING A HYPERSPECTRAL LIBRARY: APPLICATION TO SOIL IDENTIFICATION

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Abstract

The growing number of sensors dedicated to a particular application raised questions about the image parameters that meet the needs of this application. The objective of this work is to describe a methodology for estimating these image parameters for a given application. Pedology has been chosen as the application for the interest found in the hyperspectral field and according to the accessible data.

For this purpose, we analyzed a hyperspectral library specialized in bare soils spectra [1]. This library contains spectra of 90 soil samples acquired under various conditions of observation, lighting and moisture. As a first step, this library has been reduced by analyzing the influence of observation and illumination conditions on the spectra and the influence of soil moisture on the spectra. The spectral distance chosen is Spectral Angle Mapper because it cancels the effects acquisition conditions (sun and viewing angle) between 2 spectra [2]. Only spectra acquired in zenithal conditions were kept in the library. We also studied the influence of soils moisture on the reflectance but this study did not achieve to reduce more the library size [3,4]. We then used the reduced spectral library to optimize the image parameters: the spectral resolution (position and width of the bands), the quantization and the signal-to-noise ratio. At each step, the criterion for optimization has always been the rate of good classifications. This optimization leads to reduce the data volume and the processing costs. Selection is preferred to compression in order to keep bands corresponding to physical truth. The main idea of this methodology is to study the evolution of some classification results for different values of the parameters.

Applied to a wide spectral library corresponding to the soil identification domain this methodology gives significant results. The rate of well classified spectra (93,4%) remains almost unchanged (92,5%) when the high spectral resolution (1 nm, 1751 bands, 24 bits) is

highly degraded (130 nm, 12 bands, 10 bits). These results show that the size of the spectral library can be significantly reduced from 378 Mb to 1 Mb.

Results obtained on the optimization of the spatial resolution [4] with airborne hyperspectral image will also be presented in this conference.

Keywords: *Remote sensing, Hyperspectral, Spectral library, Optimization, Image parameters, Pedology.*

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