Automatic normalization of multi-temporal, hyperspectral data

Allan A. Nielsen
Technical University of Denmark
aa@imm.dtu.dk

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Morton J. Canty
Research Center Jülich, Germany
m.canty@fz-juelich.de

Abstract

A recently proposed method [1] for automatic radiometric normalization of multi- and hyperspectral imagery based on a) an invariance property of canonical correlation analysis and hence of the Multivariate Alteration Detection (MAD) transformation, and b) orthogonal linear regression, is extended by using

1) an iterative re-weighting scheme based upon no-change probabilities, and
2) a regularization scheme,

both introduced in a change detection setting in [2]. In [3] the application of the re-weighting scheme in normalization of multispectral satellite data is introduced. This re-weighting scheme in a series of iterations establishes an increasingly better estimate of no-change pixels, i.e., the observations on which the normalization is to be based. The regularization scheme prevents potential numerical problems in the procedure, and it can be designed so that it exploits the fact that the spectral variables are ordered by wavelength, a fact ignored by the original method [1] and by the re-weighting scheme [2]. The procedure is first investigated with partly artificial data and then applied to bi-temporal, hyperspectral imagery. Substantial improvement over the previous method is obtained for a scene which exhibits a high proportion of change.

References

[1] Morton J. Canty, Allan A. Nielsen and Michael Schmidt (2004). Automatic radiometric normalization of multitemporal satellite imagery. Remote Sensing of Environment 91(3-4), 441-451.

[2] Allan A. Nielsen (2006). The regularized iteratively reweighted MAD method for change detection in multi- and hyperspectral data. Accepted for IEEE Transactions on Image Processing.

[3] Morton J. Canty and Allan A. Nielsen (2006). Improved automatic radiometric normalization of multitemporal satellite imagery. Submitted.