HYPERSPECTRAL DATA: BAND SELECTION ALGORITHMS COMPARISON

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Band selection in hyperspectral data is a very crucial problem that cannot be easily solved (i) due to the size of the dataset and the redundancy of information. Especially in urban area this compelling problem has to be carefully proceeded due to heterogeneity of radiance and potential noise. Drastically reducing the number of irrelevant or redundant spectral bands might help to enhance the quality of the information by getting ride of noise and to minimize running time consumption. The topic of this paper is to test three methods to overcome this problem although they proceed differently.

Two of these methods are standard hyperspectral analysis techniques: stepwise multiple regression analysis and another proposed by ENVI software (Research Systems Inc) (ii,iii). The key concept of the latter consists in reduction of spatial and spectral data dimensions to identify only a few key spectra (endmembers). Endmember identification is refined by spectral libraries and techniques for spectral unmixing to be finally implemented in Spectral Angle Mapper (SAM) classification.

The third method deals with feature weighting algorithms (iv,v,vi). Feature weighting consists in discovering weight vector(s) used by a classification algorithm in a set of such algorithms. The discovered weights can be global (the same weights are used for each object to classify) or local (different weight vectors are used for different classes). The way the feature weights are used depends on the classification algorithm tested. Feature weighting is used here for selecting/weighting spectral bands in hyperspectral images. An unsupervised classification method with local feature weighting has been defined in (vii). The method consist in searching the best feature weights according to a statistical quality index (based on clusters compacity) by a genetic algorithm (stochastic optimization method).

All are applied on a CASI hyperspectral image of Strasbourg (2005, September). Comparison of relevancy of the classification results provide interesting insights to pursue genetic learning approach.

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