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Title of Thesis: Extracting Flexible Hyperspectral Crops Patterns

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Abstract :

Hyperspectral measures are used to capture the degree of similarity between two spectra. Spectral angle mapper (SAM) is an example of such measures. SAM similarity values range from 0 to 1. These values do not indicate whether the two spectra are similar or not. A static similarity threshold is imposed to recognize similar and dissimilar spectra. Adjusting such threshold is a troublesome process. To overcome this problem, the proposed approach aims to develop learnable hyperspectral measures. This is done through using hyperspectral measures values as similarity patterns and employing a classifier. The classifier acts as an adaptive similarity threshold. The derived similarity patterns are flexible, as they are able to capture the specific notion of similarity that is appropriate for each spectral region. Two similarity patterns are proposed. The first pattern is the cosine similarity vector for the second spectral derivative pair. The second pattern is a composite vector of different similarity measures values. The proposed approach is applied on full hyperspectral space and subspaces. Experiments were conducted on a challenging benchmark dataset. Experimental results showed that, classifications based on second patterns were far better than first patterns. This is because first patterns were concerned only with the geometrical features of the spectral signatures, while second patterns combined various discriminatory features such as: orthogonal projections information, correlation coefficients, and probability distributions produced by the spectral signatures. The proposed approach results are statistically significant. This implies that using simple learnable measures outperforms complex and manually tuned techniques used in classification.

Keywords:

Hyperspectral measures; Support vector machines; Adaptive similarity threshold.