Extraction of Spatial Frequencies using Empirical Mode Decomposition for Classification

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Abstract

Class separability represents the nature of a data set and determines the optimum performance that a classifier may achieve. A data set of good class separability has a potential of obtaining high classification accuracy. Class separability is usually considered inherent and predetermined, so efforts have rarely been made to increase class separability. The objective of this study is to present a method for increasing class separability.

There are two applications in this study. One is to reduce within-class variance prior to spectral classification of remote sensing imagery. The other is to increase the dimensions of the features based on the HHT. We construct two methods in the first application: One is to smooth the pixels among detected edge; the other is to remove the high frequency image from original image. The difference between two methods is that the first method will preserve the edge information completely, and the second one smoothes the whole image. These methods have a restriction that classes must have different means. Our goal is to integrate the sub-elements of each class, while reserving sharp boundaries between objects. We have found that after smoothing, classes have decreased internal variability and increased separability. Pixel-wise spectral classification of the smoothed image yields a relatively clean thematic map.

In the second application, we can divide the frequencies into several groups, ranging from high to low frequencies, after analyzing the frequency domain computed by the HHT. These different frequency groups are similar to the frequency analysis by the wavelet transform. From the experiment, we have found that it can be done in increasing accuracy. And the more segmentation of frequency the higher accuracy can be acquire