Fusion of Shape and Spectral Features for the Classification of High Spatial Resolution Remotely Sensed Imagery

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Abstract:

Classification of multispectral data with high spatial resolution is investigated. High spatial resolution remotely sensed (HSRRS) images with multispectral bands such as QuickBird and IKONOS provide a large amount of information, thus opening up avenues for new remote sensing applications. However, their availability poses challenges to image classification. Due to the complex spatial arrangement and spectral heterogeneity even within the same class, conventional spectral classification methods are grossly inadequate for HSRRS imagery. In order to overcome this inadequacy, spectral features must evidently be complemented by one or the other means. Shape is an important feature of high spatial resolution remotely sensed (HSRRS) imagery, and it is the manifestation of textures on such imagery. In this paper, a spatial feature index, pixel shape index (PSI), is proposed in order to describe the shape feature in a local area surrounding a pixel. PSI is a pixel based feature,

which measures the gray similarity distance in every direction. As merely the shape feature is inadequate for classification of HSRRS imagery, the spectral bands are added to the input vectors of our classifier. And then a fast fusion algorithm which integrates both shape and spectral features using the support vector machine (SVM) has been developed to interpret the complex input vectors. To test the effectiveness of PSI, some spatial features extracted by wavelet transform (WT), gray level co-occurrence matrix (GLCM) are utilized for comparison. Experimental results demonstrate that PSI is capable of describing the shape features effectively and leads to more accurate classifications than other methods, meanwhile the classification algorithm fusing spectral and shape features by SVM is feasible. It is also found that spectral and shape features can complement each other and their integration can result in enhanced accuracy.

Key words: PSI; spectrum; SVM; fusion; high spatial resolution