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Quality Metrics Evaluation of Hyperspectral Images

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Abstract. In this paper, the quality metrics evaluation on hyperspectral images has been presented using k-means clustering and segmentation. After classification the assessment of similarity between original image and classified image is achieved by measurements of image quality parameters. Experiments were carried out on four different types of hyperspectral images. Aerial and spaceborne hyperspectral images with different spectral and geometric resolutions were considered for quality metrics evaluation. Principal Component Analysis (PCA) has been applied to reduce the dimensionality of hyperspectral data. PCA was ultimately used for reducing the number of effective variables resulting in reduced complexity in processing. In case of ordinary images a human viewer plays an important role in quality evaluation. Hyperspectral data are generally processed by automatic algorithms and hence cannot be viewed directly by human viewers. Therefore evaluating quality of classified image becomes even more significant. An elaborate comparison is made between k-means clustering and segmentation for all the images by taking Peak Signal-to-Noise Ratio (PSNR), Mean Square Error (MSE), Maximum Squared Error, ratio of squared norms called L2RAT and Entropy. First four parameters are calculated by comparing the quality of original hyperspectral image and classified image. Entropy is a measure of uncertainty or randomness which is calculated for classified image. Proposed methodology can be used for assessing the performance of any hyperspectral image classification techniques.

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