TARGETED CLASSIFICATION OF REMOTE-SENSING IMAGES

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ABSTRACT:

In many remote-sensing applications the interest is solely devoted to a reduced targeted subset of land-cover classes. This happens for instance when the attention is focused only on specific types of vegetation in forest areas (e.g., grassland, woodland) or different surface types in urban settlements (e.g., buildings, green areas). In these circumstances, retrieving training samples for the only targeted classes of interest generally represents a less-complicated task (e.g., an operator with a good knowledge of the problem could do it by visual inspection). Nevertheless, supervised approaches cannot be successfully employed, due to the lack of training samples for most of the remaining land-cover classes characterizing the investigated scene. The proposed technique allows overcoming this limitation. The probability density function (PDF) of the image is modeled as a mixture of Gaussian kernels using the Expectation-Maximization (EM) algorithm. Then, the conditional PDF of targeted classes is modeled by properly weighting the resulting set of kernels using the EM algorithm over the available training samples. In fact, the PDF of the whole image is itself a mixture density both of targeted classes of interest and the “unknown class” corresponding to all the other land-cover classes characterizing the scene. An innovative approach based on Markov Random Fields is used for estimating prior probabilities and weights characterizing the “unknown class”. Each pixel of the image is finally associated with one of the targeted classes or the “unknown class” by minimizing a suitable energy function. Experimental results confirmed the effectiveness and reliability of the proposed technique.

TOPIC: Land cover classification
ALTERNATIVE TOPIC: Remote sensing applications

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