

TARGETED CHANGE DETECTION: A NOVEL SENSOR-INDEPENDENT PARTIALLY-SUPERVISED APPROACH

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ABSTRACT:

Change-detection problems are often related to the identification of targeted land-cover transitions. Let us consider the case of two images acquired over the same area at times t_1 and t_2 , where the objective is to identify all the patterns experiencing the targeted transitions from class "A" to class "B", under the hypothesis that a ground truth for "A" at t_1 and for "B" at t_2 is available (or can be retrieved by an operator). In such framework, supervised techniques cannot provide satisfactory accuracies, as in each image labeled samples are available only for a single class. To this aim, we propose a novel partially-supervised technique capable of handling even different types of images at the two dates (e.g., hyperspectral and multispectral). The probability density function (PDF) of each image is modeled as a mixture of Gaussian kernels using the Expectation-Maximization (EM) algorithm. Then, at both dates the conditional PDF of the targeted class 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 entire image is itself a mixture density of the targeted class of interest and the "unknown class" corresponding to all the other classes characterizing the scene. An innovative approach based on Markov Random Fields is used for estimating prior probabilities and weights characterizing the "unknown class" at each date. Changed pixels are finally identified by minimizing a proper energy function. Experimental results confirmed the effectiveness and the reliability of the proposed technique.

TOPIC: Change detection and process modelling

ALTERNATIVE TOPIC: Remote sensing applications