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MAPPING OF ACTIVE RAISED BOGS WITH AN ITERATIVE ONE-CLASS CLASSIFICATION APPROACH

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ABSTRACT:

The member states of the European Union are obliged to report on the status of the valuable habitats listed under Annex I of the Habitats Directive. Active raised bogs are amongst these habitats and can be monitored very well as they feature a distinctive spectral-temporal behaviour, e.g. in multi-seasonal RapidEye data. One-class classifiers have been proposed in order to increase the cost-effectiveness of mapping single or few classes. These classifiers do not have to be trained with an exhaustive training set, instead, only the sample of the class of interest is required for training. However, the limited information content of these data makes the training of an accurate one-class classifier challenging. Thus, unlabeled data is often required for deriving accurate classification results. While the computational complexity of many powerful algorithms increases strongly with the number of training pixels, a sufficient number of unlabeled pixels is required such that it comprises the relevant information. In order to resolve this trade-off an iterative one-class classification approach is investigated in the presented study. We train a biased Support Vector Machine (BSVM) with a relatively small set of unlabeled pixels and classify the image in two classes: negatives (here: 'not active raised bogs') and unlabeled. The classification is performed based on a conservative rule such that it prevents positive (here: 'active raised bogs') pixels to be classified as negatives. Then the classification is performed again on the remaining unlabeled pixels and repeated until convergence. Our results show that the iterative approach outperforms a one-step BSVM classified with a large set of training samples. This approach has further advantages due to the fact that only a small fraction of all image pixels remain unlabeled in the last iteration. As a consequence, analysis techniques for model and threshold selection can be applied which might not be feasible using the complete image.

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