**Abstract title**
Support Vector Machines for multitemporal and multisensor change detection

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**Abstract text**

Long-term change detection often implies the challenge of incorporating multitemporal data from different sensors. Most of the conventional change detection algorithms are designed for bi-temporal datasets from the same sensors detecting only the existence of changes. The labeling of change areas remains a difficult task. To overcome such drawbacks, much attention has been given lately to algorithms arising from machine learning, such as Support Vector Machines (SVMs). While SVMs have already been applied successfully for land cover classifications, the exploitation of this approach for change detection is still in its infancy. Few studies have already proven the applicability of SVMs for bi- and multitemporal change detection using data from one sensor only.

Within the ENVILAND 2 project (www.enviland.de) we demonstrate the application of SVMs for multitemporal and -sensor change detection. Our study site covers lignite open pit mining areas in the German state North Rhine-Westphalia that have been subject to excavation for more than 60 years. This includes areas in different stages of active mining and past and present recultivation. The dataset consists of multiband SAR (ALOS-Palsar, ERS-1/-2, ENVISAT-Asar) and multispectral optical data (Landsat-TM, ASTER, SPOT-4) covering three time slots (1992, 2001 and 2009). The data are co-registered with sub-pixel accuracy.

The SVM is conducted using the IDL program imageSVM. Change is deduced from one time slot to the next resulting in two change maps. In contrast to change detection, which is based on post-classification comparison, change detection is seen here as a specific classification problem. Thus changes are directly classified from the two bi-temporal datasets. To reduce the number of change classes, we created a mask that contains only those pixels that belong to the active open pit in at least one of the time slots. Training data were selected for different change classes (e.g. settlement to open pit or open pit to forest) as well as for the no-change classes (e.g. agriculture or water). Subsequently, they were divided in two independent sets for training the SVMs and accuracy assessment, respectively.

Our study shows the applicability of SVMs to classify changes via SVMs using multisensor data. The proposed method yielded two change maps of reclaimed and active mines with good accuracy. A great advantage compared to other change detection approaches are the labeled change maps, which are a direct output of the methodology. Our approach also overcomes the drawback of post-classification comparison, namely the propagation of classification inaccuracies.

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