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An ensemble classification approach for improved Land use/cover change detection

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Abstract. Change Detection (CD) methods based on post-classification comparison approaches are claimed to provide potentially reliable results. They are considered to be most obvious quantitative method in the analysis of Land Use Land Cover (LULC) changes which provides from - to change information. But, the performance of post-classification comparison approaches highly depends on the accuracy of classification of individual images used for comparison. Hence, we present a classification approach that produce accurate classified results which aids to obtain improved change detection results. Machine learning is a part of broader framework in change detection, where neural networks have drawn much attention. Neural network algorithms adaptively estimate continuous functions from input data without mathematical representation of output dependence on input. A common practice for classification is to use Multi-Layer-Perceptron (MLP) neural network with backpropogation learning algorithm for prediction. To increase the ability of learning and prediction, multiple inputs (spectral, texture, topography, and multi-temporal information) are generally stacked to incorporate diversity of information. On the other hand literatures claims backpropagation algorithm to exhibit weak and unstable learning in use of multiple inputs, while dealing with complex datasets characterized by mixed uncertainty levels. To address the problem of learning complex information, we propose an ensemble classification technique that incorporates multiple inputs for classification unlike traditional stacking of multiple input data.

In this paper, we present an Endorsement Theory based ensemble classification that integrates multiple information, in terms of prediction probabilities, to produce final classification results. Three different input datasets are used in this study: spectral, texture and indices, from SPOT-4 multispectral imagery captured on 1998 and 2003. Each SPOT image is classified individually to produce the classified output and used for comparison. A MLP is trained with the input datasets separately using a backpropagation learning algorithm and prediction probabilities are produced for each pixel as evidence against each LU/LC class. An integration rule based on Endorsement Theory is applied to these multiple evidence by considering their individual contribution and the most probable class of a pixel is identified. Integration of

the three datasets by the proposed method is found to produce 88.4 % and 84.6 % for individual image. The proposed method improves the potential of using SPOT satellite imagery for change detection.

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