SYNERGISTIC USE OF MULTI-TEMPORAL ALOS/PALSAR WITH SPOT MULTI-SPECTRAL SATELLITE IMAGERY FOR LAND COVER MAPPING IN THE HO CHI MINH CITY AREA, VIETNAM

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Land cover classification is one of the most important applications of remote sensing. Synthetic Aperture Radar (SAR) and optical sensors operate in the microwave and optical/near infrared parts of the electro-magnetic spectrum, respectively, and, consequently, their imaged products reflect different characteristics of the earth surface. Integration of SAR and optical images therefore can take advantage of the complementary nature of these data, and could potentially enhance the classification accuracy [1], [2].

One of the major strengths of a SAR system is its ability to obtain multi-temporal data since it is not affected by weather conditions. Multi-temporal SAR data offers a possibility to distinguish land cover features based on temporal variation of the SAR signals, provided that there has been no transition between land-cover classes during the considered period, only a change in physical conditions [3], [4].

This paper discusses the synergistic use of multi-temporal ALOS/PALSAR SAR and SPOT multi-spectral images for land cover classification.

The test site is Ho Chi Minh city, and its surrounding region, in Vietnam. The main land cover classes that exist in the area are urban, rural residential area, vegetations, crops, bare land and water. Five PALSAR SAR images acquired between June 2007 to June 2008, and a SPOT multi-spectral image obtained in January 2008, were used for classification. Interferometric coherence data derived from pairs of SAR images, Grey Level Co-occurrence Matrix (GLCM) texture measures and Normalized Difference Vegetation Index (NDVI) were also considered important data sources.

Different combination of multi-temporal backscatter intensity images, temporal backscatter variability, coherence data, SPOT multi-spectral bands, texture measures and NDVI were tested in order to determine the best combination, which gives the highest classification accuracy. Moreover, the usefulness of each kind of input data was evaluated according to their contribution to the improvement of the classification performance.

In this study a Support Vector Machine (SVM) classifier with the Radical Basis Function Kernel (RBF) was selected as a major classifier, based on its highly effective and robust capabilities for handling of remote sensing data [5], [6]. The commonly used Maximum Likelihood Classifier (ML) was also implemented for the comparison purposes. Results indicate that the combination of SAR and optical images can give significantly higher classification accuracy than using a single type of data, and that the SVM classifier could outperform the ML classifier in the case of classification of the combined dataset.

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