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Pattern Classification for Land Cover Analysis in Satellite Images

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ABSTRACT

Land cover classification is extremely important for land use planning and management. Pattern classification is a wide research area that can classify and analyze the Earth's surface to study the natural resources and to understand many environmental phenomena.

This research aimed to apply pattern classification methods to classify satellite images into several land cover types such as water, plants, rocks, and deserts. This was done by presenting and implementing a proposed classification system.

Satellite images of two different study areas from Jeddah in Saudi Arabia were acquired by Landsat 7 ETM+.

This research presented the application of pattern recognition algorithm, the Support Vector Machines (SVM) that is a machine learning algorithm based on statistical learning theory. SVM carried out the process of classification, and gave promising results in land cover classification problem.

Ranklet transform is a recent image processing technique proposed and applied in this research as a feature extraction method. Ranklet transform is a multi-resolution and orientation selective approach similar to that of the wavelet transform; in addition, it is non-parametric that deals with the ranks of the pixels rather than with their gray-level intensity values. Ranklet coefficients as classification features could solve successfully the classification problem and gave superior results in classification performances

Furthermore, with an accurate choice of the SVM parameters and of the resolutions at which the multi-resolution ranklet transform is performed, ranklet-based images achieved an improvement in accuracy (91%) over the pixel-based (84%) and wavelet-based (86%) images. Performance evaluation was the final step in the proposed classification system, which performed in term of accuracy.