A HIERARCHICAL TERRAIN INTERPRETATION SYSTEM
USING 'PIXEL SWAPPING' METHOD

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ABSTRACT

Digital image processing is very popular for extracting terrain information from remotely sensed data. At present, most image analysis methods are still limited to the processing of images on a pixel-by-pixel basis while the human interpretation of images is mostly based on structural spatial information with a high level of context and semantics. This paper briefly describes the concept of the microcomputer-based terrain understanding system which employs hierarchical image interpretation steps using the 'pixel swapping' method.

The 'pixel swapping' method provides a unified image analysis method for spectral and spatial features in images. Image interpretation steps are divided hierarchically into a bottom-up and top-down approach. Each involves a few steps. With the bottom-up approach, an image is analyzed first by traditional low-level processing methods using numerical pixel values. The results of the numeric interpretation are interpreted in a more symbolic way by applying the 'pixel swapping' method of spatial interpretation. The symbolized images are interpreted based on the type of the attributes, constraints of the attribute values, and the spatial relations between various objects in images.

On the other hand, the targeted object in an image is divided into its constituent components and their attributes under the top-down approach. The system gives the control to the lower levels to evaluate required attribute values, if they have not been evaluated before, and compares the estimated attribute values with existing knowledge of the attributes in a data base.

The system employs an LSI-based image processor (IP9506) to accelerate low-level image processing and to facilitate the implementation of pixel swapping.