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PRINCIPAL COMPONENTS AND CANONICAL ANALYSIS FOR SKYLAB CHANNEL EVALUATION

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The spectral channels of Skylab S192 digital data were evaluated for purposes of classification and thematic mapping. A total of 29 categories were mapped for a region in southwestern Pennsylvania.

The main and secondary dimensions (axes) of the data were found by linearly transforming the original channels. Each channel was then correlated with each of the axes. Channels strongly correlated with the important principal components axes were identified as important in contributing to the total information content of the data, while the canonical analysis axes were used to identify the importance of each channel for discrimination among the various categories.

It was determined that the most important channels in defining both total information content and discriminatory variance for this application cover the long visible through short IR wavelengths (0.68-1.75 μ) and the long reflected IR band from 2.10-2.35 μ ; the least information was found in the thermal IR band (10.20-12.50 μ).

It should be noted that these results are for the general mix of land use patterns representative of western Pennsylvania. However, the methodology should be as effective in channel evaluation under other conditions, although the specific results might be quite different.

Considerable reduction in data volume can also be achieved by use of the principal components and canonical analysis transformations followed by feature selection (dimension reduction) based on information content of the transformed axes. In addition, the transformed data are ideally suited for use with color display devices.