Principal Components and Canonical Analysis for Skylab Channel Evaluation

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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 con­
tributing 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 to­
tal information content and discriminatory
variance for this application cover the
long visible through short IR wavelengths
(0.68-1.75 \( \mu \)) and the long reflected IR
band from 2.10-2.35 \( \mu \); the least informa­
tion was found in the thermal IR band
(10.20-12.50 \( \mu \)).

It should be noted that these results
are for the general mix of land use pat­
terns representative of western Pennsyl­
vania. 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 (dimenion reduction)
based on information content of the
transformed axes. In addition, the trans­
formed data are ideally suited for use
with color display devices.