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LITHOLOGIC DISCRIMINATION BY FOURIER
ANALYSIS OF IMAGE TEXTURE

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Drainage density is influenced by the erosion resistance of the underlying rocks. Ideal circumstances for lithologic discrimination by measurement of drainage network parameters are:

1) Geomorphic maturity

2) Relatively homogeneous rock structure

3) Slope as the only source of gray-tone modulation (e.g., in jungle)

An example of such a terrain would be a crystalline shield area in the wet tropics.

Our reconnaissance study involves the use of digital topographic tapes and aircraft and spacecraft (Seasat-A) radar data. The digital topographic data are first processed by SHADY 2, an algorithm that creates a scene illuminated at a selectable geometry according to a cosine scattering law. SHADY 2 has been modified to offer radar-like scattering behavior and to generate shadows.

The Fourier transforms of the images are computed and filtered with ten annular bandpass filters. The inverse transforms of the bandpass-filtered data are generated to produce images containing spatial features having a restricted range of dimensions. Spatial regions having high activity in a given frequency band will have a large variance in these images, so we generate a variance picture whose DN's are a measure of the local variance of the input image. These variance pictures (~10) are used as inputs in a supervised classifier.

Frequency slice pictures of the Klamath Mountains of Northern California show:

1) Only weak dependence on illumination geometry

2) Distinct clumping of high-activity areas

3) Differences in the location of the high-activity areas as a function of frequency