USING HYPERSPECTRAL IMAGERY TO MAP ROADS AND DETERMINE SURFACE MATERIAL TYPES

Brian S. Penn, Principal Geoscientist
Boeing-Autometric
Colorado Springs, CO 80920
Brian.S.Penn@Boeing.com

ABSTRACT

During the last several years, Boeing-Autometric has been actively engaged in using both multispectral and hyperspectral imagery to extract Lines-of-Communication (LOC), i.e., roads and rivers, for urban environments. Panchromatic and multispectral imagery lack the spectral resolution to satisfactorily determine LOC material composition. Because of this limitation, recent effort has focused on the use of hyperspectral imagery to LOC extraction and road surface material identification. Techniques developed at Boeing-Autometric allow the rapid detection of surface material types and extraction of roads from hyperspectral imagery. The surface material extraction process is a supervised classification method based on models for different material types. These models use a hybrid knowledge-based tool combining fuzzy logic and neural networks. The LOC extraction process depends on reducing redundant information contained in a hyperspectral image cube. Through careful analysis, particular bands are selected to maximize the contrast between the LOC material and the adjoining non-road surface material. The net effect is an overall reduction in the size of the data cube needed to extract LOC. An added benefit to reducing the size of the data cube is a concomitant decrease in processing time. These bands then form the basis for the road extraction process. Once the contrasting bands are identified, a flood-fill algorithm is used to delineate the boundaries for the LOC. A raster-to-vector program is then used to generate centerline vectors for the LOC. These centerline vectors are exported in Arc/View format. An example of this approach is given using AVIRIS data from the front range of Colorado.