

## A Semi-Automated Procedure for Identifying Landsat MSS Subregion Coordinates

Source code is provided for a procedure that employs a relatively low-cost digitizing tablet.

**I**N COMPUTER-ASSISTED ANALYSIS of Landsat multispectral scanner (MSS) digital data, an entire scene measuring 2340 rows by approximately 3240 pixels per row is seldom processed; rather, some area of interest in the overall scene is subsetted from a computer compatible tape (CCT) and processed. Some image processing systems permit the subsetting of rectangular regions only while others allow irregularly-bounded polygons to be processed. Remote sensing analysts using interactive video graphics devices can often "zero in" on the area of interest with the aid of a positionable cursor or a light pen. In the absence of such tools, however, the analyst must rely on determining row and column coordinates by overlaying a transparent grid on a 7.3 inch Landsat MSS frame and approximating the limits. At least two problems exist with this method. First, because the photographic printing process varies from frame to frame and because different Landsat scenes have different row-column dimensions, the standard grid overlay often does not match the image perfectly. Second, because the images consist of approximately 400 pixels per linear inch, it is very difficult to interpolate row-column values precisely.

Although many remote sensing analysts do not use interactive video graphics devices due mainly to the expense of such equipment, a relatively low-cost digitizing tablet can be found in most laboratories where spatially-related data are analyzed. This instrument can be used to improve upon row-column identification when subsetting areas from a Landsat MSS CCT. In order to account for the variability in the row-column dimensions of Landsat scenes and in the actual print or film transparency size, and to permit more precise row-column esti-

mation than by simple ocular interpolation on grid overlays, a computer program was prepared to allow coordinate determination on such a low-cost digitizing tablet.\* The program, named *SUBLAND*, is written in PL/1 and IBM EXEC programming languages and operates interactively on an IBM 3081 computer with a Conversational Monitoring System (CMS) environment. Designed to be user-friendly, a program guides the analyst through its execution. *SUBLAND* is essentially an electronic grid overlay which adjusts digitizer coordinates to Landsat image coordinates, and, while doing so, automatically accounts for both the intrinsic skewness of the uncorrected image (due to Earth rotation) and misalignment of the image on the digitizing tablet. Scalar, offset, and Cartesian polar coordinate transformations are employed. Before executing *SUBLAND*, the user needs to know the number of rows and columns in the entire Landsat scene which is to be subsetted. These values can usually be obtained from a utility program in the image processing system being used or from published information accompanying the CCT.

This semi-automated procedure for identifying row-column coordinates of Landsat image subregions is a vast improvement over the visual overlay method by being more flexible, repeatable, and precise; tests on 1:1,000,000 scale Landsat images have shown resulting subsetted areas to be within five pixels of the desired ground coverage. A listing of the PL/1 source code for *SUBLAND* follows (Figure

\* The tablet used is a Houston Instrument HIPAD, which has an effective working area of 11 by 11 inches. Similar digitizers are available from other vendors.

