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ERTS DIRECT DIGITAL PRINTING & MULTITEMPORAL DATA REGISTRATION

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The work performed for this investigation was under U.S. Geological survey support and MTL in-house research.

The hardware applied were the Mead Digital Graphics Generator and Laser Digital Printer.

DGG – A four color, ink-jet printer, 0.005 inch dot size spaced on 0.0035 inch centers yielding up to a 40 x 60 inch format. Simultaneous four color printing (yellow, magenta, cyan and black) is based on a 4 x 4 dot matrix. A 1:250,000 scale was used on the program.

LDP – Operating on the same principal as the ink-jet printer, the laser printer utilizes a 0.002 inch dot size spaced on 0.00175 inch centers. The LDP prints on transparency film, and by its dot matrix nature yields a four band ERTS product, electronically screened, that may be used directly in any color separation process. A 1:500,000 scale was used on the program printing plates.

Existing Mead Technology Laboratories software and an IBM 370-155 computer were used in the data processing work.

The objective of this study was to determine if the quality of the ERTS imagery could be improved by averaging successive passes over the same physical area.

The U.S.G.S. designated five passes over two areas of study: Washington, D.C. and Phoenix, Ariz., with the requirement that optimized imagery be derived directly from the EROS Data Center Bulk CCT's. The Mead system goes directly from the Bulk CCT's to hard-copy print-out, thereby by-passing any intermediate electronic, electro optical, or photographic processes which may lead to image deterioration.

The first step in the program was to produce black and white images to the best quality obtainable directly from the Bulk CCT's. The passes provided were then combined into one composite image by pixel by pixel averaging.

EVALUATION OF ALL-DIGITAL PRECISION REGISTRATION METHODS FOR LANDSAT MSS DATA

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ABSTRACT

A major factor contributing to the utility of LANDSAT data is the repetitive coverage of each spot on the earth's surface within the sensor's field of view at least once every 18 days. This repeat coverage makes possible: studies of crop growth; monitoring urban development and land use; and predicting water runoff from melting ice and snow, just to name a few examples. Of central importance to investigators performing these studies is the requirement that imagery and/or image data on computer compatible tapes (CCT's) register to a fraction of a pixel. This paper describes the application of all-digital processing methods to the problem of precision registration of LANDSAT MSS scenes.

Registration accuracy has been evaluated by means of change detection imagery and a precision correlation technique. Change detection imagery (generated by differencing pixel by pixel the registered scene data) for full scenes and sub-scenes show the need for high order interpolation (Cubic Convolution Process), in contrast to lower order interpolation. Statistical analyses using error histograms derived from the change detection imagery provide a more quantitative comparison.

Full scene registration accuracy was evaluated by designating a uniformly distributed set of features in one scene of a registered pair, and performing the correlation between the features and those centered at identically the same location in the other scene. Various statistics have been compiled from the results. The method also makes possible an analysis of the spatial distribution of errors, results of which are also reported.