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Developing Processing Techniques for Skylab Data
Monthly Progress Report, February 1975

EREP Investigation 456 M
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The following report serves as the twenty-fourth monthly progress report for EREP Investigation 456 M which is entitled "Developing Processing Techniques for Skylab Data". The financial report for this contract (NAS9-13280) is being submitted under separate cover.

The purpose of this investigation is to test information extraction techniques for SKYLAB S-192 data and compare with results obtained in applying these techniques to LANDSAT and aircraft scanner data.

The SKYLAB S-192 data set being studied under this contract is the same data set being studied by a group from Michigan State University under the direction of Dr. Lester V. Manderscheid. Inasmuch as ERIM has subcontracted with MSU to perform S-192 data analysis under contract NAS9-13332, a monthly report similar to this reporting the common data preparation is also being issued under that contract.

During February, technique development and processing of SKYLAB S-192 data continued. We had previously reported on initial implementation of a technique to aid in the exact location of agricultural fields in the data.

During the reporting period we successfully digitized all the points on one of the blown up U-2 photographs. A transformation was calculated, using regression techniques, to map digitized points from photograph coordinates to scan line coordinates for scan line straightened data. It is noteworthy that the best fit regression used a first order equation with no cross terms. In all we had identified about 400 fields in a 40 section (square mile) area. We then, tentatively, merged this information with the S-192 data tape. The results of the digitization and transformation were reviewed for errors by printing graymaps of the new ground information channel. Finally, this map was compared to graymaps of selected channels and the results reviewed again. Areas were identified where it was clear that a boundary in the ground information channel was not correct. Finally, a new tape was generated with a corrected ground information channel.

Work was begun on location of points, etc, in the second U-2 photography but only half this job was completed during the month.

In response to our recent request, we received a set of four tapes in conic (not scan line straightened) format covering southern Michigan. Tape 3 of the set was identified as containing data acquired over the test area proper and this tape was converted to ERIM format. A quick check of the data on the tape using the ERIM statistics and histogram program showed a marked similarity (as well it should) to the scan line straightened data we had been using. Thus it appears that the conic data had been preprocessed in the same manner as the scanline straightened data.

Our next task with the conic data was to produce graymaps, preferably undistorted, for use in locating fields, water areas, etc. We began by making a plot showing the relationship between pixels from a conic scan and their assignment to straightened line and point numbers under a nearest neighbor rule, using a simple $\{x = R\cos\phi,\ y = R\sin\phi\}$ model. With this as a guide we marked off small arcs of the conic scan (each about 45-55 points wide) where the arc was fairly linear.

The data were graymapped, in these small strips of 45 or so points, using the deslew capability in the MAP program, where the slew for each strip had been determined from the plot. (The deslew capability allows a scan line to be printed diagonally across and down the page, incrementing one line every n characters). In this manner a map of SD09 was generated which appeared to be undistorted and definitely useable for our processing needs.

During the coming month we intend to extend the digitized ground information to the conic data coordinates. We also intend to look further into the question of SDO-to-SDO misregistration in both types of data. It is anticipated that if serious misregistration exist we will be able to efficiently process the conic data where the algorithm to register the data is simple and easy to implement, instead of processing the straightened data where such corrections are not simple to make. Further, we plan to begin training procedures by extracting signatures from areas of known object class and also by utilizing clustering techniques.

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