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ALL DIGITAL PRECISION PROCESSING OF ERTS IMAGES

Ralph Bernstein
IBM Corporation
Gaithersburg, Maryland 20760

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Type I Progress Report for Period 1 December 1972 - 1 February 1973

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Greenbelt, Maryland 20771

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IBM Corporation
Federal Systems Center
18100 Frederick Pike
Gaithersburg, Maryland 20760

Type I Progress Report
ERTS-I

- a. Title: All Digital Precision Processing of ERTS Images
- b. GSFC ID Number of P.I.: PR 514
- c. Statement and explanation of any problems that are impeding the progress of the investigation:

We have not yet been able to test methods of radiometrically correcting RBV images, primarily because of the lack of calibration (Hovis sphere) data for the edges of the image area. We have been informed that NASA is attempting to generate such calibration data.

We are awaiting NASA approval of our Data Analysis plan incorporating revised schedule and funding estimates.

- d. Discussion of the accomplishments during the reporting period:

Experimentation with the SSDA and a new reseau. detection algorithm has continued. Further discussion is given below under "Significant Results".

Coding of the production system for MSS geometric correction was completed, but initial end-to-end testing revealed unacceptable geometric errors. An APL version of the transformation equations was developed to serve as a design validation tool as well as a check against coding errors in the production system. As a result of experimentation with the APL program, a number of design changes were made. Geometric accuracy, as predicted by the APL program, now appears to meet design goals. (See performance predictions under "Significant Results" below.)

The production system is now being updated to incorporate the design changes.

Coding to provide annotation and tick marks around the borders of the image is substantially complete and is undergoing initial testing.

- e. Discussion of accomplishments planned for next reporting period:

Contingent upon approval of our recommended Data Analysis Plan, it is anticipated that the following objectives will be accomplished during the next reporting period:

- o Geometrically and radiometrically corrected MSS images of the Monterey and Chesapeake test sites will be produced and recorded on film.
 - o These images will be submitted to USGS and others for independent accuracy and quality evaluation.
 - o The system for correcting RBV images will be brought to an operational state.
 - o RBV images of the Monterey test site will be geometrically and (to some extent, at least) radiometrically corrected and recorded on film.
 - o A presentation of results will be prepared and delivered at the ERTS Users' Conference in March.
 - o Experimentation with the SSDA to determine sensitivity to seasonal variation will continue.
 - o Preparation of the 2nd Type II Progress Report will begin.
- f. Discussion of significant scientific results and their relationship to practical applications or operational problems including estimates of the cost benefits of any significant results (To be prepared in scientific abstract form of 200 words or less):

GCP Analysis

Experimentation was conducted to evaluate the performance of the Sequential Similarity Detection Algorithm (SSDA) to detect and locate Ground Central Points (GCP) automatically using MSS data. Recent experiments with ERTS data having a temporal separation of from 17 to 72 days between the search area and the GCP have shown that the algorithm can find the GCP's and with an overall probability of 88% (28 of 32 GCP's). Band 5 appears to give the best results for most of the classes of GCP's investigated.

RBV Reseau Detection

A modified reseau detection algorithm has been applied to 2 RBV scenes (6 images) separated by a 12 day period. The algorithm correctly located all 486 reseaus. No false reseaus were located in a companion experiment. Changes in apparent reseau position, due to camera characteristics, were never greater than 3 picture elements in either axis.

Geometric Accuracy

The positional error of a geometrically corrected image has been predicted by the use of an APL program. The maximum deviation of the GCP's from true UTM coordinate position was computed to be 190 meters. The RMS positional error of all GCP's was 106 meters. Further refinement of the algorithm is expected to reduce the errors.

- g. A listing of published articles, and/or papers, pre-prints, in-house reports, abstracts of talks, that were released during the reporting period:

An abstract was prepared and sent to Dr. Stanley C. Fredan for the NASA ERTS-I Symposium (March 5-9, 1973).

- h. Recommendations concerning practical changes in operations, additional investigative effort, correlation of effort and/or results as related to a maximum utilization of the ERTS system.

A Data Analysis Plan has been prepared and submitted to NASA (18 January 1973) identifying recommended changes to the investigation.

- i. A listing by data of any changes in Standing Order Forms:

None

- j. ERTS Image Descriptor forms:

None

- k. Listing by date of any charged Data Request forms submitted to Goddard Space Flight Center/NDPF during the reporting period:

None

- l. Status of Data Collection Platforms (if applicable):

N/A