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THE APPLICATION OF A PARALLEL PROCESSING COMPUTER IN THE LARGE AREA CROP INVENTORY EXPERIMENT

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ABSTRACT

The Large Area Crop Inventory Experiment (LACIE) is a joint investigation by NASA, USDA, and NOAA to determine the practicality and utility of computer analyzed remotely sensed data in crop forecasting. LANDSAT imagery combined with NOAA-supplied meteorological data and ground truth history are the principal sources of LACIE information. The LACIE responsibility of NASA-Johnson Space Center (JSC) includes a Classification and Mensuration Subsystem (CAMS) which is tailored to the production problem presented by LACIE requirements to classify large numbers of fundamentally similar regions in the same manner. In short, LACIE and CAMS represent an essential change from research and development to a production environment.

Goodyear Aerospace Corporation's STARAN parallel processing computer has been successfully interfaced to the host IBM 360/75 computers at JSC to enable NASA to efficiently process the large LACIE data base.

The algorithms executed by the parallel processor, under supervision of the host, include:

Statistics - Training field means and covariances

Iterative Clustering - Cluster means and covariances, cluster maps and probability assignments

Adaptive Clustering - Cluster centers

Maximum Likelihood and Mixture Density Classifications - Classification maps and probability assignments

The addition of the parallel processing capability has resulted in execution time improvements as high as 60:1.

During this program, the Adaptive Clustering module was re-structured to take advantage of the STARAN's parallelism. The result was a significant improvement to this algorithm in execution speed, improved stability, and accurate convergence to true cluster centers.

This program has proved, operationally, that a parallel processing computer is of significant utility in the LACIE image processing application in enabling rapid and efficient processing of high-volume repetitive tasks.