Reprinted from

Eleventh International Symposium

Machine Processing of

Remotely Sensed Data

with special emphasis on

Quantifying Global Process:
Models, Sensor Systems, and Analytical Methods

June 25 - 27, 1985

Proceedings

Purdue University
The Laboratory for Applications of Remote Sensing
West Lafayette, Indiana 47907 USA

SATELLITE REMOTE SENSING DATA AS INPUT TO GEOGRAPHIC INFORMATION SYSTEMS

MANFRED EHLERS, ROY WELCH

Laboratory for Remote Sensing and
Mapping Science
University of Georgia
Athens, Georgia

(Manuscript not available at time of printing)

SUMMARY

In recent years the demand for spatial information has increased for natural resources management, geologic exploration, urban planning and agricultural studies. A much discussed approach to meeting this demand is to develop geographic or geocoded information systems (GIS) which incorporate efficient data storage, processing and display functions, and permit the integration of remote sensing data for the creation or revision of GIS layers.

Satellite programs such as Landsat-4 and -5, MOMS, and SPOT will provide digital images with spatial ground resolutions that allow the extraction of information compatible with map products of 1:24,000 to 1:100,000 scale. If these raster data sets can be demonstrated to be of consistent geometric fidelity, they also can serve as the coordinate reference system to which the GIS layers are registered. Evaluations of Landsat-4/-5 TM data demonstrate that geodetic rectification accuracies of ± 1/4 pixel can be obtained under favorable conditions, approximating U.S. National Map Accuracy Standards for 1:24,000 scale products. Thus, it would appear that thematic classifications derived from the TM data sets can be registered to base maps with minimal difficulty. In addition, automated correlation techniques have been applied to stereo TM data sets (from adjacent orbits) to derive parallaxes caused by terrain relief. From these parallaxes, terrain elevations can be computed to an accuracy of approximately ± 40 m, which is equivalent to a planimetric correlation accuracy of better than ± 0.3 pixel. The resulting DEM's can be used as a GIS layer to create contour and slope maps, or to produce orthoimages free of relief displacement.

Because of the large volume of data associated with processing satellite image data of high resolution and the creation of raster data bases, it is evident that supercomputers offer considerable promise for manipulating these data. The advantages and problems associated with the use of vector and parallel processors for the rectification and correlation of remote sensing images will be discussed.

AUTHOR BIOGRAPHICAL DATA

Manfred Ehlers received his diploma in mathematics from the University of Kiel, West Germany, and his Ph.D. degree in remote sensing and photogrammetry from the University of Hannover, West Germany. He is currently a Research Associate at the Laboratory for Remote Sensing and Mapping Science at the University of Georgia.

Roy Welch received his Ph.D. degree in photogrammetry, remote sensing and physical geography from the University of Glasgow in 1968. He was a photo-analyst with the U.S. Government from 1962 to 1964 and served as Manager, Earth Sciences Department, Itek Corporation from 1968 to 1969. In 1969, he accepted a National Research Council-National Academy of Sciences Postdoctoral Research Associateship in conjunction with the U.S. Geological Survey to evaluate factors influencing the quality of aerial and satellite imagery. Since 1971, he has been on the faculty of the University of Georgia, where he is a Research Professor of Geography. Dr. Welch is the Director, Laboratory for Remote Sensing and Mapping Science, and has published extensively on the cartographic quality of satellite image data, sensor system performance and remote sensing applications. He is the immediate Past President of the American Society for Photogrammetry and Remote Sensing.