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TRIANGULATION USING SYNTHETIC APERTURE RADAR IMAGES, Sherman S. C. Wu, and Annie E. Howington-Kraus, U.S. Geological Survey, Flagstaff, Arizona 86001

For the extraction of topographic information about Venus from stereoradar images obtained from the Magellan Mission, we have developed a Synthetic Aperture Radar (SAR) compilation system on analytical stereoplotters (Wu et al., 1986, 1987, 1988). The system software has been extensively tested by using stereoradar images from various spacecraft and airborne radar systems, including Seasat, SIR-B, ERIM XCL, and STAR-1. Stereomodeling from radar images has been proven feasible, and development is on a correct approach. During testing, the software was enhanced and modified to obtain more flexibility and better precision. Triangulation software for establishing control points by using SAR images has also been developed through a joint effort with the Defense Mapping Agency.

The SAR triangulation system comprises four main programs, TRIDATA, MODDATA, TRISAR and SHEAR. The first two programs are used to sort and update the data; the third program, the main one, performs iterative statistical adjustment; and the fourth program analyzes the results. Also, input are flight data and data from the global positioning system and inertial system (navigation information).

We have tested the SAR triangulation system with six strips of STAR-1 radar images on our VAX-750 computer. Each strip contains images of 10 minutes' flight time (equivalent to a ground distance of 73.5 km); the images cover a ground width of 22.5 km. All images were collected from the same side. With an input of 44 primary control points, 441 ground control points were produced. The adjustment process converged after eight iterations. With a 6-m/pixel resolution of the radar images, the triangulation adjustment has an average standard elevation error of 81 m.

Development of Magellan radargrammetry will be continued to convert both SAR compilation and triangulation systems into digital form.

References

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