TRIANGULATION USING SYNTHETIC APERTURE RADAR IMAGES, Sherman S.
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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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