

Automatic Generation of Tie Points for Improving the Exterior Orientation of the Mars Express Orbiter

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The European spacecraft Mars Express is now for over one year in orbit and has returned at the time of writing 302 image strips taken by the multiple line scanner HRSC (High Resolution Stereo Camera). The three-dimensional position of the spacecraft is provided by the European Space Agency (ESA) from ranging and Doppler shift measurements. Unfortunately, these parameters are sometimes poorly constrained. However, the HRSC experiment with its multiple stereo lines is designed with the goal in mind to improve these nominal values of exterior orientation by means of photogrammetric techniques. This is accomplished in two steps. First, a large number of tie points between the multiple stereo strips are extracted via digital image matching (DIM). Then, a bundle adjustment (BA) is performed to correct the EO, using the collected tie points as observations for the unknown EO parameters.

The automatic determination of tie points is carried out at Institute of Photogrammetry and GeoInformation (IPI) of Universität Hannover. The subsequent BA is carried out at Department Photogrammetry and Remote Sensing (FPF) of Technische Universität München [1]. The remaining processing like digital terrain model (DTM) and ortho photo generation is done at Deutsches Zentrum für Luft- und Raumfahrt e.V. (DLR) in Berlin Adlershof [2].

In this paper the matching approach used for automatic extraction of tie points is presented and the results of single image strips are shown. Because of the demand for image mosaics for geological evaluation of larger areas also a result consisting of five overlapping HRSC image strips is presented.

References

- [1] H. Ebner et al., *IntArchPhRS* **35** 4, 852–857 (2004).
- [2] F. Scholten and K. Gwinner, *IntArchPhRS* **35** 2, 408–413 (2004).