STEREO MATCHING TOOL, A FREEWARE PROGRAM FOR VIEWING STEREO IMAGERY AND EDITING MATCH POINTS. R. R. Herrick, Geophysical Institute, University of Alaska Fairbanks, 903 Koyukuk Dr., Fairbanks, AK 99775-7320 (rherrick@gi.alaska.edu).

Introduction: A variety of recent and ongoing missions are producing stereo image pairs as a primary or secondary data product (e.g., Galileo, MOC, HRSC). Viewing of stereo anaglyphs can be an aid to geologic interpretation, and stereo-derived topography can be invaluable for quantitative analysis. Stereo Matching Tool (SMT), is freeware that allows stereo pairs to be viewed and match points for photogrammetry to be manually edited. A first release of the software is available at http://www.gi.alaska.edu/~rherrick/smt/index.html. The software is IDL-based, requires that IDL be installed on the system, and runs on any IDL-supported platform. Stereo viewing is accomplished through the use of red – green/blue anaglyphs, so any color monitor can be used.

Input Image and Data Formats: Input images must be processed to be 8-bit grayscale images. The image pair should be processed so that both images have the same resolution and are in the same map projection. The program can move the images relative to each other both vertically and horizontally, but visually obtaining a three-dimensional effect requires that the pair be oriented so that the parallax is horizontal.

Information regarding image dimension can either be stored in a text file or input upon entry into the pro-

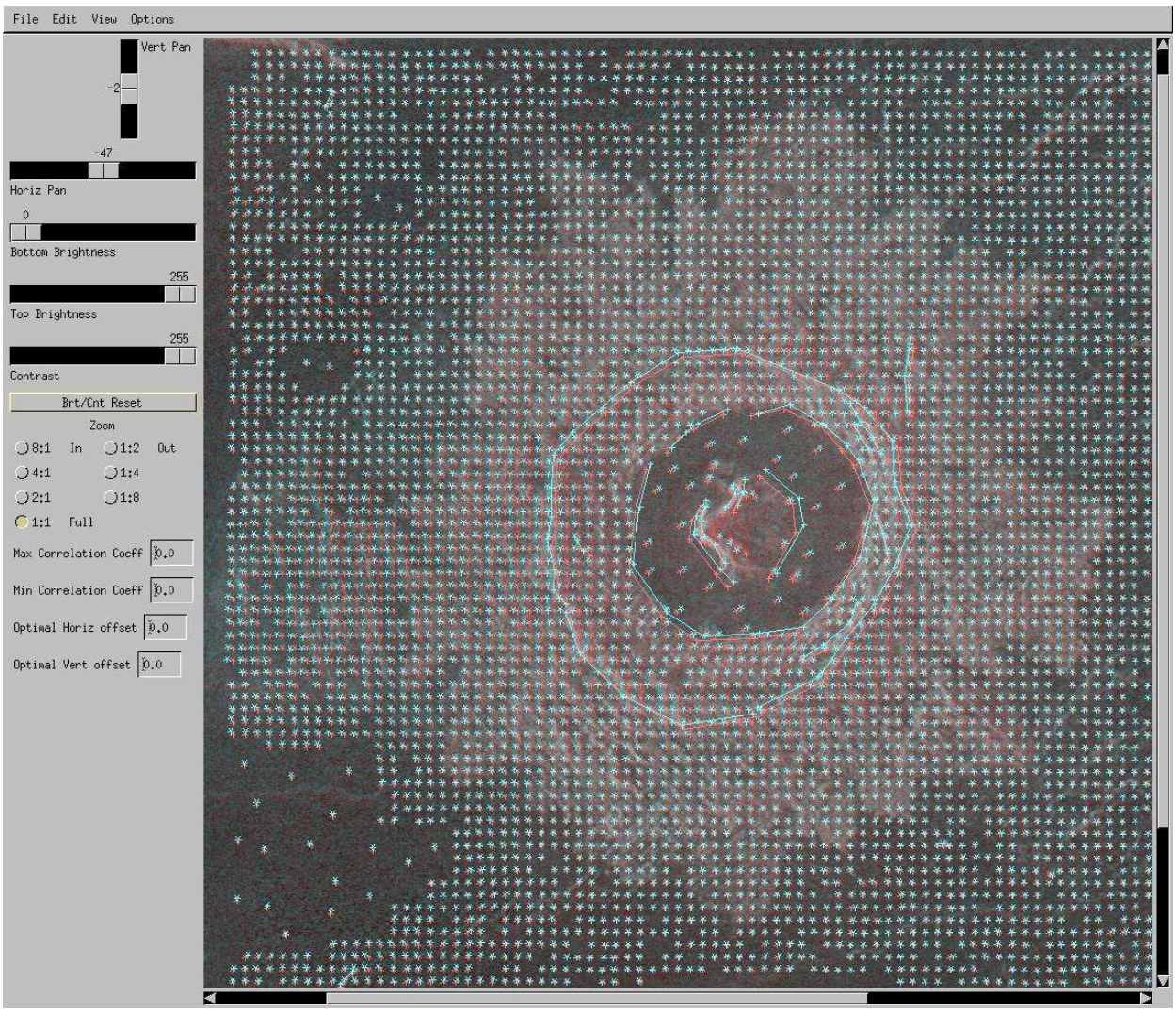

Figure 1. Screen capture from SMT program. Image is a stereo pair from the Magellan mission.

gram. Match points and match lines between the images are stored as text files. The match point file for each image has three columns giving the x and y location of each match point (in pixels) and an id number for the match point. Match lines have a similar format for the vertices of the line segments.

Program Capabilities: Figure 1 shows a window dump of the program in use with a Magellan stereo pair. The left-eye image is displayed in the red channel and the right-eye image is displayed in the green and blue channels. The images can be zoomed in and out in factor of two increments, and they can be scrolled together horizontally and vertically. Brightness and contrast levels for the pair can also be adjusted.

The left and right images can be moved independently of each other in real-time to allow manual match point selection. Display of match points and match lines can be turned on and off. Points and lines can be deleted individually or by selecting all points within a specified rectangular area. Manual addition of match points and lines can be performed with the aid of a simple cross-correlation routine that automatically adjusts the parallax to a nearby relative maximum correlation value.

Applications and Discussion: Manual editing is not feasible for photogrammetric studies that involve bulk processing of millions of match points, and automatically generated topography usually has adequate accuracy for general broad-brush interpretations. However, automated techniques often produce artifacts that are significant if one is interpreting features that are only hundreds of pixels across. Abrupt changes in topography are often smoothed over, and false topography is often introduced in featureless areas. Manual editing allows such artifacts to be corrected, and match points can be collected over specific features (e.g., a crater rim or the summit of a cinder cone) that are smaller than the nominal match-point spacing.

Figure 1 illustrates the utility of SMT for the impact crater Lullin (25 km in diameter) on Venus. Automated matching worked well for the majority of the image pair. However, false topography was generated in a few featureless areas, particularly the crater floor and the southwest corner of the image. These errant match points were deleted and a handful of points were manually selected. Match lines were selected to capture the critical slope breaks at the crater rim and crater wall-floor boundary.

Future plans include incorporating SMT into development of freeware to perform the entire photogrammetric processing stream for some of the prominent planetary stereo data sets (particularly MOC and HRSC). Comments and suggestions for further improvements are welcome.