Geophysical Research Abstracts,
Vol. 10, EGU2008-A-07337, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-07337
EGU General Assembly 2008

ExoMars Panoramic Camera 3D Vision: Expected Quality of Rover Surroundings Description

G. Paar (1), J. Oberst (4), D.P. Barnes (3), A.D. Griffiths (2), R. Jaumann (4), A.J. Coates (2), J.-P. Muller (2), Y.Gao (5), R. Li (6)

(1) Institute of Digital Image Processing, JOANNEUM RESEARCH, Wastiangasse 6, A 8010 Graz, Austria, (gerhard.paar@joanneum.at) (2) Mullard Space Science Laboratory, University College London, Holmbury St. Mary, Dorking, RH5 6NT, UK (adg/ajc/jpm@mssl.ucl.ac.uk) (3) Department of Computer Science, University of Wales, Aberystwyth, SY23 3DB, UK (dpb@aber.ac.uk) (4) German Aerospace Center, Institute of Planetary Research, Rutherfordstr. 2, D-12489 Berlin, Germany (juergen.oberst/ralf.jaumann@dlr.de) (5) Surrey Space Centre, University of Surrey, Guildford, GU2 7XH, UK (Yang.Gao@surrey.ac.uk) (6) Mapping and GIS Laboratory, CEEGS, The Ohio State University, 470 Hitchcock Hall, 2070 Neil Avenue, Columbus, OH 43210-1275 (li.282@osu.edu)

The Pasteur payload on the ESA ExoMars Rover due for launch in 2013 is designed to search for evidence of extant or extinct life either on or down to $\sim$2 m below the surface of Mars. The Panoramic Camera stereo imaging system (PanCam) on the rover will be used for visual characterization of the rover's surroundings and remote detection of potential sample sites. It consists of two wide angle multispectral cameras each with a 34° field-of-view (Wide Angle Camera WAC) and a high resolution monoscopic camera (High Resolution Camera, HRC) with 5° field-of-view, both mounted on a shared pan-tilt unit on top of the rover mast.

The optical and mechanical layout as well as ground processing software development is driven by the following scientific and operational objectives:

- Localization of the landing site (fusion between orbiter data and ground image products)
- Provision of context information to detect, locate and measure potential scientif-

ically interesting targets, particularly in view of the ExoMars mission objectives (search for traces of past and present signs of life)

- Geological characterization and cartography of the local environments (local Digital Terrain/Elevation Model or DTM)
- Complement to and/or backup of the rover visual navigation system (perception, localization/orientation/tilt within the 3D environment, path planning, 3D/visual odometry)
- Supporting the operation of other scientific instruments and complementing their data (e.g. pose determination of Magnetometer, fusion with Microscope, Monitoring of rover experiments such as drilling and coring including a characterization of the derived rock and soil products)
- Studying atmospheric properties and variable phenomena near the Martian surface (e.g. aerosol opacity, water vapour column density, clouds, dust devils, meteors, surface frosts)
- Geodetic studies (observations of Sun, bright stars, Phobos/Deimos).

Three dimensional (3D) vision processing is a key element of mission planning and scientific data analysis. The quality of images and image products describing 3D surface structure is essential to scientific and operations planning. It is therefore necessary to study the expected quality of such products. We report on the current status addressing quality issues, proposed solutions for problems or shortcomings encountered, and what open questions remain to be answered. Relevant topics include:

- Influence of compression ratio, method and effected image property (i.e. spatial, spectral, or radiometry compression)
- Geometric parameters such as stereo base length, focal length and scene distance
- Viewing parameters such as incidence angle
- Stereo matching strategy
- Influence of different wavelengths
- Geometric and radiometric properties of the scene (e.g. shadow distribution, rock distribution, overhangs, images taken at different sun incidence angle)

- Close-range stereo processing: Effects of large baseline and fusion between views taken at different pan angles
- Expected 3D accuracy
- Potential of HRC and WAC fusion

The whole processing chain verification and quality assessment is using real-scale tests (ESTEC Planetary Test Bed, Planetary Analogue Terrain at Univ. Wales Aberystwyth, Caldera of Tenerife) as well as a 1:10 mockup containing artificial objects with known dimensions.