Geophysical Research Abstracts
Vol. 17, EGU2015-10346-3, 2015
EGU General Assembly 2015

A virtual environment for the accurate geologic analysis of Martian terrain

Christoph Traxler (2), Gerhard Paar (1), Sanjeev Gupta (3), Gerd Hesina (2), Kathrin Sander (1), Rob Barnes (3), Bernhard Nauschnegg (1), Jan-Peter Muller (4), and Yu Tao (4)

(2) VRVis Forschungs-GmbH, Vienna, Austria, (1) JOANNEUM RESEARCH Forschungsgesellschaft mbH, DIGITAL, Graz, Austria, (3) Imperial College London, United Kingdom, (4) University College London, United Kingdom

Remote geology on planetary surfaces requires immersive presentation of the environment to be investigated. Three-dimensional (3D) processing of images from rovers and satellites enables to reconstruct terrain in virtual space on Earth for scientific analysis. In this paper we present a virtual environment that allows to interactively explore 3D-reconstructed Martian terrain and perform accurate measurements on the surface. Geologists do not only require line-of-sight measurements between two points but much more the projected line-of-sight on the surface between two such points. Furthermore the tool supports to define paths of several points.

It is also important for geologists to annotate the terrain they explore, especially when collaborating with colleagues. The path tool can also be used to separate geological layers or surround areas of interest. They can be linked with a text label directly positioned in 3D space and always oriented towards the viewing direction. All measurements and annotations can be maintained by a graphical user interface and used as landmarks, i.e. it is possible to fly to the corresponding locations.

The virtual environment is fed with 3D vision products from rover cameras, placed in the 3D context gained from satellite images (digital elevations models and corresponding ortho images). This allows investigations in various scales from planet to microscopic level in a seamless manner.

The modes of exploitation and added value of such an interactive means are manifold. The visualisation products enable us to map geological surfaces and rock layers over large areas in a quantitative framework. Accurate geometrical relationships of rock bodies especially for sedimentary layers can be reconstructed and the relationships between superposed layers can be established. Within sedimentary layers, we can delineate sedimentary faces and other characteristics. In particular, inclination of beds which may help ascertain flow directions can be accurately quantified. Overall, we are able to construct digital models of rock outcrops that assist in identification of ancient sedimentary environments that may have been habitable.

Representative examples and further information about the interactive 3D visualization tool can be found on the FP7-SPACE Project PRoViDE web page http://www.provide-space.eu/interactive-virtual-3d-tool/.

The research leading to these results has received funding from the European Union's Seventh Framework Programme (FP7/2007-2013) under grant agreement n° 312377 "PRoViDE".