

## PRoVisG - Planetary Robotics Vision Ground Processing

FP7-2007.2.1.01 Space - Collaborative Project Grant Agreement no: 218814

Project Homepage: [www.provisg.eu](http://www.provisg.eu) starting: Oct 08 duration 39 months

### D1.2.1 Periodic Report 1

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**Work package** 1 – Management

**Lead contractor for this deliverable** JR

Dissemination level: Confidential, only for members of the consortium (including the Commission Services)

#### EXECUTIVE SUMMARY

PRoVisG has been operating more than one year. In the period from Project start to the end of the first reporting period (13 Months duration) a set of **achievements and results** were successfully finalized:

- Following the Project logistics, **requirements from scientists and mission operators** to robotics computer vision on Planetary surfaces were formulated and integrated into relating **reports**. The reports are publicly available upon request to the PRoVisG Co-ordinator.
- The collection of **necessary information for interfacing** existing planetary data bases, exploiting various vision sensor geometries, identifying relevant 3D data structures and finding the necessity for newly developing missing items has been almost finished. A set of **reports** is under review that provides the necessary background for combining the various sources & aspects into an operational processing suite:
- The **design of the vision processing chain PRoViP has been finished** (see illustration below for its main layout). It will collect and integrate high-level vision tools from the relevant PRoVisG partners in order to fulfil all requirements for a comprehensive toolbox to serve future missions as well as educational aspects. One main aspect is the envisaged availability of **remote processing abilities** to ensure the integration of components protected by intellectual property right.
  - PRoVisG contains the development of a specialised **sensor suite for panoramic stereo imaging**, as well as the adaptation of an active range sensing sensor (3D-Time-of-Flight: **3D-TOF**). After **successful design** by one of the PRoVisG Partners (CSEM from Switzerland; see illustration) and joint agreement within the Consortium, its first **delivery is almost finished**.
  - Relevant **vision processing steps were already adapted**, such as automatic feature detection for landmark matching using planetary data from the Phoenix Lander, dense stereo matching for Digital Elevation Model (DEM) generation, or the formulation of a calibration chain for the Panoramic Camera system of the European Mars Rover ExoMars 2018.
  - Practical consolidation included the controlled **collection of image data sets** within representative robotic environment at the Planetary –Analogue Terrain (PAT) Laboratory at Aberystwyth University (AU, see illustration to the lower right) – including a geology interpretation rehearsal using PRoVisG 3D data processing results -, a successful data acquisition campaign using the EADS-Astrium Rover Bridget in a UK quarry, as well as the collection and test processing of representative data from previous US missions such as MER or Phoenix.
  - The PRoVisG Consortium and most of its members have already **published** more than ten abstracts and papers at relevant conferences such as the European Planetary Science (EPSC) Congress, the European Geoscience Union (EGU) Conference, and computer vision as well as 3D vision conferences. In addition, **press releases, YouTube Videos, and Fair demos** could be accomplished. Various public presentations and Press conference presentations as well as more than 20 **public scientific presentations** in the frame of PRoVisG Plenary meetings were held. A **workshop at AU**, organized by PRoVisG, brought together members from the PRoVisG Consortium, ESA scientists, representatives of national

funding agencies, and prime contractors of the ExoMars Mission. See some representative published illustrations below. [www.PRoVisG.eu](http://www.PRoVisG.eu) is the official PRoVisG web site.

At present the **PRoViP backbone structure** is implemented, based upon a batch processing framework named “**PROX**”, provided by the PRoVisG Co-ordinator JR. An internal poll is currently in circulation to collect high-level vision processing functions and their interfaces; these will gradually be filled into the PRoViP chain during the next two years.

An important action in the near future will be the **definition of the PRoGIS design**. Further to that, PRoVisG will continue its dissemination activities, prepare for further field testing using Bridget, intensify its synchronization actions with the JPL Stereo Work Station development, and finalize specifically needed high-level tools for vision processing to be fit into the PRoViP chain. The project is well within its scheduled time frame for most of the components planned for the first third of Project duration. Its resources are consumed by about one fourth, personnel is well allocated and consolidated, and internal communication, data exchange and R&D interface are operationally established. The current status promises that PRoVisG can reach its project objectives and will build a cornerstone of Europe’s Planetary robotics vision.

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