Contextualising and Analysing Planetary Rover Image Products through the Web-Based PRoGIS

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The international planetary science community has launched, landed and operated dozens of human and robotic missions to the planets and the Moon. They have collected various surface imagery that has only been partially utilized for further scientific purposes. The FP7 project PRoViDE (Planetary Robotics Vision Data Exploitation) is assembling a major portion of the imaging data gathered so far from planetary surface missions into a unique database, bringing them into a spatial context and providing access to a complete set of 3D vision products. Processing is complemented by a multi-resolution visualization engine that combines various levels of detail for a seamless and immersive real-time access to dynamically rendered 3D scenes.

PRoViDE aims to (1) complete relevant 3D vision processing of planetary surface missions, such as Surveyor, Viking, Pathfinder, MER, MSL, Phoenix, Huygens, and Lunar ground-level imagery from Apollo, Russian Lunokhod and selected Luna missions, (2) provide highest resolution & accuracy remote sensing (orbital) vision data processing results for these sites to embed the robotic imagery and its products into spatial planetary context, (3) collect 3D Vision processing and remote sensing products within a single coherent spatial data base, (4) realise seamless fusion between orbital and ground vision data, (5) demonstrate the potential of planetary surface vision data by maximising image quality visualisation in 3D publishing platform, (6) collect and formulate use cases for novel scientific application scenarios exploiting the newly introduced spatial relationships and presentation, (7) demonstrate the concepts for MSL, (9) realize on-line dissemination of key data & its presentation by a web-based GIS and rendering tool named PRoGIS (Planetary Robotics GIS).

PRoGIS is designed to give access to rover image archives in geographical context, using projected image view cones, obtained from existing meta-data and updated according to processing results, as a means to interact with and explore the archive. However PRoGIS is more than a source data explorer. It is linked to the PRoVIP (Planetary Robotics Vision Image Processing) system which includes photogrammetric processing tools to extract terrain models, compose panoramas, and explore and exploit multi-view stereo (where features on the surface have been imaged from different rover stops). We have started with the Opportunity MER rover as our test mission but the system is being designed to be multi-mission, taking advantage in particular of UCL MSSL's PDS mirror, and we intend to at least deal with both MER rovers and MSL. For the period of ProViDE until end of 2015 the further intent is to handle lunar and other Martian rover & descent camera data.

The presentation discusses the challenges of integrating rover and orbital derived data into a single geographical framework, especially reconstructing view cones; our human-computer interaction intentions in creating an interface to the rover data that is accessible to planetary scientists; how we handle multi-mission data in the database; and a demonstration of the resulting system & its processing capabilities.