EPSC Abstracts
Vol. 10, EPSC2015-291, 2015
European Planetary Science Congress 2015

A spatial planetary image database in the context of processing

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1. Introduction

Planetary image data is collected and archived by e.g. the European Planetary Science Archive (PSA) or its US counterpart the Planetary Data System (PDS). These archives usually organize the data according to missions and their respective instruments. Search queries can be posted to retrieve data of interest for a specific instrument data set. In the context of processing data of a number of sensors and missions this is not practical. In the scope of the EU FP7 project PRoViDE meta-data from imaging sensors were collected from PSA as well as PDS and were rearranged and restructured according to the processing needs. Exemplary image data gathered from rover and lander missions operated on the Martian surface was organized into a new unique data base. The data base is a core component of the PRoViDE processing and visualization system as it enables multi-mission and -sensor searches to fully exploit the collected data.

2. PRoViDE Project

The goal of the PRoViDE project is to collect a major portion of the imaging data gathered so far from vehicles and probes on planetary surfaces into an unique database, bringing them into a spatial context and providing access to a complete set of 3D vision products.
Excellent example data are provided by the Martian rover and lander imaging systems like the Navcam [1] and Pancam [2] on board the Mars Exploration Rovers, Phoenix Lander Surface Stereo Imager [3] , or the Curiosity Rover Mastcam [4] . Nonetheless, the PRoViDE processing and visualization system set out to also be capable to deal with historic and future landed mission data.

3. Requirements

For the PRoViDE processing chain the data base (or data catalogue) needs to deal with images ranging from orbital to microscopic scale and needs to support multiple missions as data fusion will be applied within the viewing components. Furthermore, a variety of products need to be handled and the data catalogue shall be capable to be re-usable for future mission. An additional requirement is to also keep geospatial information in the data base. While not the full record of information of considered images needs to be kept in the DB (e.g. all PDS label entries), meta-data required for processing and geospatial context need to be kept directly within the DB.

4. Existing Planetary Data Bases

PSA and PDS provide a collection of data from planetary mission with the background archiving. Hence, the focus is set on fixed standards to ensure usability for scientist from all disciplines as well as accessibility and usage in future. These objectives of data storage do not meet the needs in the context of processing and probably also other scopes.

5. Approach

The PRoViDE data catalogue is implemented as a PostgreSQL data base that will in an upcoming version also support the required spatial relation of images with respect to the global reference frame as image footprints – called fulcra. The DB is designed around two principle tables that represent the input and output of the PRoViDE processing chain. These tables are the Images and the Products table and do hold records for all images of all mission and scales considered as well as all products envisaged to be processed, respectively. Detailed property information of images or products are recorded in

separate tables. The implemented schema is expected to be capable to be adapted for future missions and newly designed products if necessary.

6. Population

The DB was populated based on index files included in PDS data volumes that provide a list of data stored at this location including meta-data. The initial population with Mars rover and lander data resulted in entries listed in Table 1.

Table 1: Number of image data initially inserted in the DB.

Mission	Sensor 1	Sensor 2
MER1	Pancam 32553	Navcam 16208
MER2	Pancam 26510	Navcam 10175
MSL	Mastcam 16711	Navcam 5200
MPF		IMP 5511
PHX		SSI 3251

Products were first defined and later an estimation of how many image stereo pairs, panoramas, mosaics etc. could be hidden in the data were computed applying the collected meta-data in combination with the SPICE kernel information [5] of the respective mission.

7. Conclusion

A data base was designed and implemented that is well suited for various batch processing applications. It can hold information of orbital to microscopic scale image data. As one of the central components of PRoViDE the data catalogue it will be tested in depth during the upcoming batch processing tests having all PRoViDE components working jointly within the integrated system. Results and progress on further data catalogues developments will be presented at the meeting.

Acknowledgements

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

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