Footprint Representation of Planetary Remote Sensing Data

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The geometric outline of remote sensing image data, the so called footprint, can be represented as a number of coordinate tuples. These polygons are associated with according attribute information such as orbit name, ground- and image resolution, solar longitude and illumination conditions to generate a powerful base for classification of planetary experiment data. Speed, handling and extended capabilites are the reasons for using geodatabases to store and access these data types. Techniques for such a spatial database of footprint data are demonstrated using the Relational Database Management System (RDBMS) *PostgreSQL*, spatially enabled by the *PostGIS* extension. Exemplary, footprints of the HRSC and OMEGA instruments, both onboard ESA's Mars Express Orbiter, are generated and connected to attribute information. The aim is to provide high-resolution footprints of the OMEGA instrument to the science community for the first time and make them available for web-based mapping applications like the "Planetary Interactive GIS-on-the-Web Analyzable Database" (PIGWAD), produced by the USGS. Map overlays with HRSC or other instruments like MOC and THEMIS (footprint maps are already available for these instruments and can be integrated into the database) allow on-the-fly intersection and comparison as well as extended statistics of the data.

Footprint polygons are generated one by one using standard software provided by the instrument teams. Attribute data is calculated and stored together with the geometric information. In the case of HRSC, the coordinates of the footprints are already available in the VICAR label of each image file. Using the VICAR RTL and PostgreSQL's *libpq* C library they are loaded into the database using the *Well-Known Text (WKT)* notation by the Open Geospatial Consortium, Inc. (OGC). For the OMEGA instrument, image data is read using *IDL* routines developed and distributed by the OMEGA team. Image outlines are exported together with relevant attribute data to the industry standard *Shapefile* format. These files are translated to a *Structured Query Language (SQL)* command sequence suitable for insertion into the PostGIS/PostgrSQL database using the *shp2pgsql* data loader provided by the PostGIS software. PostgreSQL's advanced features such as geometry types, rules, operators and functions allow complex spatial queries and on-the-fly processing of data on DBMS level e.g. generalisation of the outlines. Processing done by the DBMS, visualisation via GIS systems and utilisation for web-based applications like mapservers will be demonstrated.