ASQuLD: an Advanced Semantic Query System for Large Satellite Database

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ABSTRACT

In the context of a complete increase on Remote Sensing data amount, with improvement of resolution, spectral capabilities and revisiting time, the upcoming challenge is to find a way to manage (store, make available) the data information content (meaningful information) among all the available data sources in near real-time, and thus to reduce screening and calculation times. As an example, since 1995 the ATSR-2 and AATSR sensors have been collecting more than 20TB of data stored by ESA into magnetic and optical media while newly collected data is available through an FTP based rolling archive. Stored Landsat Archives consist of more than 500TB of stored data. No more than 10% of this data is currently accessed and used.

A challenging application is not only to extract meaningful information from large volume of satellite data, but also searching the right images to be processed among all scenes contained on a large image database: advanced and effective large database query systems are application/context dependant, with specific semantic included into the image database and dedicated user-interfaces.

An online database with preliminary ATSR-2/AATSR classification maps was studied and implemented in the framework of the "Classification Application-services and Reference Datasets" (CARD) ESA project. The preliminary classification maps are created using the SOIL MAPPER® software, a fully automated, multi-sensor, spectral rule-based preliminary classifier of Earth Observation images that generates fully objective land cover maps where each pixel is associated with one label out of a discrete set of spectral categories where each spectral category has a semantic meaning. A dedicated database structure hosting image standard information (acquisition time and location) and semantic information (number of pixels for each of the land cover classes) was created. A dedicated query interface was implemented as a web service onto the SSE portal. The final system allows performing four-dimensional queries on the entire database: geographic (2 dimensional), temporal and semantic (land cover) parameters can be used to search through the entire database. The data access structure resulted very effective on having the entire (A)ATSR database on line and browsable.

Based on the wide applicability of the SOIL MAPPPER® software (it can process in the same way twelve different sensors from low to very-high spatial resolution data), a generalised data access system named ASQuLD (Advanced Semantic Query System for Large Satellite Database) is being implemented, to provide a standard infrastructure for advanced database queries based on land cover types. In the framework of the Support by Pre-classification to specific Applications (SPA) ESA project the ASQuLD infrastructure is being designed and implemented for a test database of three years of ALOS-AVNIR-2 data.

ASQuLD, for its characteristic, is the ideal tool to improve the accessibility and usability of large optical satellite databases, improving the exploitation of data that are normally not used because difficult to identify.