Development And Use through Internet A RDBMS System to Manage Earth Observation Meta-Data for the Needs of the Greek Scientific And User's Community

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Development and Use trough Internet a RDBMS System to Manage Earth Observation Meta-Data for the Needs of the Greek Scientific and User/s Community

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1. Abstract

Several initiatives have been undertaken worldwide to integrate and diffuse to the scientific community meta-data on available EO sources. The knowledge on existing EO data, value added products and relevant services provided, is considered as indispensable towards the further development of fruitful EO applications. Main emphasis is put on the data base architecture, data collection, data integration and representation, since they comprise key elements for the effective use and ease update of the relevant catalogues. This paper illustrates the frame of requirements which led to the project initiation in order to meet the needs of the Hellenic E.O. scientific and user's community. In addition, it presents the principles on which the data base design and man machine interface have been based. Project realisation has started recently. It should be noted that this initiative will permit, for the first time to the Greek scientific community, free access to catalogue

information relevant to the existing EO data and facilities.

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2. Introduction

The increasing strategic importance of Earth Observation for regular and operational monitoring and mapping of the planet Earth and its environment, the continuous EO market development and the further improvement of the relevant services, presuppose the ease exchange of available remote sensing, geospatial and value added data, as well as the diffusion of advertising notes, news and expertise throughout the scientific community. As it has been already mentioned, several initiatives have been undertaken by the European Commission in order to integrate into a common exchange environment the relevant meta-data information (e.g. CEO Enabling Services). Moreover, specific standards and guidelines for system development have been proposed (e.g. CEO Metadata User Guide). However, such pan-European initiatives could be helped significantly by responsible agencies, entities and/or governmental bodies acting at a more restricted geographic area (e.g. national level) capable to communicate with local bodies and authorities and report the volumes and types of available E.O. data, processed and archived in decentralised Data Bases. In addition a realistic view of the current needs for the exchange of data and expertise and meta-data base system specifications, may be easier defined at national level, before they are integrated into a common European or international exchange environment via the Web and/or related Internet technologies.

In the context of these needs, the Hellenic Space Research and Technology Committee has initiated a project for the development of a Relational Data Base Environment, which integrates detailed catalogue information regarding the available remote sensing data, value added products, airborne data, aerial photography, in-situ data, statistics, geo-spatial data. This node interfaces with existing data bases at national or international level. It also provides the user with general information on specific organisations and service providers acting in the domain of Earth Observation and integrates news on scientific events, relevant services and scientific achievements relating to advanced algorithms, sw packages, models, etc. It is foreseen that this information exchange environment will use ORACLE tools and run on a Silicon Graphics Challenge server. It will be accessible through internet and especially the World Wide Web environment using GUI technology in order to be easily used by the wide scientific community. Therefore, the data base update, data representation and data query is done by the employment of graphic capabilities provided through internet (e.g Image Maps, Dynamic Gif Construction, etc).

As it has been previously mentioned, special emphasis is put on data base architecture, data collection, data integration and representation, since they comprise key elements for the effective use and ease update through the time. It should be noted that the development of this meta-database, consists the first trial within the Greek scientific and user's community to collect and represent the available EO information.

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3. Remote Sensing in Greece: Perspectives, and needs

Recently the Hellenic Space Research and Technology Committee has completed a study relating to the "Development of the Hellenic National Strategy for Earth Observation and Monitoring ". The relevant official report is already published. In the frame of this activity a series of actions have been undertaken including workshop organisation, realisation of relevant studies and circulation of specific questionnaires aiming to identify the current level of expertise and user's community needs. This research enabled the specialists of the Hellenic Space Research and Technology Committee to report organisations involved in the domain and identify running applications and national opportunities for data capture, manipulation, use and dissemination. In addition, it helped to define volumes of existing data (original and value added) in various public and private entities. Some of the most significant results have been reported in the studies "Needs and Co-operation in Mediterranean: The Hellenic Case (C.C. Kontoes, G. Veis, 1996) and "Remote Sensing in Greece: Perspectives and needs" (C. Kartalis, C.C. Kontoes, T. Tsilimbaris, 1996). These remarks may be summarised as follows:

- The present E.O. activities in Greece cover a wide range of application areas, as for example land cover, land use, mapping, forestry, geology, agriculture, marine environment and atmospheric studies.
- A good volume of meteorological satellite data is been received on a daily basis.
- Satellite scenes of high resolution optical sensors have been largely used by greek scientists in the frame of their studies.
- Special requirements to transfer technology and know how to exploit fruitfully the existing satellite systems, the establishment of relevant networking facilities to support the needed transfer and the development of co-operation with specific centres of excellence in the domain of Earth Observation, are reported.

On the basis of these remarks, the development and maintenance of continuously updated data catalogues was considered as being of primary importance. Specific facilities to help updating data catalogues, by exploiting networking capabilities offered by the current technology, should be necessarily considered. Moreover, the needs of the Greek community for data acquisition should be accommodated through inter-net connections to national and pan-European web sites.

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4. Development and maintenance of catalogue information for existing sources of Earth Observation, geo-spatial and geo-statistical data in Greece

4.1 Objectives

As it is stated previously, the main objective is to enable users to get informed about the existing sources of EO data and relevant services reported in Greece. It will provide information on currently acting scientific groups, as well as on relevant projects by highlighting their main features. It will additionally aim to allow better communication between industry, research organisations, universities and other public and private entities in order to avoid unnecessary dispersion and duplication of human effort and investments. Furthermore, it will encourage the use of space data in addition to other value added products for the benefit of users, resulting in the widening of the relevant market. Last but not least, it is intended to inform agencies and governmental bodies responsible for environmental monitoring and mapping in taking advantage of these services and products and raise awareness on limitations pertaining to their use and cost.

4.2 Data Base Structure

The proposed Data Base will provide information on the three following categories:

1. Satellite Data.
2. Non-satellite data and value added products.
3. General news and advertising notes.

In general the proposed Data Base structure may be summarised as follows:

Table 1: Satellite Data Description

Field Name	Description	Restrictive	Query
Geog_Cover	Extend of the geographic area covered by the satellite data, (expressed in Lat, Lon).	X	X
Spect_categ	Sensor description: Optical/SAR data	X	X
Satellite 1. Sensor	Satellite and sensor description (e.g. SPOT 3: HRV2, ERS-1: ATSR1, etc)	X X	X X
Spe_chan	Channel description (e.g. Landsat TM 1-7, thermal, SPOT P, etc)	X	
Spat_res	Data spatial resolution	X	X
Process	Data processing level	X	
Date	Date and time of data acquisition	X	X
Tech_info	General technical information on the archived data (e.g, means on which it resides, file size, image size, data format, cartographic projection, available prinouts, scale of analog printouts etc)		
Organism	Responsible organisation to maintain archives of the data	X	X

Person	Name of the person responsible to provide information on the data		
Provider	Name of data provider/distributor (e.g. SPOT Image, Eurimage, etc)		
Data_Access	Information on data availability and ways of access (e.g. FTP, telnet, etc)		
Restrictions	Restrictions in data use (copyright, other restrictions)		
Archmean	Description of the mean the data resides		
Filnam	File name of the satellite image if it is available on the local computer system		
Quicklk	File name of the quick look if it is available on the local or the provider's system		
DatForm	Data format description (digital and/or analog)	X	X

Table 2: Non-Satellite Data Description Table

Field Name	Description	Restrictive	Query
Geog_region	Extend of the geographic area the data refer to (community name,department name, nomos name, etc)	X	X
Geog_cover	Optionally, extend of the geographic area covered by the data (expressed in Lat, Lon), where applicable	X	X
Data_type	Denotes one of the following seven data types: aerial photography, airborne data, field radiometry data, topographic maps, thematic maps, statistics, technical reports	X	X

Tech_desc	General technical description of the archived data. For airborne and field radiometry data, the spectral channels are described	X	
Scale	Description of the scale of the product (applicable in aerial photography and maps)	X	X
Date	Date (and time if available) of data capture	X	X
Spat_res	Spatial resolution of the data (applicable to scanned arial photos, other scanned images)		
Data_upd	Frequency for data update (for multi-temporal and through the time continuously captured or produced data)		
Prim_Data	Description of the primary data sources used for the production of the value added data		
Tech_info	General technical information on the archived data (e.g, means on which it resides, file size, data format, cartographic projection, available prinouts, scale of analog printouts etc)		
Organism	Responsible organisation to maintain archives of the data	X	X
Person	Name of the person responsible to provide information on the data		
Provider	Name of the provider / distributor of the data		
DataAccess	Information on data availability and ways of access (e.g. FTP, telnet, etc)		
Restrictions	Restrictions in data use (copyright, other restrictions)		
Last_updt	Date for last data update		
Reference	Any published reference		

	relating to the data (especially for value added products)		

4.3 General news and advertising notes

A web-server devoted to disseminate general information regarding studies, workshops, running projects and relevant events, is currently under development and as a service is offered to the greek scientific community. The currently recorded information may be found at http//www.space.noa.gr. Especially in this web address one could find the following:

1. Brief news regarding the advancement of the remote sensing worldwide and especially in Greece.

2. Information on the fore-coming scientific events (workshops, training seminars) and announcements regarding new opportunities for projects, call for proposals, invitation to tenders, etc.

3. Detailed list of public and private entities acting in the domain of remote sensing. Their relevant activities and realised projects, as well as their studies' products available to the Greek scientific community, are also presented. For the time being, the Hellenic Space Research and Technology Committee is in charge to updated these catalogues, by keeping continuous contacts with the responsible persons of these entities, through questionnaires and personal interviews.

4. Connection to existing national and international Data Bases, providing data and general information on the subjects of Remote sensing, Geographical Information Systems, GPS technology, Mapping, etc.

The future development of the system, foresees dynamic representation and integration of the above described information, by the use of RDBMS tables similar to the ones described in section 4.2. The necessary computer interface for data entry, data query and update through Internet connections will be part of the future development of this system.

4.4 Data access through Internet

The access to the data will be done by remote connection through Internet. Each time a user is accessing the meta-data tables, he will be asked to enter his user_id and password. This information will permit the system administration to keep control on the users and the frequency the system is used by them. It is also foreseen that data base query and authorised data update is done via Internet, by using a special graphical interface. The user will define on special forms key elements on which the data base search will be based. Such keywords could refer to the geographic area, the date(s)/time of interest, the satellite system, the sensor, the map scale, the aerial photography scale, the data format etc, that is elements which are denoted as query fields in the table descriptions of section 4.2. It has been decided that the system will integrate and make use of list domain tables and controlled lists of keywords, according to the scheme proposed by CEO, in order to keep compatibility with this European standard. The list domain tables and controlled keyword lists will be updated either automatically, while entering new data to the meta-database, or regularly by the system administrator each time a new CEO version for controlled lists is provided. In addition, the data base records referring to a certain entity will be unlocked for automatic update via Internet. This authorisation is given to the responsible person of the concerned entity, identified by his users_id and password.

For data query and representation it will be employed a graphics environment. The system will provide users with graphical tools to be able to create queries either by filling specific tabular forms or by delimiting on a graphic screen the geographic area of interest. The same will apply for data representation after the data base search. The results of a specific query will be given in the form of tables but also using a graphic representation on the screen (e.g. the boundaries of the area of interest with the frames of the available satellite scenes drawn on it).

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5. Conclusions

According to the market research conducted by the Hellenic Space Research and Technology Committee, it is concluded that the integration of Earth Observation technology to operational programmes is considered as indispensable, since it complements traditional approaches and provides the relevant studies with valuable products needed to support processes for decision making and policy definition. Nowadays, the exploitation of this technology may be proved more fruitful, since better E.O. products, as well as advanced processing algorithms and models, have been developed and offered to the relevant scientific and user's community for further use. However, it is generally accepted that the best exploitation of these tools presuppose the good communication between industry, research organisations, universities, private companies and governmental bodies, in order to keep them aware of the offered services and data which could eventually meet their research and/or operational requirements. In the frame of these requirements the Hellenic Space Research and Technology Committee takes the initiative to develop and promote this RDBMS E.O. metadata environment.

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