

Geosciences Data Digitize and Materialize, Standardization Based on Logical Inter- Domain Relationships GeoDMS

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Abstract

In order to manage, digitize, standardize, produce and acquire geo data, GeoDms system (Geosciences Data Digitize and Materialize, Standardization) as a complete reference of geo data and modern technology integration was designed. The logical and applicable relationships between geo domains in GeoDMS system and its high extensibility and flexibility meet the needs of investors, geo-related experts and organizations. A comprehensive recognition of geo domains and their nature discovery is the main basis for GeoDMS system. This system deals with specification and determination of boundaries of each geo domains via representation of a description document and an explicit conceptual model in accordance with world standards in UML 2.0 in order to create a common language between geo and software experts. The role of each domain is determined via focusing on extractable and maintainable data with the aim of entities discovery, their characteristics and logical relationship. In addition to manage data of each domain, the applicable relationships between adjacent domains were specified as well. A type of web- based software was set up to manage, store and revise data were mentioned for conceptual models of each domain via outputs of GeoDMS recognition project.

Keywords: *Geosciences Data; Inter- Domain; GeoDMS; Geo Domains; Conceptual Model; Entities; Digitize;*

Introduction

Certainly, the development of political, economical and cultural relations and promotion of geopolitical significance of each country greatly depend on sub-structural and basic studies in particular, geo studies. In order to attain these goals, an integrated relation should be developed between various geo data branches through employing the related and applied databanks in accordance with standard format of GeoDMS.

Regarding these goals as well as creating bedrock for expansion and standardization of various geo domains and promoting the technical knowledge of all geo-domains administrators, a new movement was formed to promote all significant aspects of geo domains with sufficient support and commitment. GeoDMS as an abbreviation for Geosciences Data Digitize and Materialize, Standardization, was selected to indicate such a movement.

- **Digitization:** Geo domain data preparation to store, process and transfer them via computer systems. It also includes digitizing and preparing maps for applying them in GIS- based software environments. But the main focus is on all information related to geo phenomena, terrains, entities and elements.
- **Materialization:** Creating a bright illustration of geo domains (geochemistry, geophysics, geology, etc) so that all geo administrators have a common understanding on related domains,

available data boundaries and entries. The second aspect is objectifying geo data, i.e. creating a mental image of them via geo data processing as graphics, map, report, etc outputs.

- **Standardization:** Standardization is studied from various aspects, as follows:
 - Standardization of conceptual and data models and their processing to standardize the recognition of individuals from various geo domains.
 - Methods of data production from fields, the required tools and instruments, processes as well as the evaluation method of data validity needs to be standardized to reduce the costs and mistakes in data collection and processing.
 - Implementation methods of the study projects in order to estimate parameters such as operational programs, expectable results, required time duration and specialties as well as financial evaluations are systematized, managed and contrasted via standardizing available data.

Geosciences Data Digitize, Materialize and Standardization:

Regarding that the design method of structure and establishment of each databank (geo domains) in current geo information transfer system is insular and independent so that all data and model needs is meet inside each domain and there is no relationship between adjacent domains, the establishment of High Level Geosciences Database (GeoDMS) to apply a better method for databanks production (geo domains), remove the disadvantages of insular system, attain goals such as quality maintaining and inter domain relations management as well as to provide a bed rock for geo domains digitization and standardization is so necessary. Due to the lack of relationship between main sections of each domain, adjacent domains and lack of geo spatial data which lead to duplication of work on designing related domains, data distribution and high cost of data production and maintenance and most importantly, presentation of non applied geo data, the High Level Geosciences Database (GeoDMS) was established as an inclusive reference for systematical and integrated geo data storage and presentation in order to determine the logical relationships between various geo data domains and different sections in each domain. GeoDMS system meets the needs of geo users via presentation of up to date scientific and technical geo information within short time and high flexibility and scalability on interaction between geosciences and data technology in current age. In line with attaining goals were presented in GeoDMS (Geosciences data Digitize, Materialize and Standardization), 3 various phases were described, as follows:

1- GeoDMS Recognition Phase:

In general, the main basis for GeoDMS is an inclusive recognition of geo domains. The main goal of this phase is to recognize the geo domains, standardize and discover the nature of domains. For this purpose, the presentation of a comprehensive definition of geo-sciences, determination of geo boundaries, various attitudes toward geo classification, number and boundaries of geo domains, main entities and standards of each domain and the requirements of domains and users is so necessary. The result of study of above- mentioned items in line with developing and standardizing domains in GeoDMS system and complete recognition of each geo domains leads to determine the entities of geo domains and their attributes as well as relations between entities of each domains and with adjacent domains.

The precise definition of each domain and their main entities led to draw an initial tree algorithm for each domain. In order to create a common language between geo and software specialists and make an explicit and understandable image of domains and standardize them, a conceptual model and structural figure for each domain was produced in accordance with UML.2.0 standards. The conceptual model of each domain consists of structure and attributes of each domain and relation between adjacent domains. In this paper, e.g. the conceptual model of mine exploitation domain was addressed (Fig1, 2, 3).

2- GeoDMS Software Design and Structure Phase

Following the recognition phase and design of conceptual models of each domain, the software system production as the second phase of project (web-based software) was developed as an independent section for data entry, edition and management in order to manage data of conceptual models in each domain based on outputs of GeoDMS recognition project. Using this software, in addition to manage data of each domain, the relation between data of adjacent domains and if required, the production of common pieces usable by almost all geo domains is administered. The software system of geo data management involves in storing geo data depending on the research necessities and their conceptual model systematically. In addition, the geo domains are managed through installation, execution, promotion or omission of modules and general services are offered for all modules. Recovering the geological data based on future needs leads to the scientific mutation. Using this system, the non- centralized data are updated and geo centralized data are presented through the website.

Some important achievements obtained in this phase:

- Management of Geo data involves with adding, editing, deleting, reading and evaluating the validity of data of geo databanks
- Presentation of software pieces (" Geosciences Module" which is abbreviated as Geo Module) with independent structure for data management and meets the functional and non functional software needs of each domain.
- A web- based user software as bedrock for geo modules to offer the services and create relation between modules and their management.

The other benefits of software system are, as follows:

- Stable software structure
- Rich client application
- Module and user interface manual production and installation
- Insertion or omission of each module without stopping system operation
- Module insertion to generalize the available facilities
- Multilingual support of information and user interface

3- Propagation Phase of Geological Products (GeoDMS Website)

In the third phase of GeoDMS project, the geo products as the outputs of recognition phase and GeoDMS software system is presented at GeoDMS website. This website in addition for geo data presentation, uses the experiences of geo specialists to promote geo knowledge (Fig.3).

Conclusion

- Digitize, materialize and standardization of geo data and present a standard format for each domain
- Produce geo data domains via determining inter data natural relations inside each domain and create an integrated relations between various domains
- Establish High Level Geosciences Database (GeoDMS) using related and applied data domains and standard format and under a data management system
- Providing maximum accessibility to correct information for executive managers of administrative and private sectors, planners and investor to
- Geo Data high level management and correct resources planning

Figures:

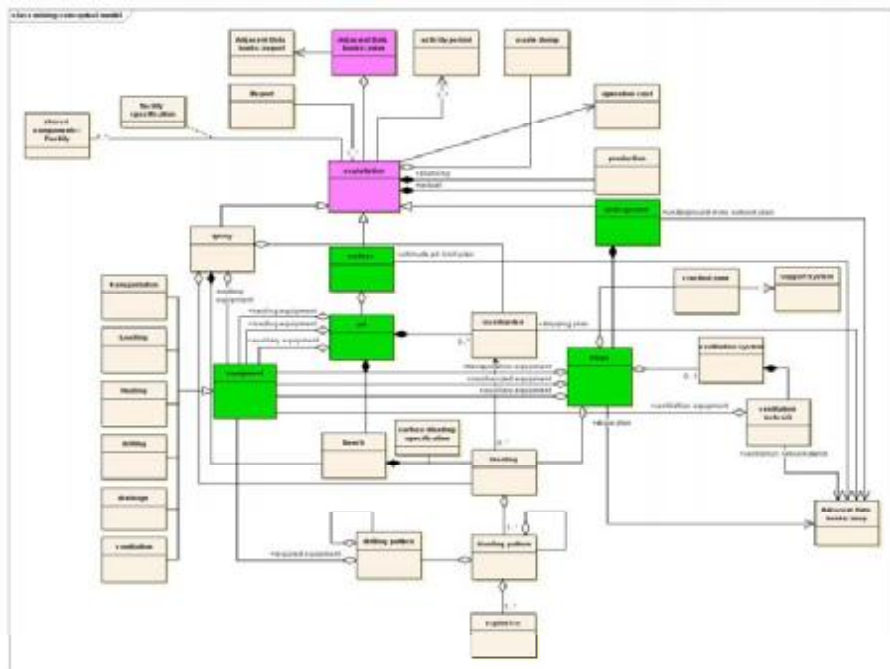


Fig 1- Conceptual Model of Exploitation Domain Based on UML.2

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