Geophysical Research Abstracts
Vol. 12, EGU2010-5181, 2010
EGU General Assembly 2010


# Modelling and approaching pragmatic interoperability of distributed geoscience data

Xiaogang Ma

Department of Earth Systems Analysis, Faculty of Geo-Information Science and Earth Observation (ITC), University of Twente, Enschede, The Netherlands (xiaogang@itc.nl; +31 53 4874227)

Interoperability of geodata, which is essential for sharing information and discovering insights within a cyber-infrastructure, is receiving increasing attention. A key requirement of interoperability in the context of geodata sharing is that data provided by local sources can be accessed, decoded, understood and appropriately used by external users.

Various researchers have discussed that there are four levels in data interoperability issues: system, syntax, schematics and semantics, which respectively relate to the platform, encoding, structure and meaning of geodata. Ontology-driven approaches have been significantly studied addressing schematic and semantic interoperability issues of geodata in the last decade. There are different types, e.g. top-level ontologies, domain ontologies and application ontologies and display forms, e.g. glossaries, thesauri, conceptual schemas and logical theories. Many geodata providers are maintaining their identified local application ontologies in order to drive standardization in local databases. However, semantic heterogeneities often exist between these local ontologies, even though they are derived from equivalent disciplines. In contrast, common ontologies are being studied in different geoscience disciplines (e.g., NAMD, SWEET, etc.) as a standardization procedure to coordinate diverse local ontologies. Semantic mediation, e.g. mapping between local ontologies, or mapping local ontologies to common ontologies, has been studied as an effective way of achieving semantic interoperability between local ontologies thus reconciling semantic heterogeneities in multi-source geodata.

Nevertheless, confusion still exists in the research field of semantic interoperability. One problem is caused by eliminating elements of local pragmatic contexts in semantic mediation. Comparing to the context-independent feature of a common domain ontology, local application ontologies are closely related to elements (e.g., people, time, location, intention, procedure, consequence, etc.) of local pragmatic contexts and thus context-dependent. Elimination of these elements will inevitably lead to information loss in semantic mediation between local ontologies. Correspondingly, understanding and effect of exchanged data in a new context may differ from that in its original context. Another problem is the dilemma on how to find a balance between flexibility and standardization of local ontologies, because ontologies are not fixed, but continuously evolving. It is commonly realized that we cannot use a unified ontology to replace all local ontologies because they are context-dependent and need flexibility. However, without coordination of standards, freely developed local ontologies and databases will bring enormous work of mediation between them. Finding a balance between standardization and flexibility for evolving ontologies, in a practical sense, requires negotiations (i.e. conversations, agreements and collaborations) between different local pragmatic contexts.

The purpose of this work is to set up a computer-friendly model representing local pragmatic contexts (i.e. geodata sources), and propose a practical semantic negotiation procedure for approaching pragmatic interoperability between local pragmatic contexts. Information agents, objective facts and subjective dimensions are reviewed as elements of a conceptual model for representing pragmatic contexts. The author uses them to draw a practical semantic negotiation procedure approaching pragmatic interoperability of distributed geodata. The proposed conceptual model and semantic negotiation procedure were encoded with Description Logic, and then applied to analyze and manipulate semantic negotiations between different local ontologies within the National Mineral Resources Assessment (NMRA) project of China, which involves multi-source and multi-subject geodata sharing.