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Use Case: OntoFrame 2008—A Semantic Portal Service of Academic Research Information

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August 2009



Introduction

According to the US NSF (National Science Foundation), researchers are reportedly spending more than half of their total research and development hours hunting for information. Thus, to allow researchers to have more time to spend on research and development itself, it is crucial to reduce time on information gathering. Currently, leading search engines only provide a keyword-based matched list as the result of a search query, which is limited in terms of accuracy and efficiency of information comprehension. A new type of information service is required that can find the information desired by the researcher, and then connect, combine and analyze it to provide as much value to the user as possible. To address this need, we have developed a prototype of a knowledge-driven semantic portal that provides an analysis service on academic research information using OntoFrame®.

OntoFrame®, developed by KISTI, is an information service platform that uses Semantic Web technologies. It includes OntoURI®—a semantic knowledge management tool that creates ontology schemata and instances and identifies co-references between ontology individuals; OntoReasoner®—an inference engine that stores and infers ontology-based RDF triples and answers SPARQL queries; and Mariner®, that provides search functionality.

The Solution

The goal of the Semantic Portal Service is to provide connection, fusion, and analysis services on academic research information to enable scientists to effectively obtain information. In order to help scientists to access relevant information, we have developed the KISTI Reference & Academic Ontology (Figure 1). The ontology models research entities (e.g., persons and institutions), their accomplishments (e.g., articles), publications which indicate specific journal issues or proceedings, locations and topics. In contrast with previous research-related ontologies, our ontology connects researchers to the affiliations they were members of at the time they had their accomplishment. It also connects institutions to their locations such as countries, states and cities. The ontology schema is composed of 16 classes and 89 properties, and supports inference.

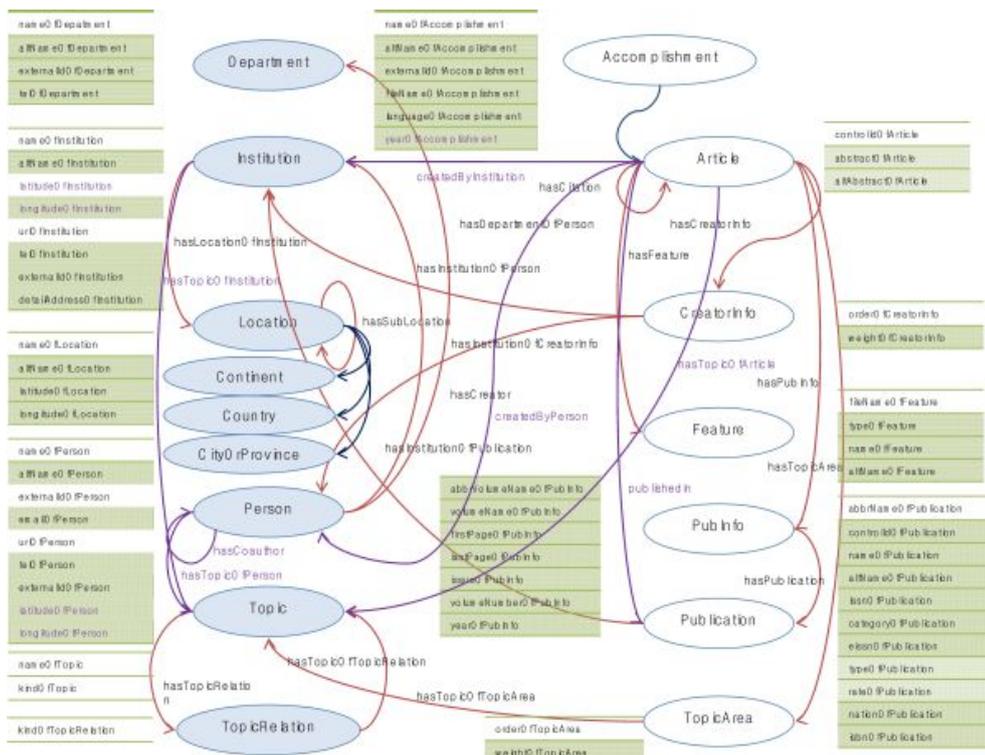
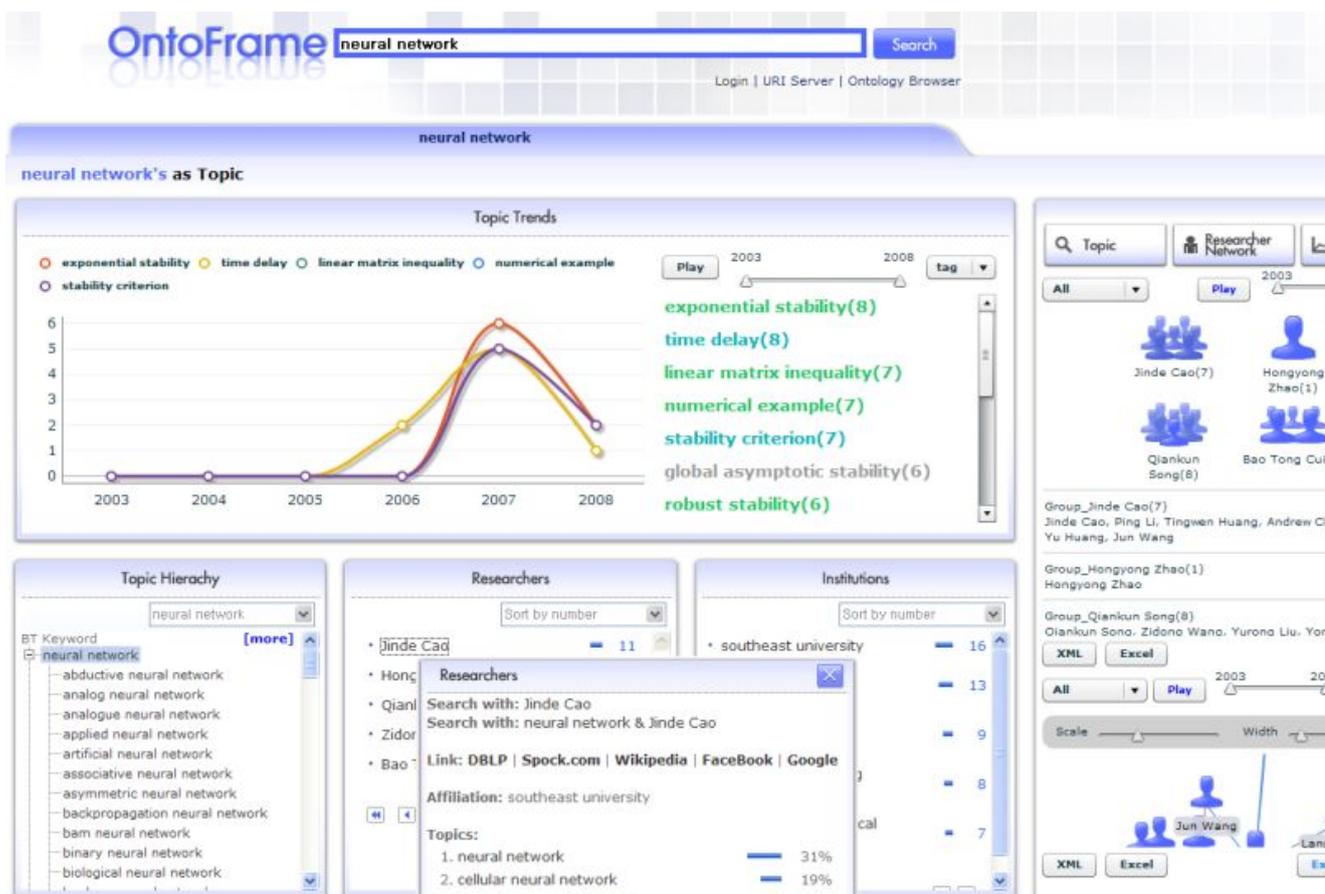


Figure 1: KISTI Reference & Academic Ontology (a [larger version](#) of the image is also available).

Currently, the semantic portal service is in service as a prototype (<http://ontoframe.kr/2008/>). It contains about 450,000 articles, which have been written by 1.35 million researchers, on 340,000 topics, who work for 90,000 institutions, spanning 410,000 locations. In total, the system has a total of about 300 million RDF triples.

The Semantic Portal Service of Academic Research Information is designed to be topic and researcher focused (Figure 2). This is because authors (i.e., researchers) and research topics are useful starting points for finding research information. When a user performs a search, a keyword-based search engine is used to find results, but URIs for the terms are also retrieved and used to search the ontology for more information relating to the term. The results are presented to the user by appropriate visualization. The semantic service currently includes many components such as topic trends, identification of leading researchers or research institutes for a particular topic, main research focus of a given researcher, researcher publication network, statistics of accomplishments in a particular topic area, and geographical distribution of researchers specialized in a given topic. Such functionality provides knowledge that has been analyzed by connecting and fusing fractional information along with proper visualization.

Figure 1: Semantically-operated Services controlled by Topic (a [larger version](#) of the screen dump is also available).

Semantic Web technology

The Semantic Portal Service of the Academic Research Information follows several Semantic Web standards such as RDF, RDFS, OWL and SPARQL. KISTI Reference & Academic Ontology is described in OWL (more specifically, OWL-Lite), and the request for service is represented and executed in SPARQL internally.

Conclusion and further work

This Semantic Portal Service shows how Semantic Web technologies can be utilized for information connection and fusion in the academic research information service sector. KISTI will continue to test the services on much larger data and formulate new connection and fusion services. Moreover, by connecting with similar external services synergy can be gained.

Other Works

Based on this service platform, namely OntoFrame, we are developing another advanced services, which are listed here with a link to their brief descriptions.

Use Cases

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Key Benefits of Semantic Web Technology

- By using an ontology to process academic research information it has become more flexible compared to a database system in terms of adding new information or services.
- Ontology instances with URIs can easily be connected to other ontology instances with URIs using relationships. This makes it easy to connect and fuse information, and also to develop knowledge service beyond the current information service.
- A semantic service is able to easily connect with external services by referring to URIs. This makes it easier to connect to and develop other services.
- Data represented in an ontology can be easily expanded by inference, so the data construction process has become convenient.

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