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Ontologies and their Applications

J.UCS Special Issue

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After pursuing a long tradition of study in Philosophy, the term “ontology” has become the new buzzword in computer science. It is receiving special attention not only from an active community of researchers pertaining to many areas of informatics but also from the industry, which is providing increasing budgets and investments to develop this technology and make it available in business as soon as possible.

There is at least one main reason for this recognition: ontologies constitute the backbone of the Semantic Web, as they are responsible for providing context to pages, thus promising to make a relevant part of the Web contents understandable and processable by the software. However, there are some challenging obstacles that should be tackled to make ontologies wide-spread reputation shift from a promise to a daily used technology. For instance, heterogeneity and evaluation are two of these obstacles.

Following the realization of the Brazilian "Workshop on Ontologies and their Applications" series, we planned this Special Issue as a follow-up for the last edition of the workshop (http://www.icmc.usp.br/~iarn2006/coevents/wonto.php). With this Special Issue, we intend to enrich the discussion on how to enhance ontologies’ applicability, thus realizing this promising technology in general, but also in specific settings, such as e-business and e-commerce to name but a few.

This Special Issue received a strong response from the community in the form of a high number of submissions (41), what indicates that the community is committed in advancing the state-of-the-art in many of the current challenges proposed in the

Issue's early announcement. The volume and high standard of this response also enforces the relevancy of the field in the computer science mainstream.

As for the selection process, all of the submitted articles were carefully peer-reviewed by a high-quality team of ontology researchers, who accomplished a serious and rigorous reviewing work. From the submissions, only six papers were selected, thus reaching the tough acceptance rate of around 14.6 per cent. The articles published in this issue have undergone a plenty of changes suggested by these referees, and some of them passed through a second round of reviews indeed. These refinements delayed the launching of the edition a little; on the other hand, they assured a best quality in the outcome for our readers.

We will describe the published articles briefly in the following. The first three articles contribute with methodologies and systems geared towards supporting non-trivial tasks for applications, viz. ontology translation, annotation and ranking, whilst the others present applications' descriptions for the areas of information retrieval, information extraction, multi-agents, mediators and information integration.

The paper "ODEDialect: a Set of Declarative Languages for Implementing Ontology Translation Systems" written by Oscar Corcho from the University of Manchester, England, and Asunción Gómez-Pérez from the Polytechnic University of Madrid, Spain, introduces a novel approach to ontology transition that comprises the various dimensions required for this task, namely, the lexical, syntactical, semantic and (partly) pragmatic dimensions based on rules and primitive translations functions implemented in Java. The authors discuss their approach against the state-of-the-art, in special, some logic-based related work.

The paper entitled "An Adaptable Framework for Ontology-based Content Creation on the Semantic Web", written by Onni Valkeapää, Olli Alm and Eero Hyvönen from the Helsinki University of Technology (TKK), Finland (the last two are also with the University of Helsinki), discusses how to make provision of metadata easier and cost-effective by an annotation framework comprising of annotation editor combined with shared ontology services. This is a highly important issue for the scalability of Semantic Web, since many emerging applications, such as semantic portals, cannot be realized with the lack of proper tools to provide metadata for them. The authors report on an annotation system developed by them that supports distributed collaboration in creating annotations, which has the advantage of hiding the complexity of the annotation schema and the domain ontologies from the annotators. The system is being tested in various practical semantic portal projects.

The paper "On Ranking RDF Schema Elements (and its Application in Visualization)", a contribution made by Yannis Tzitzikas, Dimitris Kotzinos and Yannis Theoharis, all from the Computer Science Department, University of Crete, Greece, touches a relevant issue to the realization of the Semantic Web, the task of ontology selection, that may require the support of specialized ranking systems. Their paper elaborates on this issue for the case of RDF schemas, by proposing several metrics for evaluating automatic methods for ranking schema elements, as well as evaluating ranking methods and discussing interesting insights to the problem brought up by these evaluation results. The article finishes with a report of experiences from the application of these ranking methods for visualizing RDF schemas as subgraphs.

The paper entitled "An Ontology-based Approach to Support Text Mining and Information Retrieval in the Biological Domain" by Khaled Khelif, Rose Dieng-Kuntz and Pascal Barbry, all from the INRIA research insititute at Sophia Antipolis, France, describes an ontology-based approach aiming at supporting biologists in the validation and interpretation of their DNA microarray experiments' results, by allowing for semantic annotation of documents and its respective retrieval. The authors propose a method and a system for the generation of ontology-based annotations as well as another system able to draw advanced inferences on these annotations. The article stresses the potential advantage of such a semantic approach, in the form of a possible extension to accomplish other massive analyses of other biological events (such as provided by the areas of proteomics and metabolomics, for instance).

The paper "Discovering the Semantics of User Keywords" done by Raquel Trillo, Jorge Gracia, Mauricio Espinoza and Eduardo Mena from the University of Zaragoza, Spain, presents an approach for an extremely relevant application of ontologies, the disambiguation of keyword-based queries entered by the user. Their proof-of-concept system discovers the semantics of user keywords by consulting the knowledge represented by many heterogeneous and distributed ontologies. Context information is used to remove ambiguity and build the most probable query. As keyword-based search is the dominating approach in search engine technology, this work is highly relevant and could indeed be a killer application for semantic techniques using ontologies.

Finally, the paper "The SEWASIE Network of Mediator Agents for Semantic Search" made by Domenico Beneventano, Sonia Bergamaschi, Francesco Guerra and Maurizio Vincini, from the University of Modena and Reggio Emilia in Italy, adresses the well-known problem of information integration from heterogenenous sources, one of the most spread application of ontologies and Semantic Web technologies. Their proposal is to tackle this integration problem with a multi-agent system composed of different kinds of agents, such as Mediator, query end-user and broker agents, a main result from a successfully finished project supported by the European Community. As a proof-of-concept, the authors describe a running example which details the techniques implemented for integrating and querying data sources by means of ontologies.

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