Enrico Motta
Nigel Shadbolt
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LNAI 3257

Engineering Knowledge in the Age of the Semantic Web

14th International Conference, EKAW 2004
Whittlebury Hall, UK, October 2004
Proceedings

Springer

TP18-53
K732
2004

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Springer

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Arthur Stutt
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Walton Hall, Milton Keynes, MK7 6AA, UK
E-mail: {e.motta, a.stutt}@open.ac.uk

Nigel Shadbolt
Nick Gibbins
University of Southampton, School of Electronics and Computer Science
Highfield, Southampton, SO17 1BJ, UK
E-mail: {nrs, nmg}@ecs.soton.ac.uk

Library of Congress Control Number: 2004112955

CR Subject Classification (1998): I.2, H.4, H.3, J.1, C.2

ISSN 0302-9743
ISBN 3-540-23340-7 Springer Berlin Heidelberg New York

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Typesetting: Camera-ready by author, data conversion by Scientific Publishing Services, Chennai, India
Printed on acid-free paper SPIN: 11329886 06/3142 5 4 3 2 1 0

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Edited by J. G. Carbonell and J. Siekmann

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Preface

The central themes of the 14th International Conference on Knowledge Engineering and Knowledge Management (EKAW 2004) were ontological engineering and the Semantic Web. These provide the key foundational and delivery mechanisms for building open, Web-based knowledge services. However, consistent with the tradition of EKAW conferences, EKAW 2004 was concerned with all aspects of eliciting, acquiring, modelling and managing knowledge, and its role in the construction of knowledge-intensive systems. Indeed a key aspect of the Knowledge Acquisition Workshops (KAWs) held in the US, Europe and Asia over the past 20 years has been the emphasis on 'holistic' knowledge engineering, addressing problem solving, usability, socio-technological factors and knowledge modelling, rather than simply analyzing and designing symbol-level inferential mechanisms. The papers included in this volume are thus drawn from a variety of research areas both at the cutting edge of research in ontologies and the Semantic Web and in the more traditionally grounded areas of knowledge engineering.

A Semantic Web service can be seen as the addition of semantic technologies to Web services to produce Web-accessible services that can be described using appropriate ontologies, reasoned about and combined automatically. Since Web services can be seen as Web-accessible computational objects, much of the work in this area is also concerned with problem-solving methods (PSMs). Over the past 20 years the EKAW community has been at the forefront of research on PSMs and it remains the case that this event is one of the few places in which the reasoning structures that will make up knowledge services are discussed in depth. Ontologies may well be the current buzzword, but knowledge engineers know only too well that without PSMs or some other means of modelling inferential structures, we will never move beyond simple indexing and service discovery systems.

Thus, these proceedings show that research on PSMs is still going strong and PSM technology has much to offer both 'traditional KA' as well as research on the Semantic Web and on Semantic Web services. Van Harmelen et al. show how composite Web service configuration can be seen as an instance of the parametric design PSM. Svatek et al. discuss how PSMs can be deployed to describe deductive Web mining applications. Stojanovic uses the cover-and-differentiate PSM to model the reasoning patterns of a generic e-shop agent. López Cobo et al. present a notification agent in the financial domain, which is implemented using Semantic Web services. Johnston and Kushmerick present an algorithm for Web service data integration. Di Sciascio et al. show how request and offer descriptions can be reconciled.

We can also see several experiments in creating semantic applications. These applications range from semantic portals, through medical applications to applications

that use ontologies to establish trust in social networks and extend the possibilities of e-learning.

Contreras presents an overview of a semantic portal currently operational at a Spanish current affairs institute. Lei et al. present OntoWeaver-S, an ontology-based infrastructure for building knowledge portals, which is integrated with a comprehensive Web service platform. This is the first example of an ontology-based modelling methodology to address the issue of providing remote Web services for knowledge portals. Tamma et al. describe a system that combines a number of technologies to search for digital content on the Semantic Web. Stuckenschmidt presents a system that combines thesaurus-based search and topic-based exploration for large information spaces.

Some of the earliest expert systems were concerned with the medical domain so it's good to see that this area of research is still very important to researchers in knowledge technologies. Hu et al. use DAML+OIL to model instances of breast cancer patient records while Dieng-Kuntz et al. model cooperative diagnosis using a medical ontology derived from a medical database and natural-language processing of a textual corpus.

In more explicitly Semantic Web-oriented work, Golbeck and Hendler show how it is possible to calculate reputation ratings to establish trust in a Web node. Stutt and Motta propose a vision of how current online learning environments can be extended through ontologically based learning services.

One of the fundamental problems that needs to be solved if the Semantic Web is to become a reality concerns ontologies. Knowledge engineers invented these as the key enabling technology to support knowledge sharing and reuse, and ontologies have gone on to become the defining property of the Semantic Web. Without an ontology, an application is just another Web application. Thus, at this conference we see several technical papers on issues such as ontological mapping and translation, ontology maintenance, and ontology representations and methodologies.

Papers on the technical aspects of ontologies include those by Herre et al. and van Elst and Kiesel on ontology mapping. Given the heterogeneous nature of the ontology representations to be found on the Web, it is vitally important that we find ways of integrating the knowledge to be found in distributed knowledge bases. One way of doing this is to map between terms in different knowledge bases. Corcho and Gómez-Pérez approach the problem from a different perspective, showing how it is possible to translate from one ontology to another.

If we are going to have large, distributed knowledge bases or populated ontologies that are able to change as knowledge changes, we need some means of maintaining these ontologies. Valarakos shows how an incremental ontology maintenance methodology coupled with ontology learning can lead to better results overall, while Baumeister et al. provide a framework for the automatic restructuring of knowledge bases.

One of the problems of deploying ontologies on the Web is in choosing the notation to use from those available. Wang et al. discuss their experience of teaching OWL-

DL, while Guizzardi et al. provide an ontological analysis of the commonly used UML representation. Van Acker et al. present a Web-based tool for the development of representations of innovation environments. Kitamura and Mizoguchi discuss a methodology for capturing functional knowledge.

We can't have knowledge-based applications (and knowledge services are knowledge intensive by definition) without knowledge, and knowledge needs to be acquired. Thus, true to the name of our conference, we have a range of papers on knowledge acquisition. These range from papers on technical solutions, through acquisition from multiple experts, to tools for KA and KA for specialist applications.

More-traditional knowledge acquisition papers include Pacheco et al.'s work on a knowledge authoring system that uses graphical assembly to capture different kinds of rules and relations. Bekmann and Hoffmann present a novel incremental knowledge acquisition approach to the introduction of domain knowledge in adapting probabilistic search algorithms. Tecuci et al. show how a knowledge base can be built from the knowledge of multiple experts. Helsper et al. discuss methods for acquiring the probabilities needed to build Bayesian networks in the domain of neonatology. Suryanto and Compton show how machine learning can be used to generalize from knowledge to produce new predicates that reduce knowledge acquisition. Molina and Blasco describe a document-oriented KA tool for modelling of emergency management in the domain of hydrology. Finally Simpson et al. discuss an environment for knowledge acquisition for AI planning in the hiking domain.

The EKAW series of workshops started in 1987 to provide a forum for researchers interested in the acquisition, modelling and engineering of knowledge. Seventeen years later this event is still going strong, and indeed the original motivation (engineering knowledge for use in intelligent applications) is of course more pressing today than it was 17 years ago. The dramatic growth of the Web and the rise of the knowledge economy makes knowledge-based decision making under uncertainty the key skill needed to deal with complexity. Thus, EKAW is even more important and topical now than it was when it was launched. At the same time the World Wide Web provides an infrastructure capable of realizing the ambitions and aspirations of our field. The goal ultimately is to offer up both services and content in the right form, at the right time to those agents (human and artificial) that need them.

We would like to acknowledge the sterling work of the members of the Programme Committee in reviewing and commenting on, in some heroic cases, up to eight papers. Special thanks also go to Jane Whild at the Open University and Susan Davies at the University of Southampton without whose organizational skills this conference would still be a gleam in the organizers' eyes. The other members of the local organization committee also deserve our gratitude for dealing with a variety of academic and support tasks. They include John Domingue, Martin Dzbor, Harriett Cornish and Damian Dadswell at the Open University and Kieron O'Hara at the University of Southampton (although we ought to point out that Kieron did not really have that much to do ...).

Finally we are also grateful to our sponsors, the Engineering and Physical Sciences Research Council (UK), the Advanced Knowledge Technologies (AKT) project, the KnowledgeWeb Network of Excellence, the British Computer Society, the Open University and the University of Southampton, for ensuring the financial viability of the event.

July 2004

Enrico Motta
Nigel Shadbolt
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