Guest Editorial Preface

Special Issue:
Ontology Matching

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An ontology typically provides a vocabulary that describes a domain of interest and a specification of the meaning of terms used in the vocabulary. Depending on the precision of this specification, the notion of ontology encompasses several data and conceptual models, for example, classifications, database schemas, or fully axiomatized theories. However, when several competing ontologies are in use in different applications, they cannot interoperate.

Ontology matching is a plausible solution to this semantic heterogeneity problem. Ontology matching aims at finding correspondences between semantically related entities of the input ontologies. These correspondences can be used for various tasks, such as ontology merging, query answering, data translation, and so forth. Thus, matching ontologies enables the knowledge and data expressed in the matched ontologies to interoperate.

The goal of this special issue is to present recent advances in ontology matching. We welcomed submissions on three wide areas of interest: (1) *theories and methods*, including formal foundations and frameworks, background knowledge in ontology matching, uncertainty in ontology matching, performance of ontology matching techniques, interactive ontology matching, explanations and transparency of ontology matching, social aspects of ontology matching, multilingual ontology matching, partial automated ontology matching, libraries of basic (elementary) automatic matchers, automation of the combi-nation of basic matchers, self-configuration of matching solutions, ontology matching evaluation methodology, large evaluation dataset construction, evaluation quality measures, large-scale case studies, (2) *applications,* including information integration, query answering, Web query interface integration, peer-to-peer systems, multi-agent systems, Web service integration, and (3) *tools*, including user interfaces, scalability of visualization techniques, customizing technology, systems, and infrastructures.

This special issue is the outcome of the selection of articles spontaneously submitted in response to the call for articles described previously, and issued on March 15, 2006. Altogether, 30 submissions were received and reviewed. After the first round of reviews, two articles were accepted (one of which entitled "Semantic Enrichment in Ontologies for Matching" by Nwe Ni Tun (Nini) and Satoshi Tojo went to the earlier regular *IJSWIS 2*(4) issue) and 11 submissions were asked to perform a major revision and resubmit. Most of these were actually resubmitted and went through a second round of reviews, with the same referees as assigned for the first round. Eventually, six articles were accepted for publication after the second round of reviews and some modifications suggested by the referees. However, due to space limits, in this special issue, only five articles appear, while the other articles will appear in the forthcoming regular *IJSWIS* issues.

The first article "Experience in Aligning Anatomical Ontologies" by Songmao Zhang and

Olivier Bodenreider summarizes and discusses the authors experience in schema-based automatic matching of large anatomical ontologies. In particular, a number of lexical, structural, and semantic techniques as well as their combinations have been employed. The proposed approach is evaluated on such ontologies as the Foundational Model of Anatomy, GALEN, the Adult Mouse Anatomical Dictionary and the NCI Thesaurus.

The second article "Association Rule Ontology Matching Approach" by Jérôme David, Fabrice Guillet, and Henri Briand, presents the work to automatically discover equivalence and subsumption relations between entities of the input ontologies based on data mining methods. In particular, the approach provides two related techniques: the first designed to work on Web directories or classifications and the second designed to handle OWL ontologies. The basic matching method relies on extracting kinds of association rules denoting semantic associations holding between terms they include. The extraction is made on a statistic basis. The approach has been implemented in the AROMA system and evaluated on a number of datasets.

The third article "A Formal Foundation for Ontology-Alignment Interaction Models" by Marco Schorlemmer, Yannis Kalfoglou, and Manuel Atencia, provides a foundation for ontology alignment in a channel-theoretic framework based on interaction models between heterogeneous agents, and formalizes semantic alignment as a process of information channel refinement. By using this formalization, an ontology matching process can be directly translated into an executable interaction model when grounded on particular agents.

The fourth article "An Ontology-Based Data Mediation Framework for Semantic Environments" by Adrian Mocan and Emilia Cimpian presents a formal model for alignment creation between ontologies and investigates how such a model helps expressing alignments in a logical language. They describe a design-time graphical tool supporting this model and discovering alignments in a semi-automatic fashion with the help of lexical and structural matching techniques as well as user feedback guided by the tool.

The fifth article "Automatically Integrating Heterogeneous Ontologies from Structured Web Pages" by Shiren Ye and Tat-Seng Chua provides a systematic end-to-end framework for integrating multiple ontologies extracted from structured Web pages into a common ontology as well as its application domain. The approach introduces a similarity paradigm to perform matching. The similarities, in turn, are computed based on intention information, extension information and context information. The proposed approach has been implemented in the OnModer platform and evaluated on a large number of various DTDs from the health and publication domain.

The two articles to appear in the forthcoming regular IJSWIS issues include: "Dynamic, Automatic, First-Order Ontology Repair by Diagnosis of Failed Plan Execution" by Fiona McNeill and Alan Bundy, and "Semantic Labeling of Online Information Sources" by Kristina Lerman, Anon Plangprasopchok, and Craig Knoblock.

We think that this set of articles reflects the vitality and diversity of the approaches to ontology matching. Because such a special issue would not have been possible without them, we would like to express our utmost gratitude to the special issue referees, who invested a lot of time and energy in contributing detailed reviews and feedback on the submitted articles:

- Sonia Bergamaschi, University of Modena and Reggio Emilia, Italy
- Alex Borgida, Rutgers University, USA
- Paolo Bouquet, University of Trento, Italy
- Diego Calvanese, Free University of Bozen-Bolzano, Italy
- Mark Carman, University of Southern California, USA
- Francesco Colasuonno, Politecnico di Bari, Italy
- Tommaso Di Noia, Politecnico di Bari, Italy
- Avigdor Gal, Technion, Israel
- Fausto Giunchiglia, University of Trento, Italy
- Michael Gruninger, University of Toronto, Canada
- Nicola Guarino, ISTC-CNR, Italy
- Francesco Guerra, University of Modena and Reggio Emilia, Italy
- Bin He, IBM Almaden Research, USA
- Pascal Hitzler, University of Karlsruhe, Germany

Pavel Shvaiko is a postdoc fellow at the Department of Information and Communication Technology (DIT) of the University of Trento (UniTn), Trento, Italy. He obtained his PhD in 2006 at DIT UniTn with the dissertation "Iterative Schema-based Semantic Matching." He has co-authored and co-edited a number of books, contributed to, and published in various international journals, conferences and workshops in the fields of Semantic Web, artificial intelligence, and information systems. He participated in several European, national, and industrial projects. Currently, he is intensively involved in various projects of the European Commission's 6th Framework Programme, such as Knowledge Web and OpenKnowledge. In particular, in Knowledge Web he works on matching multiple schemas, classifications, ontologies as a solution to the semantic heterogeneity problem. His activities in the OpenKnowledge project include dynamic ontology matching and knowledge management for GIS data.

Jérôme Euzenat is senior research scientist (directeur de recherches) at INRIA, the French National Institute for research in computer science and control, where he leads the Exmo team. Exmo is dedicated to the use of knowledge representation to improve computer-mediated communication. In particular, it investigates the use of relations between representations for ensuring interoperability on the Semantic Web. Euzenat has published in many areas of artificial intelligence including truth maintenance systems, object-based knowledge representation, temporal granularity, cooperative knowledge base edition and knowledge representation. His long term interests are tied to the concurrent representations of the same situation and the relationships among them. So he is naturally researching ontology matching and the representation of alignments. With Pavel Shvaiko he wrote a reference book on this topic: ontology matching.