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Guest editorial preface: Software and system engineering: an ontological perspective

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1 Motivation

The evolution and growth of organizations is unpredictable and continuous: today, globalization of markets and nations has led to the development of new ways of building social relationships among people in every science context, from family to working environments.

In this scenario, an evolution of computer science is also necessary. Starting from the explosion of the Internet and the World Wide Web to the most recent phenomena such as communities of practice (Wenger, 1998) and social networks (Hannemann & Riddle, 2005), new models of interactions between human beings and computers have been proposed that must be considered in the design and implementation of modern systems.

For this reason, a closer relationship between software and knowledge engineering should be established, taking a concrete step towards the integration of methodologies coming from these two disciplines in dealing with new challenges proposed by the evolution of society. Although significant examples of such integration can be found in literature, for example, CommonKADS (Akkermans *et al*., 1994) and MIKE (Angele *et al*., 1998) and, more recently, SWEBOK (Bourque & Dupuis, 2004), and the development of new computational models should be thought about and realized.

In this conceptual framework, the design and implementation of complex and high-quality software systems today require a greater understanding of theoretical, epistemological and conceptual theories and practices coming from the area of human sciences. The common interest in ontologies (Guarino, 2008) as a means of sharing knowledge among people and representing pieces of software systems is an actual and scientifically grounded research area.

The joint involvement of researchers on Software, Systems and Knowledge Engineering investigating ontologies from different perspectives of Computer Science and Social Science has opened-up both novel networking possibilities and shared common scientific and cultural interests. An initial result of this investigation has been the creation of an inter-disciplinary group of researchers who periodically discuss these topics during the ONTOSE workshop series[1,2], originally starting from a collaboration between the Information Engineering Research Unit at the University of Alcalà de Henares and the Software Engineering Research Laboratory at the Ècole Supèrieure—Universitè du Quèbec. At the time of writing this article, the third edition of the ONTOSE workshop is being organized for 2009.

This special issue is a consequence of this effort, with the goal to give an overview of the state-of-the-art research on the design of high-quality software systems, reflecting on how ontologies can be used for this purpose. Topics of the accepted papers include both theoretical and practical aspects of *Ontology and formal ontology representations of Software Engineering*, *Systems Engineering*

[1] http://www.cc.uah.es/msicilia/ws-onto/
[2] http://www.lintar.disco.unimib.it/ONTOSE07/

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and Information Systems; *Studies and essays about metrics*, *indicators*, *and general issues regarding research on Software and Systems Engineering*; *Conceptualizations*, *bodies of knowledge or schemas for SE or SWE representation*; *Applications that deal with representations of concepts and relations of the disciplines*; *Social*, *psychological*, *and organizational issues about the disciplines*; *Epistemological and philosophical aspects of software development*; *Architectural patterns for the design of high-quality software*; *UML modeling*.

This special issue contains a careful selection of papers that make a significant contribution to the cross-fertilization of different disciplines. The 11 papers proposed are organized into two separate issues and represent only a small set of the nearly 40 articles originally submitted. The current issue includes five papers mainly related to the Software Engineering area; whereas the second issue will collect six papers mainly concerning the Knowledge Engineering field.

2 Contents of this issue

The first paper, *The Concepts of Model in Information Systems Engineering: a Proposal for an Ontology of Models* by Diana M. Sanchez, Jose Maria Cavero, and Esperanza Marcos, tries to clarify the concept of model through a study of some of the more common ones used in the area of Information Systems. Very often models (such as schemata, ontologies, and patterns) are exploited in a confused and erroneous manner as the roles they can play within an information system are very different. The authors propose a clear conceptual framework of the terms most widely used in Information Systems to attribute a role to each type of model. To this end, they present an ontology on the concept of model.

The second paper, *Effective Use of Ontologies in Software Measurement* by Felix Garcia, Francisco Ruiz, Coral Calero, Manuel F. Bertoa, Antonio Vallecillo, Beatrix Mora, and Mario Piattini, presents experiences and lessons learnt from the effective use of the Software Measurement Ontology (SMO). First, the authors present the use of SMO as a domain ontology by describing how SMO can serve as a conceptual basis for comparing international standards related to software measurement. Successively, the authors describe several examples of the applications of SMO as a software artifact. In particular, they instantiate SMO to define a data quality model for web portals. Finally, they use SMO to define a Domain Specific Language for measuring software entities.

The third paper, *An Ontologically Based Evaluation of Software Design Methods* by Udo Kannengiesser and Liming Zhu, introduces an application of the well-known FBS (function–behaviour–structure) model for designing support in the software management field, with very promising results. The most interesting achievement of the authors is the demonstration of how the FBS can be considered general enough to be applied in a variety of contexts. In particular, the classification of methods depending on the development perspective to design software proposed by authors, as well as the comparison of practical methods usually adopted in SW design defined on the basis of the conceptual model, which is the subject of the paper, is very relevant. This shows how the FBS model is interesting from both the theoretical and practical point of view.

The fourth paper, *A Semantic Web Environment for Components* by Hai H. Wang and Jing Sun, provides an OWL- and SWRL-based ontology that captures the intricacies of the Exogenous Connectors Component model. This ontology allows designers to perform automated analyses of their systems. The authors also propose a framework for designing, implementing, and running component-based systems, which can benefit from their proposed ontology.

The fifth paper, *Engineering Spatial Concepts* by Daniela Micucci, Francesco Tisato, and Marzia Adorni, through a simple example, discusses how basic software engineering principles can be exploited to identify a coherent set of spatial abstractions and to devise a space-aware architecture. As the underlying software engineering principles are close to principles that underlie the definition of space ontologies, the authors' conjecture is that the proposed space architectural abstractions may be the basis for a formalization in ontological terms.

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