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GUEST EDITORIAL

We are honored and pleased to open this special issue of the International Journal on Artificial Intelligence Tools (IJAIT) focused on Intelligent Distributed Systems.

The new generation of Intelligent Distributed Systems faces the challenges of adapting and combining research results in the fields of Intelligent Computing and Distributed Computing. Intelligent Computing develops methods and technology ranging from classical Artificial Intelligence, Computational Intelligence and Multi-Agent Systems to Game Theory. The field of Distributed Computing develops methods and technology to build systems that are composed of collaborating components deployed on computer networks.

Modern distributed systems employ a service-oriented architecture that allows the development of systems composed of distributed components that interact and coordinate using standardized network protocols. This approach allows the development of open and scalable distributed systems that can engage in complex intelligent processes that are capable of solving increasingly difficult problems. Agents are software components that can decide autonomously if and when to perform a given action, can communicate with other agents by asynchronous message passing, and can be located on arbitrary machines of a computer network, providing that a certain software runtime is locally available. Agents are often endowed with high-level mental properties including goals, beliefs, plans, knowledge, and reasoning that altogether can be seen as incarnations of "intelligence". Thus agents are obviously an appealing candidate as building blocks for intelligent distributed systems.

This special issue focuses on how Artificial Intelligence techniques of various AI sub-areas, such as Intelligent Agents and Multi-agent Systems, Knowledge Representation and Reasoning, Semantic Web and Ontologies, Machine Learning can contribute to intelligent distributed computing in order to build distributed systems that are able to communicate and coordinate their actions to exhibit intelligent and adaptive behavior. The special issue brings to the reader new results, applications and tools of intelligent distributed systems, with a special focus on synergies between agents, services and processes on one side and semantic technologies including ontologies and rules on the other side. In particular, some of the papers address interesting applications of intelligent distributed approaches in the areas of ambient intelligence, human collaboration and e-business.

This issue includes articles which are extended versions of selected papers from the 4th International Symposium on Intelligent Distributed Computing (IDC 2010) held on September 16–18, 2010, in Tangier, Morocco and the collocated 2nd International Workshop on Multi-Agent Systems Technology and Semantics (MASTS 2010). There were 61 papers from 20 countries submitted to IDC 2010 and MASTS 2010, from which 32 in total were accepted and included in the proceedings. From the accepted papers, eight papers with the highest review scores, those related more to AI Techniques for Distributed Computing, were selected and invited to be extended and submitted to this special issue. Furthermore, two more papers were invited from well-known research teams working on intelligent distributed systems. Finally, after two peer-review rounds, eight of them were finally selected for this special issue

The first four articles are mainly in the area of Intelligent Agents and Multi-agent Systems. The first article, by Andrei Olaru and Cristian Gratie, presents the first steps toward the realization of a multi-agent system that relies on local interaction and self-organization of agents, having as purpose the context-aware sharing of pieces of information generated throughout an Ambient Intelligence environment, formed mostly of a network of sensors, intelligent appliances and computer-like devices with limited capabilities. The article presents the structure of the system, the design of the agents, the way to build scenarios, experiments and the evaluation of a prototype.

The second article, by Andreea Urzică, Andrei-Horia Mogoş and Adina Magda Florea, investigates the interactions between parties within large open systems which are driven by trust, represented by reputation. The article proposes a negotiation model for a normative multi-agent system where reputation represents the leverage that ensures norm enforcement. The negotiation framework is comprised of a marketplace using barter exchanges. Based on this model, the article shows how self-interested agents manage to establish cooperation relationships in order to accomplishing their goals, being aware of the influence that reputation has on the costs of future transactions.

The third article, by Kai Jander, Lars Braubach, Alexander Pokahr, Winfried Lamersdorf and Karl-Josef Wack, introduces the goal oriented process modeling notation (GPMN) by presenting a new language that has the objective of bringing together business people and IT people working together on business process management by establishing higher-level modeling concepts for workflows. The new language results in an increased intelligibility of workflow descriptions for business people and greater consideration for the way processes are described on the business side. The core idea of the approach consists in introducing different kinds of goals and goal relationships in addition to the established activity-centered behavior model. The applicability of the approach is illustrated with an example workflow from Daimler AG.

The fourth article, by Adrian Paschke and Harold Boley, presents Rule Responder, a Pragmatic Web infrastructure for distributed rule-based event pro-

cessing multi-agent eco-systems. This allows specifying virtual organizations, with their shared and individual (semantic and pragmatic) contexts, decisions, and actions/events for rule-based collaboration between the distributed members. The (semi-)autonomous agents use rule engines and Semantic Web rules to describe and execute derivation and reaction logic which declaratively implements the organizational semiotics and the different distributed system/agent topologies with their negotiation/coordination mechanisms. They also employ ontologies in their knowledge bases to represent semantic domain vocabularies, normative pragmatics and pragmatic context of event-based conversations and actions.

The last four articles are mainly in the areas of Knowledge Representation and Reasoning, Ontologies and the Semantic Web. The fifth article, by Ate Penders, Gregor Pavlin and Michiel Kamermans, introduces a new collaborative approach to construction of large scale service oriented systems supporting distributed reasoning. In the article complex situation assessment is carried out through composition of heterogeneous services, each specialized on a particular type of analysis. Services are composed automatically by using service discovery and negotiation. The presented solution supports efficient definition of services by using a combination of light weight service ontologies, efficient construction procedures and tools. In particular, machine-understandable descriptions of heterogeneous services with well defined syntax and semantics can be created by multiple designers, without complex coordination of collaborative design processes and without any knowledge of formal ontologies.

The sixth article, by Grzegorz J. Nalepa, Antoni Ligęza and Krzysztof Kaczor, formalizes, using ALSV(FD) logic, a new hybrid knowledge representation scheme for rule-based systems, called XTT2, combining decision trees and decision tables. XTT2 forms a transparent and hierarchical visual representation of the decision units linked into a tree-like structure. There are two levels of abstraction in the XTT2 model: the lower level, where a single knowledge component defined by a set of rules working in the same context is represented in a single decision table, and the higher level, where the structure of the whole knowledge base is considered. The model opens up possibilities of formalized design and verification. Based on the visual XTT2 model, an algebraic human-readable textual representation of the rule base is generated. Finally, a dedicated engine provides a unified run-time environment for the XTT2 rule bases.

The seventh article, by Maxim Davidovsky, Vadim Ermolayev and Vyacheslav Tolok, presents a method and a tool for migrating instances between ontologies that have structurally different but semantically overlapping TBoxes. The approach is based on the use of the manually coded transformation rules describing the changes between the input and the output ontologies. The tool is implemented as a plug-in to Cadence ProjectNavigator prototype software framework. The article also reports the results of three evaluation experiments, which evaluate the degree of complexity in the structural changes to which the approach remains valid and the scalability of the approach.

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Finally, the eighth article, by Bouchra Frikh, Ahmed Said Djaanfar and Brahim Ouhbi, proposes a new method to extract information from the Web in order to build a taxonomy of terms and Web resources for a given domain. Firstly, a method is used to identify candidate terms. Then a similarity measure is introduced to select relevant concepts to build the ontology. The proposed algorithm, called CHIRSIM, can be efficiently integrated into an information retrieval system to help improve the retrieval performance. Experimental results show that the proposed approach can effectively and efficiently construct a domain ontology for cancer from unstructured text documents.

Concluding, we would like to thank the authors of the papers for preparing extended versions of their conference papers and the reviewers for their great job that assures the high quality of the final articles. Also, we would like to thank Professors Mohammad Essaaidi and Michele Malgeri for co-organizing IDC 2010, whose high scientific quality standard enabled this special issue. Finally, we would like to express our appreciation to Prof. Nikolaos Bourbakis, Editor-in-Chief of IJAIT, for offering us the opportunity to edit this exciting special issue and to Assist. Prof. Ioannis Hatzilygeroudis for guiding us throughout the entire process. We really hope that the readers of this issue will find the articles quite interesting and stimulating.

Guest Editors
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