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Collective Intelligence for Semantic and Knowledge Grid

J.UCS Special Issue

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Recently, grid computing has been regarded as the most promising paradigm to interconnect heterogeneous computing environments. Main goal of this grid computing paradigm is to share local but limited resources with others to solve very complex problems [Foster 2003]. Especially, semantics and knowledge are playing an important role of building an efficient grid platform to share information and knowledge with each other [de Roure et al. 2005]. A variety of domains, e.g., business [Zhen and Jiang 2008, Jung 2008], chemistry [Taylor et al. 2006], information retrieval [Jung 2007], and biomedical areas [Tsiknakis et al. 2008], have been attempting to employ this semantic grid platform.

However, there are several hurdles that they have to overcome in common, e.g., semantic heterogeneity (e.g., inconsistency and conflict) between information sources on a grid. In order to efficiently deal with the hurdles and implement the semantic grid platform, there have been representative approaches, e.g., web services (S-OGSA [Corcho et al. 2006]), metadata, ontologies and reasoning.

More particularly, collective intelligence is the latest buzzword to take into account how to find any opportunities to link individual intelligence as well as how to apply the collective intelligence to various problems. In this issue, we are focusing on the semantic and knowledge grid platforms (as well as distributed platforms) for building and exploiting collective intelligence. Main topics of interests are noted, as follows;

1. Theoretic aspects
   – Ontology models and ontology engineering
   – Ontology mapping (alignment, matching, and merging)
   – Consensus theory (conflict resolution and negotiation)
   – Knowledge representation and discovery
   – Social network analysis (user clustering and community identification)
2. Applicaiton aspects
   – Knowledge management systems

- Data mining applications
- Multi-agent architecture
- Semantic Web service applications
- Other applications (e.g., e-commerce and e-learning)

Hence, the aim of this special issue is to bring together researchers and practitioners in areas of knowledge and intelligence, semantics, and grid computing to share their visions, research achievements and solutions to real applications, to resolve the challenge issues and to establish worldwide cooperative research and development.

This issue is composed of two parts, as selected from the studies presented in two international events. For the first part of this issue, we selected two papers from The First International Workshop on Collective Intelligence on Semantic and Knowledge Grid (CISKGrid 2007), which were held in Beijing, China.

The first paper, entitled "Ranking Retrieval Systems with Partial Relevance Judgements" (Shengli Wu and Fabio Crestani), claims that in distributed information retrieval architecture partial relevance judgements can be integrated. They discuss how to rank retrieval systems in the condition of partial relevance judgments, which is common in major retrieval evaluation events such as TREC conferences and NTCIR workshops.

The second paper "Query Transformation Based on Semantic Centrality in Semantic Social Network" (Jason J. Jung) is focusing on semantic social network platform. He proposes a new measurement of semantic centrality, i.e., the power of semantic bridging on semantic peer-to-peer environment. Thereby, semantically cohesive user subgroups are built so that semantic affinities between peers can be computed.

As second part of this issue, we have selected seven papers from International Symposium on Agent and Multi-agent System: Technology and Applications (AMSTA 2007), which were successfully held in Wroclaw, Poland.

The third paper in this issue is "Schema Mappings and Agents Actions in P2P Data Integration System" (Grażyna Brzykcy, Jerzy Bartoszek, and Tadeusz Pankowski). It proposes a novel mapping method between distributed schema to support automatic communication between software agents.

The fourth paper is entitled "An Improved Multi-Agent Simulation Methodology for Modelling and Evaluating Wireless Communication Systems Resource Allocation Algorithms" (Panagiotis Minas Papazoglou, Dimitrios Alexios Karras, and Rallis Constantine Papademetriou). This work investigates how to model more abstract entities involved in WCS operation, and especially the concurrent network procedures (services) for conducting efficient resource allocation in wireless communication systems

The fifth paper, entitled "An Agent-Based Solution for Dynamic Supply Chain Management" (Vedran Podobnik, Ana Petric, and Gordan Jezic), is attacking a business-oriented application (i.e., supply chain management). It has proposed a mutli-agent coordination framework, called CrocodileAgent, for efficiently managing dynamic supply chains.

The sixth paper, "A Knowledge Discovery Agent for a Topology Bit-map in Ad Hoc Mobile Networks" (SungSoo Lee, HangKon Kim, and ChongGun Kim), proposes a knowledge discovery agent for an effective routing method that uses simple bit-map topology information with Ad-hoc On Demand Distance Vector (AODV) protocol. The agents can collect topology information and aggregate it as a bit-map to figure out all available paths from a source to a destination.

The seventh paper is "Formalizing Agent-Based English Auctions Using Finite State Process Algebra" (Amelia Bădică and Costin Bădică). It introduces a formal framework based on finite state process algebra to take into account modeling and analysis of interaction protocols during agent-based negotiations.

The eighth paper, entitled "Reinforcement Learning on a Futures Market Simulator" (Koichi Moriyama, Mitsuhiro Matsumoto, Ken-ichi Fukui, Satoshi Kurihara, and Masayuki Numao), presents the futures market simulator U-Mart (Unreal Market as an Artificial Research Testbed) to construct various reinforcement learner models and compare them.

The ninth paper, entitled "Structural Performance Evaluation of Multi-Agent Systems" (Dariusz Król and Michal Zelmozer), proposes the new metrics on distributed object systems to evaluate a variety of types of distributed systems.

As a final remark, this set of papers provides a perspective on issues and experiences in not only collective intelligence on semantic grid platforms but also cooperation and collaboration on multi-agent systems. We are much indebted to the referees for their excellent work in suggesting ways to improve the previous versions of these research contributions. Especially, we thank Prof. GeunSik Jo, Prof. ChulMo Koo, and Dr. YoungShin Han for their great efforts to review and edit this special issue.

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