Editorial of Special Issue on Distributed Intelligent Systems

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Systems are becoming more and more complex. The properties of distribution are more and more important in systems for their identification, description, management, controlling, maintenance, knowledge, and intelligence. Applications of Distributed Intelligent Systems are emerging in more and more fields of industry.

A distributed system is composed of many computers and devices inter-connected with networks which cooperate and coordinate to accomplish one common task. Distributed intelligent systems are intelligent systems built on a distributed system. They are based on the use of cooperative agents and organized in hardware or software components. In the system, each agent independently handles a small set of specialized tasks and cooperates to achieve the system-level goals and a high degree of flexibility.

Distributed intelligent systems are also simulations of people societies or virtual societies. To simulate real societies, we need to understand the nature of our societies. A well-organized society should encourage the members of the society to contribute. With the same requirement, distributed intelligent systems as virtual societies should also create a healthy platform or environment for virtual participants to contribute and work in the virtual societies. We may view agents as virtual persons in intelligent systems. Distributed intelligent systems are aiming to obtain collective intelligence by organizing a large quantity of simple agents.

This special issue concentrates on the issues of intelligence and its distributions, management, controlling and maintenance of systems. I believe all the papers in this issue could provide the readers with new and broader views of distributed intelligent systems.

The first paper by Benaskeur et al. reports on the project initiated by Defense R&D Canada - Valcartier that is intended as a vehicle to assess holonic control as a means of improving tactical sensor management for distributed military surveillance operations. Three levels of sensor management are considered: sensor, platform, and group. The proposed design is used to develop a simulation using a military scenario in which the holonic control system is employed in the sensor management role.

Boloni et al. presents an agent-based coalition formation approach for disaster response applications. We assume that agents are operating in a dynamic and dangerous environment, and they need to form convoys to traverse unsafe areas. We introduce a commitment-based convoy model, where the commitments are negotiated between the participant agents. We show that this leads to a complex multi-issue negotiation, with two spatial and two temporal components. We propose an approach for reducing the negotiation space through the creation of discrete offer points, and describe a possible negotiation flow. We validate the model in a scenario using the map of New Orleans flooded by hurricane Katrina.

Farid and McFarlane present an Design Structure Matrix-based approach in a systematic view. It is applied for the reconfigurability measurement of manufacturing systems and illustrates its application on a robot assembly cell designed on distributed manufacturing system principles.

Gomez and Plaza presents an Open, Reusable and Configurable multi-Agent System (ORCAS). In order to improve the reusability of multi-agent systems, they apply knowledge modeling and into dealing with multi-agent systems. They describe the ORCAS e-Institution, and agent platform for developing and deploying open, reusable and configurable cooperative multiagent systems.

The paper by de Mingo et al. presents a practical example of a system based on neural networks. This neural system classifies an input pattern as an element of each different category or subcategory that the system has, until an exhaustive classification is obtained. It establishes relationships among all the different neural networks in order to transmit the neural activation when an external stimulus is presented to the system.

Armano et al. presents a “progressive filtering” technique aimed at improving the performances of a multiagent system devised to perform text categorization. The technique applies the discriminant capabilities of multiple classifiers organized into a taxonomy and is aimed at solving the unbalance problem between relevant and non relevant inputs in text categorization tasks.

An Integrated Vehicle Health Management (IVHM) system on modern aircraft or autonomous unmanned vehicles is presented by Angulo et al. In their paper, they propose an Open System Architecture - Condition-Based Maintenance (OSA-CBM) approach to consider self-health awareness by defining a multi-agent smart health management architecture that is based on smart device models, communication agents and a distributed control system.

To formally describe the unfolding of a communication process within a multi-agent system is an important topic. Koning begins his paper by giving a brief survey of the various methods used to represent communications within a multi-agent system. He uses a powerful tool (π-calculus) to specify the communication processes. He also presents the initial version of a paradigm based on operational semantics called POS. In order to demonstrate our model’s feasibility, he

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implements a generic program that enables the simulation of any multi-agent system governed by POS rules.

Agents' sociality enables the distribution of the application logic among different agents that can interact together and with the host environment. Cabri et al. presents an interesting agent interaction scenario and adopts the concept of a role in different (agent) approaches to flexibly manage interactions. In their paper, they explore the adoption of overhearing in conjunction with agent roles in order to provide more features to agents themselves.

The next three papers are originally considered for the special issue on Emergency Management Systems (vol. 11, no. 2006). They are included in this issue because of time reasons and also highly relevant to this issue's theme.

Crisis response is an information intensive process, which produces and consumes large quantities of information from, and for, different relief/response organizations. Chen and Dahanayake present a new service architecture for information seeking and retrieval, which offers a new way of thinking about seeking and retrieval of role-based, situation-aware information in the context of a crisis situation.

To achieve an effective response in crisis situations, organizations must play multiple roles. A high degree of collaboration among the responders of these organizations who serve on the front-line of a crisis is needed. Gomez and Passerini review the varying roles of these responders and how information and communication technology (ICT) device usage relevant to their respective roles can help. Increased ICT training and device usage is proposed for timely coordination when responding to a crisis.

To achieve the necessary capabilities of crisis technology, Fitrianie and Rothkrantz presents a communication-interface prototype. To support language-independent communication and to reduce the ambiguity and multitude of semantic interpretation of human observers' reports, they develop a grammar to interpret and convert the visual language messages to (natural language) text and speech.

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