

Guest Editorial

New generation of information systems should provide answers to the current trends in ICT system development. Real scaled systems should provide high autonomy with built-in intelligence in order to provide high quality service to the potential users. Agents and multi-agent systems (MAS) have been recognized as a promising platform for creating dynamic and adaptive complex intelligent systems. There is no scientific field where the application of agents and MASs is not recognized and used during the system's life cycle.

Modern agent and multi-agent systems are faced with continuous demands in order to provide the best quality of service. Adequate intelligent solutions and system design patterns are needed in various areas of modern agent-based systems, particularly for network security, availability and robustness, as well as for emerging mobile network services, social networks, cloud computing, Internet of Things (IoT), vehicular technologies, Web technologies and multiple users interactions. There is a growing need for improvement in networking and support infrastructure – not just in terms of quality and performance, but also in scalability, mobility, energy efficiency, and multiple technologies integration. Current and emerging agent and MAS technologies that enable ubiquitous computing and communications are key drivers for future society in smart environments.

Software agent technology is a rapidly evolving area of research and probably one of the fastest growing areas in the field of information technology and computer science. A software agent is a software artifact that autonomously acts on behalf of its environment. The most important property of an agent is its autonomy, meaning that the agent can act without direct intervention from its user or environment and it has the control over its own actions and internal state. A multi-agent system (MAS) is a distributed system with a number of interacting software agents. Therefore, multi-agent systems are not bound to a specific system or platform and can run on any software platform which supports the execution of an agent.

Agents can learn users' preferences and habits over time and adapt according to them, if necessary. They are also cooperative, which means that they communicate with other agents in the system in order to complete their tasks but are not bound to the system where they began their execution. Moreover, agents can react dynamically, which makes them suitable for rapid changing environments. Agents can also provide mobility which means that they can migrate from one host to another in the network. This is a very useful feature, because it helps to reduce network load and balance processor load. Instead of exchanging significant amounts of data during the communication between two distributed systems, agents can migrate to the destination host so that interactions can then take place locally. After it has finished its task, the agent returns to its original host with the results thus obtained.

This Special Issue of *CIT. Journal of Computing and Information Technology* on Agent and Multi-agent Systems Design (AMASD) comprises five research papers related to agent and multi-agent systems. All these papers are substantial extensions of papers originally presented at the 10th and 11th *International KES Conference on Agent and Multi-Agent Systems: Technologies and Applications (KES-AMSTA)* held in 2016 and 2017 respectively and organized by KES International.

KES-AMSTA is an international scientific conference for discussing and publishing innovative research in the field of agent and multi-agent systems and technologies applicable in the digital and knowledge economy. The aim of the conference is to provide an internationally respected forum for both research and industrial communities on the latest work on innovative technologies and appli-

cations that are potentially disruptive to industries. Topics of research in this field, among others, include technologies in the area of decision making, big data analysis, IoT, business informatics, artificial intelligence, expert systems, social systems, social networks, health, transportation systems and smart environments. Special attention is paid to agent communication and architectures, modelling and design, agent negotiation and optimization, business informatics, intelligent agents and multi-agent systems. The conference attracts a substantial number of researchers and practitioners from all the world, who submit their papers covering the methodologies of agent and multi-agent systems applicable in smart environments and knowledge economy.

The Guest Editors would like to point out that it was quite a challenging task to select the papers for this Special Issue from a large number of high-quality papers presented at the Conference. All the papers submitted for consideration passed a rigorous double-blind review process carried out with the help of a number of independent reviewers, and resulting in the present selection of five papers.

The issue starts with the paper by Mohammed El Habib Souidi, Abderrahim Siam, Zhaoyi Pei and Songhao Piao, titled *Multi-Agent Pursuit-Evasion Game Based on Organizational Architecture*. The paper describes a novel approach to agent reinforcement learning that is a combination of the YAMAM (Yet Another Multi Agent Model) modelling framework with the Q-learning, which aims to improve the results of the pursuit-evasion problem solution. The concepts agent, role, task and skill are proposed to develop a coalition formation algorithm to allow optimal task sharing. Reinforcement learning method (Q-learning) is used for controlling the pursuers' path selection in the environment as well as their internal advancement during the tasks' performance.

The topic of the second paper by Salma Noorunnisa, Dennis Jarvis, Jacqueline Jarvis and Marcus Watson, titled *Application of the GORITE BDI Framework to Human-Autonomy Teaming: A Case Study*, is the Believe-Desire-Intention (BDI) framework that supports the key requirements for human-agent collaboration. The authors present the GORITE framework responsible for employing explicit goal representations. The ability of the GORITE framework to address the requirements is demonstrated through a case study that is based on the war-gaming scenario. In such a scenario, a company agent produces a plan and courses of action to carry out the four phases of an attack, namely the preparatory, assault, exploitation and reorganization phases.

Costin Badica, Milan Vidaković, Sorin Ilie, Mirjana Ivanović and Jovana Vidaković introduce the structure, methodological aspects and educational experiences of teaching two courses on distributed systems and agent technologies at two different universities in two different countries in their paper titled *Role of Agent Middleware in Teaching Distributed Systems and Agent Technologies*. The presentation is focused on the role of agent middleware and multi-agent systems in teaching the various theoretical and practical aspects of these courses.

Matteo Cristani, Francesco Olivieri, Claudio Tomazzoli, Luca Viganò and Margherita Zorzi focus on diagnostic reasoning and labeled modal logic in this Issue's fourth paper titled *Diagnostics as a Reasoning Process: from Logic Structure to Software Design*. They develop the logical system TL, a framework able to formalize a form of diagnostic reasoning based both on deduction and on experimental knowledge. Some notions are introduced about experiment-based deduction, following a perspective clearly oriented to reasoning mechanization. Experiments are modeled in terms of tests viewed as Bayesian classifiers, which reveal one or more properties of the samples.

The last paper by Robert Bucki and Petr Suchánek, titled *The Cost-Based Lean Approach to the Information Logistics Business System Modelling*, deals with the problem of modelling logistic manufacturing systems. The authors transform the real manufacturing system into the form of a mathematical model, including necessary assumptions of the logistic-business system. The proposed approach deals with efficiency issues by assuming that discounting or shortening the time of production, distribution or other business processes never leads to a decrease in quality. Software and sophisticated mathematical calculating tools are used to carry out the simulation process.

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feedback. We would also like to thank the Honorary Chair of the *KES-AMSTA* Conference, Professor Emeritus Ignac Lovrek, Fellow of the Croatian Academy of Science and Arts, for the continuing support in preparing this Special Issue. Our thanks also go to Professor Robert J. Howlett, *KES-AMSTA* Executive Chair, for graciously granting permission to base the papers in this Issue on presentations previously given within the *KES-AMSTA* Conferences.

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