Introduction

Instead of designing complex and centralized systems, researchers rather prefer to work with many small and autonomous agents. The agents mimic the ant's behavior within an ant colony. Each one acting on the simplest of rules, these many agents can solve very complex problems known as hard problems. Generally, such multi-agent systems are used as search and optimization tools.

This special issue of the *Informatica - International Journal of Computing and Informatics* is focused on ant colonies and multi-agent systems. It includes seven contributions that describe new methods and experiences for multi-agent implementations of aspects of artificial life, ant colony and swarm intelligence.

The first paper is entitled "Investigating Strategic Inertia Using OrgSwarm" and was proposed by *Anthony Brabazon, Arlindo Silva, Tiago Ferra de Sousa, Michael O'Neill, Robin Matthews and Ernesto Costa*. The study describes a novel simulation model, called *OrgSwarm*, of the process of strategic adaptation. In this paper, strategic adaptation is conceptualized as a process of adaptation or search, on a landscape of strategic possibilities, by a population of profit-seeking organizations.

The second paper is entitled "Towards Improving Clustering Ants: An Adaptive Ant Clustering Algorithm" and was proposed by *André L. Vizine, Leandro N. de Castro, Eduardo R. Hruschka, Ricardo R. Gudwin*. The paper introduces and discusses both a progressive vision scheme and pheromone heuristics for the standard ant-clustering algorithm, together with a cooling schedule that improves its convergence properties. The proposed algorithm is evaluated in a number of well-known benchmark data sets, as well as in a real-world bioinformatics dataset.

The third paper is entitled "Efficient Pre-Processing for Large Window-Based Modular Exponentiation Using Ant Colony" and was proposed by *Nadia Nedjah and Luiza de Macedo Mourelle*. The paper exploits the ant colony strategy to finding an optimal addition sequence that allows one to perform the pre-computations in window-based methods with a minimal number of modular multiplications and hence, improves the efficiency of modular exponentiation.

The forth paper is entitled "Max Min Ant System and Capacitated *p*-Medians: Extensions and Improved Solutions" and was proposed by *Fabrício Olivetti de França, Fernando J. Von Zuben, Leandro Nunes de Castro*. The work introduces a modified MAX MIN Ant System (MMAS) designed to solve the Capacitated *p*-Medians Problem (CPMP). It presents the most relevant steps towards the implementation of an MMAS to solve the CPMP, including some improvements on the original MMAS algorithm, such as the use of a density model in the information heuristics and a local search adapted from the un-capacitated *p*-medians problem.

The fifth paper is entitled "Application of Ant-based Template Matching for Web Documents Categorization" and was proposed by *Siok Lan Ong, Weng Kin Lai, Tracy S. Y. Tai, Choo Hau Ooi and Kok Meng Hoe*. The paper examines the direct implementation of a template based on a Gaussian Probability Surface to supervise these homogeneous multi-agents to form clusters within a specified dropping zone.

The sixth paper is entitled "Efficient and Scalable Communication in Autonomous Networking using Bio-inspired Mechanisms – An Overview" and was proposed by *Falko Dressler*. In this paper, the author demonstrates the possibilities which evolve by the application of cell biology for computer networking. With the focus on autonomous networking, the combination with methodologies known from swarm intelligence is evaluated. The author shows the capabilities of this combination and derive destinations and goals for self-organization in communication networks showing a more efficient and scalable behavior.

The seventh paper is entitled "Model Checking Multi-Agent Systems" and was proposed by *Mustapha Bourahla and Mohamed Benmohamed*. In this paper, the authors show how a well known and effective verification technique, model checking, can be generalized to deal with multi-agent systems. The paper explores a particular type of multi-agent system, in which each agent is viewed as having the three mental attitudes of belief, desire and intention.

Nadia Nedjah and Luiza de Macedo Mourelle