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Transactions on Computational Collective Intelligence XV

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Preface

This volume of TCCI is a special issue dedicated to the International Conference on Practical Applications on Agents and Multi-Agent Systems (PAAMS 2012 and PAAMS 2013) held in Salamanca during March 28–30, 2012 and May 22–24, 2013. PAAMS provides an international forum to present and discuss the latest scientific developments and their effective applications, to assess the impact of the approach, and to facilitate technology transfer. PAAMS started as a local initiative, but has since grown to become the international yearly platform to present, to discuss, and to disseminate the latest developments and the most important outcomes related to real-world applications. It provides a unique opportunity to bring multidisciplinary experts, academics, and practitioners together to exchange their experience in the development and deployment of agents and multi-agent systems. PAAMS intends to bring together researchers and developers from industry and the academic world to report on the latest scientific and technical advances in the application of multi-agent systems, to discuss and debate the major issues, and to showcase the latest systems using agent-based technology. This will promote a forum for discussion on how agent-based techniques, methods, and tools help system designers to accomplish mapping between available agent technology and application needs. Other stakeholders will be rewarded with a better understanding of the potential and challenges to the agent-oriented approach. The conference is organized by the Bioinformatics, Intelligent System and Educational Technology Research Group (http://bisite.usal.es/) of the University of Salamanca.

This volume includes the best papers presented at the conference, which were subsequently extended and selected after the peer-review process. In the first paper, Lamarche-Perrin et al. present measures inherited from information theory to evaluate abstractions of large-scale MAS and provide experts with feedback regarding the quality of generated representations. The design and debugging of large-scale MAS require abstraction tools to work at a macroscopic level of description. Agent aggregation provides such abstractions by reducing the complexity of the microscopic representation. Since it leads to information loss, such a key process may be extremely harmful for analysis if poorly executed. In this paper, several evaluation techniques are applied to spatial and temporal aggregation of an agent-based model of international relations. The information from online newspapers constitutes a complex microscopic representation of agent states. Lamarche-Perrin et al.'s approach is able to evaluate geographical abstractions used by domain experts to provide efficient and meaningful macroscopic representations of the world global state in space and in time.

Alexei Sharpanskykh and Kashif Zia, in the second paper, discuss and investigate the role of emotions in social decision-making in large technically assisted crowds. For this a formal, computational model is proposed, which integrates existing neurological and cognitive theories of affective decision-making. Based on this model, several variants of a large-scale crowd evacuation scenario were simulated. By analysis of simulation results, it was established that (1) human agents supported by personal

assistant devices are recognized as leaders in groups emerging in evacuation; (2) spread of emotions in a crowd increases the resistance of agent groups to opinion changes; (3) spread of emotions in a group increases its cohesiveness; and (4) emotional influences in and between groups are, however, attenuated by personal assistant devices when their number is large.

In the third paper, Ksontini et al. propose to improve the validity of traffic simulations in the (sub-)urban context, with better consideration of driver behavior in terms of anticipation of positioning on the lanes and occupation of space. They introduce a model based on a multi-agent approach and the emergence concept. This model considers that each driver perceives the situation in an ego-centered way and readapts the road space using the virtual lane concept. They implement the model with the traffic simulation tool ArchiSim. The so obtained simulator intends to reproduce the observed behavior such as filtering between vehicles (two-wheels and emergency vehicles), repositioning on lanes when approaching the road intersections, and "exceptional" situations (stranded vehicle or improperly parked, etc.).

In the fourth paper, Philippe Mathieu and Yann Secq show how to leverage information from the order books such as the best limits, the bid-ask spread, or waiting cash to adapt more effectively to market offerings. Like B. Arthur, they use learning classifier systems and show how to adapt them to a multi-agent system. In the study of financial phenomena, multi-agent market order-driven simulators are tools that can effectively test different economic assumptions. Many studies have focused on the analysis of adaptive learning agents carrying on prices. But the prices are a consequence of the matching orders. Reasoning about orders should help to anticipate future prices. While it is easy to populate these virtual worlds with agents analyzing "simple" prices shapes (rising or falling, moving averages, etc.), it is nevertheless necessary to study the phenomena of rationality and influence between agents, which requires the use of adaptive agents that can learn from their environment. Several authors have obviously already used adaptive techniques but mainly by taking into account prices historical. But prices are only consequences of orders, thus reasoning about orders should provide a step ahead in the deductive process.

In the fifth paper, Li et al. target the coupling similarities from these three perspectives and design a novel classification method that applies a weighted K-nearest centroid to obtain the coupled similarity for non-iid data. From value and attribute perspectives, coupled similarity serves as a metric for nominal objects, which consider not only intra-coupled similarity within an attribute but also inter-coupled similarity between attributes. From the object perspective, they propose a more effective method that measures the centroid object by connecting all related objects. Extensive experiments on UCI and student datasets reveal that the proposed method outperforms classical methods for higher accuracy, especially in imbalanced data.

Zied Sellami and Valerie Camps, in the sixth paper, present DYNAMO-MAS, an adaptive multi-agent system that automates these tasks by co-constructing an ontology from texts with an ontologist. Terms and concepts of a given domain are agentified and they act, according to the adaptive multi-agent system (AMAS) approach, by solving the noncooperative situations they locally perceive at runtime. These agents cooperate to determine their position in the AMAS (that is, the ontology) thanks to (i) lexical relations between terms, (ii) some adaptive mechanisms enabling addition, removing,

or moving of new terms, concepts, and relations in the ontology as well as (iii) feedbacks from the ontologist about the propositions given by the AMAS. The paper focuses on the instantiation of the AMAS approach to this difficult problem. It presents the architecture of DYNAMO-MAS, and details the cooperative behaviors of the two types of defined agents for ontology evolution. Evaluations made on three different ontologies are also given to prove that our proposed solution is generic.

Stiborek et al., in the seventh paper, present a self-adaptation mechanism for network intrusion detection system based on the use of game-theoretical formalism. The key innovation of our method is a secure runtime definition and solution of the game and real-time use of game solutions for immediate system reconfiguration. Their approach is suited for realistic environments, where we typically lack any ground-truth information regarding traffic legitimacy/maliciousness and where the significant portion of system inputs may be shaped by the attacker to render the system ineffective. Therefore, they rely on the concept of challenge insertion: we inject a small sample of simulated attacks into the unknown traffic and use the system response to these attacks to define the game structure and utility functions. This approach is also advantageous from the security perspective, as manipulation of the adaptive process by the attacker is far more difficult.

In the last paper, De la Prieta et al. discuss how cloud computing has gained importance at a remarkable pace. The key characteristic of this technology is the possibility to provide new resources to services in an elastic way according to current demand. In contrast to cloud computing, multi-agent systems are the focus on other features such as autonomy, decentralization, auto-organization, etc. De la Prieta et al. demonstrate that these features of MAS are suitable to manage the physical infrastructure of a cloud computing environment; in other words, they present +Cloud which is a cloud platform managed by a multi-agent system.

We thank all the contributing authors, as well as the members of the Program Committee and the Organizing Committee, for their hard and valuable work. Their work has helped to contribute to the success of this symposium. Finally, the iHAS project is acknowledged. We hope the reader will share our joy and find this special issue useful.

This work has been carried out by the project Sociedades Humano-Agente: Inmersion, Adaptacion y Simulacion (iHAS)—TIN2012-36586-C03-03; Ministerio de Economía y Competitividad (Spain); and Fondos Feder.

June 2014

Juan Manuel Corchado
Javier Bajo

Transactions on Computational Collective Intelligence

This Springer journal focuses on research on the applications of computer-based methods of computational collective intelligence (CCI) and their applications in a wide range of fields such as the Semantic Web, social networks, and multi-agent systems. It aims to provide a forum for the presentation of scientific research and technological achievements accomplished by the international community.

The topics addressed by this journal include all solutions to real-life problems for which it is necessary to use CCI technologies to achieve effective results. The emphasis of the papers is on novel and original research and technological advancements. Special features on specific topics are welcome.

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