Introduction

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1 Introduction

The global trend towards more flexible and dynamic business process integration and automation has led to a convergence of interests between service-oriented computing, semantic technology, and multiagent systems. In particular, the areas of service-oriented computing and semantic technology offer much interest to the multiagent system community, including similarities in system architectures and provisioning processes, powerful tools, and the focus on issues such as quality of service, security, and reliability. Similarly, techniques developed in the multiagent systems and semantic technology areas promise to have a strong impact on the fast-growing service-oriented computing technology.

Service-oriented computing has emerged as an established paradigm for distributed computing and e-business processing. It utilises services as fundamental building blocks to enable the development of agile networks of collaborating business applications distributed within and across organisational boundaries. Services are self-contained, platform-independent software components that can be described, published, discovered, orchestrated, and deployed for the purpose of developing distributed applications across large heterogeneous networks such as the internet.

Multiagent systems are also aimed at the development of distributed applications, however, from a different but complementary perspective. Service-oriented paradigms are mainly focused on syntactical and declarative definitions of software components, their interfaces, communication channels, and capabilities with the aim of creating interoperable and reliable infrastructures. In contrast, multiagent systems centre on the development of reasoning and planning capabilities of autonomous problem solvers that apply behavioural concepts, such as interaction, collaboration, and negotiation, in order to create flexible and fault-tolerant distributed systems for dynamic and uncertain environments.

Semantic technology offers a foundation for interactions among agents and services, forming the basis upon which machine-understandable service descriptions can be obtained and, as a result, autonomic coordination among agents is made possible. On the other hand, ontology-related technologies, ontology matching, learning, and automatic generation, *etc*., not only gain in potential power when used by agents, but also are meaningful only when adopted in real applications in areas such as service-oriented computing.

2 Paper synopsis

This issue includes papers related to various aspects of the application of agent technology and semantic technology to service-oriented computing. Web services coupled with agent and semantic technologies have created all sorts of challenging, yet interesting research problems for business and academic communities. This special issue consists of papers exploring the following concepts:

- web service clustering using text mining
- agent-based coordination of web services
- a process mediation framework for semantic web services.

2.1 Web service clustering using text mining

In this paper, Liu and Wong (2008) focus on the problem of service discovery under the premise that there are no centralised registries for all services. Subsequently, they propose to use a service search engine to obtain web-based service descriptions and employ text mining to cluster web services into groups with similar functionalities, called *homogenous service communities.* Such service clusters will then be used in other service-level activities, such as classification of services, match-making, and composition. Liu and Wong employ an existing web search engine to obtain service description files (*e.g.*, WSDL files) before applying text mining techniques to produce clusters of web services. The authors manually obtain real data from the web instead of work on hypothetical examples. The resulting clusters of services produced by their algorithms are also presented. The paper illustrates the potential application of text mining research to discovering emergent semantics in a service-oriented environment.

2.2 Process mediation framework for semantic web services

In the second paper of this issue, Vaculín *et al.* (2008) are concerned with the issues caused by incompatibilities of service requesters and service providers. To address these issues, they propose a process mediation approach to enable interoperability between incompatible process models (of the service requester and the service provider). Their approach is based on the premise that the requester and provider's process models consist of semantically annotated web services. A number of algorithms have been devised to address the two target problem scenarios: (1) when the mediation framework has complete knowledge of the process models of the service provider and the service requester, and (2) when the mediation framework has only knowledge of the process model of the service provider but not the service requester. The authors also discuss an execution infrastructure consisting of the Process Mediation Agent (PMA) for runtime mediation. The proposed architecture aims to mediate in real conditions where failures and changes in the environment must be considered. Based on recovery mechanisms using dynamic recovery and built-in heuristics, the PMA is designed to handle exceptions and recover from failures.

2.3 Agent-based coordination of web services

In the last paper, Witwicki and Durfee (2008) present an agent-based approach to the problem of service composition and coordination in domains involving temporal constraints and duration uncertainty. Their approach is based on multiagent planning of the interaction between complex services involving stochastic and interdependent processes by utilising a service choreography protocol. To facilitate the planning process, the authors also introduce a commitment-based negotiation mechanism between service-requesting and service-providing agents, with explicit temporal and probabilistic parameters to achieve coordinated provision of services. Via the use of stochastic temporal commitments, *i.e.*, a commitment given by a provider that it will satisfy the request within a given time with a given probability, the approach gives room for the service-requesting and service-providing agents to negotiate the tradeoff between minimum completion time and maximum probability of completion within a given time. The authors also present empirical results to show the scalability of their approach.

3 About this special issue

This special issue arises, primarily, out of the workshop on Service-Oriented Computing: Agents, Semantics and Engineering (SOCASE 2008) held on 12 May 2008 in Estoril, Portugal, in conjunction with the *Seventh International Joint Conference on Autonomous Agents and Multi-Agent Systems* (AAMAS'2008). The authors of the best papers from that event were invited to submit an extended version of their paper to this special issue. Out of the six invitations sent to the authors of the selected papers, we received five submissions to this special issue. All submissions were carefully reviewed and three papers were selected to be included in this special issue.

We are confident that this special issue of the *International Journal of Agent-Oriented Software Engineering* (IJAOSE) will fuel further research dealing with the application of agent and semantic technologies in service-oriented computing and motivate many other researchers to get involved in this exciting and challenging area.

4 Editorial board and reviewers

- Minyi Li of Swinburne University of Technology in Australia
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- Quoc Bao Vo of Swinburne University of Technology in Australia.

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