Gabriela Lindemann
Jörg Denzinger
Ingo J. Timm
Rainer Unland (Eds.)

Multiagent System Technologies

Second German Conference, MATES 2004
Erfurt, Germany, September 2004
Proceedings

Springer

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Preface

After the huge success of the first German Conference on Multiagent System Technologies (MATES) last year in Erfurt the German Special Interest Group on Distributed Artificial Intelligence together with the steering committee of MATES proudly organized and conducted this international conference for the second time.

The goal of the MATES conference is to constitute a high-quality platform for the presentation and discussion of new research results and system developments. It provides an interdisciplinary forum for researchers, users, and developers, to present and discuss the latest advances in research work, as well as prototyped or fielded systems of intelligent agents. The conference covers the complete range from theory to application of agent and multiagent technologies.

MATES 2004 was conducted
- as an integral part of the 5th International Conference Net.Object Days 2004 along with the
- 8th International Workshop on Cooperative Information Agents (CIA) 2004
- Autumn meeting of FIPA (Foundation for Intelligent Physical Agents)
- Prototype and Product Exhibition of Agent Related Platforms, Frameworks, Systems, Applications, and Tools

As such all these events together may have formed the biggest agent-related event of this year in Europe and one of the biggest worldwide.

The call-for-papers attracted about 60 submissions from all over the world. After a careful reviewing process, the international program committee accepted 22 high-quality papers of particular relevance and quality. The selected contributions cover a wide range of exciting topics, in particular agent analysis and security, agent negotiation and control, agents and software engineering, simulation and agents, and agent policies and testing. Exciting highlights of the conference were the invited talks, by Jim Odell on *Agent UML 2.0: Too Radical or Not Radical Enough?*, and Cristiano Castelfranchi on *Emergence and Cognition: Towards a Synthetic Paradigm in AI and Cognitive Science*. Moreover, several agent-related tutorials were conducted.

As editors of this volume, we would like to thank all the authors for their contributions and, especially, the program committee members and the external reviewers who sacrificed their valuable time to review the papers. Their careful, critical, and thoughtful reviews helped not only the authors but also us in putting together a truly convincing program.

There were also some sponsors that helped to conduct this conference in these difficult times. Our highest gratitude goes to the Ministry for Business, Work, and Infrastructure of the state Thuringia (Thüringer Ministerium für Wirtschaft, Arbeit und Infrastruktur), which provided all the support needed to conduct such a big and successful event. A big supporter of MATES was also the Foundation for Intelligent Physical Agents (FIPA), which not only sponsored

this event but also conducted its 2004 autumn meeting in Erfurt at the same time as MATES and Net.ObjectDays.

We would also like to thank Alfred Hofmann from Springer for his support and cooperation in putting this volume together.

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Policies and Testing

Agent UML 2.0: Too Radical or Not Radical Enough?

James Odell

Agentis Software

Abstract. The theory and application of agents and multi-agent systems is now experiencing a new surge in interest in the international commercial sector. As a result, a cacophony of modeling notations is beginning to emerge. This presentation discusses the issues involved in extending the OMG's UML 2.0 as a possible starting point. This approach is under debate from both the object and agent groups. Some believe that agents are just objects with a few more feature, and some believe that agents share absolutely nothing in common with objects. This talk presents examples from work already underway and discusses the work that still needs to be addressed.

Emergence and Cognition: Towards a Synthetic Paradigm in AI and Cognitive Science*

(Extended Abstract)

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Abstract. In this (very) extended abstract I will make explicit the general ideo-logical perspective and theoretical claims of the talk (like in a *manifesto*). As for the exemplification of these claims within the AI domain - in particular within the Agent and Multi-Agent Systems area - I will provide the overall blueprint but I will develop here only some part and give only some examples. I will illustrate how a synthetic paradigm can be built through the notion of different levels of reality description and of scientific theory, and through their interconnections thanks to *bridge-theories, cross-layered theories,* and *layered ontologies.* I will provide several examples of bridge-theories and layered ontologies with special attention to agents and multi-agent systems. In particular I will sketch the problem of emotions in agents with reference to agent/mind re-embodiment (the theory of needs and the relation between 'believing' and 'feeling'); I will examine the theory of the mental counterparts of social objects illustrating the mental facet of norms and of commitment; the grounding of social power in the personal power; the cognitive bases of organisations; the layered notions of conflict, cooperation, communication, goal, agent, delegation, as applied to different levels of agenthood.
I will examine the problem of emergence among intelligent agents by exploring the problem of unplanned cooperation and social functions. I will conclude with the importance of the new "social" computational paradigm in this perspective, and the emergent character of computation in Agent Based Computing.

1 Premise. At the Frontier of a Millennium: The Challenge

Will the "representational paradigm" - that characterised Artificial Intelligence (AI) and Cognitive Science (CS) from their very birth - be eliminated in the 21th century? Will this paradigm be replaced by the new one based on dynamic systems, connectionism, situatedness, embodiedness, etc.? Will this be the end of the AI ambitious project? I do not think so. Challenges and attacks to AI and CS have been hard and radical in the last 15 years, however I believe that the next century will start with a renewed rush of AI and we will not assist to a paradigmatic revolutio, with connectionism replacing cognitivism and symbolic models; emergentist, dynamic and evolutionary models eliminating reasoning on explicit representations and planning; neuro-

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* Published in H. Coelho (Ed.) *Progress in AI - IBERAMIA '98* Springer, LNAI 1484. 13-26.

science (plus phenomenology) eliminating cognitive processing; situatedness, reactivity, cultural constructivism eliminating general concepts, context independent abstractions, ideal-typical models.

I claim that the major scientific challenge of the first part of the century will precisely be the construction of a new "synthetic" paradigm: a paradigm that puts together, in a principled and non-eclectic way, cognition and emergence, information processing and self-organisation, reactivity and intentionality, situatedness and planning, etc. [Cas98a] [Tag96].

AI is going out of a crisis: crisis of grants, of prestige, and of identity. This crisis was not only due - on my view- to exaggerated expectations and overselling of specific technologies (like expert systems) tout court identified with AI. It was due to the restriction of cultural interests and influence of the discipline, and of its ambitions; to the dominance either of the logicist approach (identifying logics and theory, logics and foundations) or of a mere technological/applicative view of AI (see the debate about the 'pure reason' [McD87] and 'rigor mortis'). New domains were growing as external and antagonistic to AI: neural nets, reactive systems, evolutionary computing, CSCW, cognitive modelling, etc. Hard attacks were made to the "classical" AI approach: situatedness [Suc87], anti-symbolism, reactivity [Bro89] [Agr89], dynamic systems, bounded and limited resources, uncertainty, and so on (on the challenges to AI and CS see also [Tha96]).

However, by relaxing previous frameworks; by some contagion and hybridisation, by incorporating some of those criticisms; by re-absorbing as its own descendants neural nets, reactive systems, evolutionary computing, etc.; by developing important internal domains like machine learning and DAI-MAS; by important developments in logics and in languages; and finally with the new successful Agents framework, AI is now in a revival phase. It is trying to recover all the original challenges of the discipline, its strong scientific identity, its cultural role and influence.

We may in fact say that there is already a neo-cognitivism and a new AI.

In this new AI of the '90s systems and models are conceived for reasoning and acting in open unpredictable worlds, with limited and uncertain knowledge, in real time, with bounded (both cognitive and material) resources, interfering – either cooperatively or competitively – with other systems. The new password is *interaction* [Bob91]: interaction with an evolving environment; among several, distributed and heterogeneous artificial systems in a network; with human users; among humans through computers.

The new AI and CS are – to me – only the beginning of a highly transformative and adaptive reaction to all those radical and fruitful challenges. They are paving the way for the needed synthesis and are starting the job.

1.1 The Synthesis

Synthetic theories should explain the dynamic and emergent aspects of cognition and symbolic computation; how cognitive processing and individual intelligence emerge from sub-symbolic or sub-cognitive distributed computation, and causally feedbacks into it; how collective phenomena emerge from individual action and intelligence and causally shape back the individual mind. We need a principled theory which is able to reconcile cognition with emergence and with reactivity: