

Special issue: perspectives on recent intelligent agents research as viewed through two conferences

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In recent years, interest in intelligent agents has ballooned. With the WWW as a source of seemingly limitless opportunity and robotics platforms becoming cheaper and more easily maintained, the applications are myriad, challenging and within reach of even small groups.

From a research perspective, intelligent agents require a diverse set of capabilities and so support investigations in many subareas of AI and computer science: automated reasoning, distributed AI, natural language, computer vision, information retrieval, machine learning, planning, robotics, knowledge engineering, etc. Intelligent agent applications demand architectures that integrate algorithms and techniques from many subareas.

The synergy of demanding practical applications and theoretical advances has driven tremendous progress in intelligent agents research and development in a remarkably short time. To showcase those advances and to serve this community, a number of major conferences have been inaugurated in the past few years, including the International Conference on Multi-Agent Systems (ICMAS), the International Conference on Autonomous Agents (AA), and The International Conference and Exhibition on the Practical Application of Intelligent Agents and Multi-Agent Technology (PAAM). All have been extremely successful in the number and calibre of papers attracted, the degree of industrial participation in demonstrations and the attendance of a wide variety of people from industry, business and academia.

The *International Conference and Exhibition on the Practical Application of Intelligent Agents and Multi-Agent Technology* (PAAM) focuses on fielded applications of agent technologies. In its call for participation, PAAM'97 identified four key issues: how agent technology is overcoming today's business problems, what developments we can expect to see tomorrow, what the tangible benefits of investing in agents are, and what opportunities agents open up, and where the potential pitfalls lie. The PAAM conferences have been held in London in April 1996, April 1997 and March 1998.

The *International Conference on Autonomous Agents* (AA) focuses on research in modeling and building autonomous agents, intelligent computer systems that can take initiative. The conference includes tutorials, demonstrations, panel sessions and technical presentations on supportive technology and applications ranging from traditional robotics through to entertainment characters. The proceedings of the last conference, AA'97, is available on-line at <http://sigart.acm.org:80/proceedings/agents97/>. The first AA conference was held in Marina del Rey, California, USA in February 1997 and the second in Minneapolis, Minnesota, USA in May 1998.

The purpose of this special issue is to identify and initiate a discussion of different strands of agent research, as represented by the two different conferences: PAAM'97 and AA'97. Each conference serves different aspects of the same community and is based in different locations. In this issue, program chairs from each conference will present their perspectives on the state-of-the-art and future of the field based on what was showcased at their respective conferences. Barry Crabtree was programme chair for PAAM'97. Barbara Hayes-Roth and Lewis Johnson contributed for Agents'97. Barbara Hayes-Roth was program chair along with co-chair Pattie Maes, and Lewis Johnson was General chair along with co-chair Nick Jennings. In addition, the program chairs were asked to invite two other representative papers from the conference. For Agents'97, two area chairs submitted overview/viewpoint papers. For PAAM'97, the two papers cover two important themes of

the conference: electronic commerce and workflow management. Thus, we received two extra papers from each of the conferences to complement the overviews from the conference program chairs.

The contributors to this issue were free to summarize recent progress in their areas, describe the activity at their conference or speculate about the future of their areas and the field as a whole. The choice was theirs. The result is a collection of papers that do a bit of all three.

Two of the papers review the activities at the Agents Conference. The Johnson and Hayes-Roth (1998) paper is a comprehensive summary of the conference. They categorize the four areas covered by the technical papers in the conference and summarize the highlights of the plenary sessions. To put it in context with the rest, they conclude by speculating about the future of the conference and its role in the agents community. Anand Rao (1998), who was area chair for Expert Assistants, describes this area and gives more depth on the papers that were accepted.

Two of the papers survey areas of activity related to the PAAM conference. These papers provide a framework in which to place work in electronic commerce and workflow management. Guttman, Moukas and Maes (1998) identify a Consumer Buying Behavior model which focuses a broad overview of recent work in agents in commerce. They cover issues such as brokering, negotiation and infrastructure, while comparing and contrasting some prominent projects in the area. O'Brien and Wiegand (1998) identify issues in workflow management and present recent research in this area.

The last papers are more provocative; both conjecture possible future for research in this area. Bekey (1998) comments on the field of autonomous robotics. He partly covers research presented at the Autonomous Agents conference, ties it in with a historical perspective and current trends and looks a bit into the future. From his perspective as programme chair, Crabtree (1998) identifies key issues in constructing practical applications for agents. In particular, he notes that competence, privacy, and social issues will need to be addressed to deploy these systems. In parallel, he points out the importance of selecting tasks and setting standards.

The Knowledge Engineering Review has published several authoritative papers on agents, including Wooldridge and Jennings (1995) and Nwana (1996) and has included a number of Grey Page articles on topics related to agents (see especially Luck (1997), Doran *et al.* (1997), D'Inverno *et al.* (1997) and Fisher *et al.* (1997)). We intend this special issue to significantly broaden the views of agent research and promote discussion of the key issues and directions for this relatively new, but extremely active field. Towards that end, we will solicit and encourage followup responses and papers for a later issue.

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