
Introduction

Intelligent Agent Issue

by [Alessio Lomuscio](#)

Under the caption name of "Agent" lives one of the ground-breaking paradigms that has hit Computer Science since the advent of Object-Oriented Programming. Agents, like expert systems, are one of the paradigms that originated in Artificial Intelligence (AI) and that were quickly taken up by many computer scientists not necessarily working in AI. Indeed, it is striking to note how many Computer Science sub-disciplines now have well-established research areas that contain the keyword "agent-based" in their titles. This international community has seen research in robotic agents, agents for automatic diagnosis, agents for control systems, agents for Internet-based information retrieval, agents for management systems, agents for telecommunication, agents for automatic negotiation, etc.

In Computer Science there are currently no less than ten annual or bi-annual international conferences on agents themes, and several international journals. So many different theories, languages and architectures for agents have been proposed that agent *standards* are currently under investigation in order to provide a more systematic technology transfer to the industry.

The agent paradigm has reached beyond Computer Science and into Psychology, Economics and other disciplines. Indeed, even big business is also fascinated by the concept. In 1994 the UK-based consultancy firm Ovum predicted that the agent technology industry would be worth some US\$3.5 billion worldwide by the year 2000. Today's estimates confirm this figure. Sun, Microsoft, Hewlett Packard, Mitsubishi Electronics, just to name a few, all have internal ongoing research on agent-related topics.

So, what are these agents and what is all this fuss about? According to the one of the most widely accepted definitions, given by Wooldridge and Jennings in one of their influencing journal papers, an agent is a *self-contained problem solving system capable of autonomous reactive, pro-active, social behaviour*. In other words, Dennet's "intensional's stance" approach is followed here by assuming that an agent's behaviour can usefully be described in terms of collections of mental concepts such as *knowledge, beliefs, intentions, desires, obligations*, etc. Clearly, depending on the application only a subset of these will be employed.

As to why agents are attracting so much attention, agents are increasingly being seen as a most *promising high-level abstraction tool* to developing complex distributed computing systems. Indeed, applications built upon the agent paradigm (agent-based systems or simply multi-agent systems (MAS)) already cover a wide number of areas including electronic commerce, information management, health

care, process control, electronic games, manufacturing, etc.

With so much intellectual and economic investment in the idea of agent-based computing, it should not be too surprising that the term ``agent" is seriously running the risk of becoming a conceptually overloaded term and agent-based technology an ill-defined software architecture (and sometimes quite simply a vehicle for re-branding object-oriented software for distributed computing).

In this issue the authors try not to jump on the agent-bandwagon simply because it is fashionable, but try to define precisely what agents are and what they offer in some of the leading areas in which agent technology can be employed.

The clear conceptual distinction between agent theories, agent architectures and agent languages is always present in the papers and we tried to strike a balance among these three fundamental areas of research in agent technology today. It could be said that agent theories have not here the importance they enjoy in many academic departments, but considering the role they have in other scientific forums we are happy to present this issue as mainly "applications-driven".

Everyone at Crossroads' enjoyed very much preparing this issue; I hope you enjoy reading it too!