

Overview of the Workshop on Ontologies in Agent Systems

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ABSTRACT

The Workshop on Ontologies in Agent Systems took place at the 5th International Conference on Autonomous Agents, Montreal, Canada, 2001. This overview provides a summary of the aims and outcomes of the workshop.

1. WORKSHOP AIMS

The potential benefits and technical difficulties of sharing information between heterogeneous and distributed agents (both human and software) have led various research communities to develop techniques for explicitly modelling the concepts used within information sources and service-providing software to express their contents and responses. Whether these conceptual models are called ontologies, schemas or data models, their use can facilitate the construction of applications from loosely-coupled heterogeneous and distributed components, and there is evidence of widespread research and commercial activity in this area:

- There are increasing efforts to use explicit representations of ontologies for multi-agent systems that communicate at the “knowledge level”.
- Research efforts such as DARPA’s CoABS Grid and Agent-cities, as well as commercial developments like UDDI are working to link together large numbers of heterogeneous systems.
- Initiatives such as ebXML and BizTalk are encouraging industry to create a large amount of machine-readable ontological data.
- Formally defined ontologies are a key component of the Semantic Web community, which seeks to enhance the potential for automated search and information integration across the Web by including machine readable information in Web resources.

Against this background, the Workshop on Ontologies in Agent Systems was initiated in order to provide a forum for the discussion and comparison of different approaches to the representation of ontologies for agent systems, the practical considerations of designing applications using these techniques and the infrastructural support required for their effective use. In particular, the call for papers listed the following topics of interest:

- Strengths and weaknesses of current ontology representation approaches for use with agents—both specific technolo-

gies and generic techniques such as logic-based and object-oriented approaches and those based on Semantic Web models.

- Relationships between ontology modelling languages and agent communication mechanisms: what are the dependencies between (for example) the semantics of a communication language and what can be expressed in the ontology?
- Techniques for translation between different ontology representation languages and coping with the evolution of ontologies.
- Meta-modelling or other techniques for clarifying the relationship between ontologies and agents’ messaging and reasoning systems.
- Practical experience in building agent systems using explicit ontologies to support communication.
- Requirements for ontology support in agent applications and agent toolkits including support access to existing (e.g. Web-based) ontology resources.
- Classifications identifying which approaches are most appropriate for particular applications or communication requirements.

2. WORKSHOP SUMMARY

The workshop was held as a full-day workshop at the 5th International Conference on Autonomous Agents, Montreal, Canada on 29 May, 2001. Nine full papers and fourteen short papers and position papers were accepted. The workshop programme included four invited talks, eight long paper presentations and a final discussion session, and 30 to 40 participants attended throughout the day.

These proceedings include all accepted long and short papers and the presentation slides for invited talks by Sheila McIlraith, Michael Uschold and Natalya Noy. A fourth invited talk was presented by Dominic Greenwood of Fujitsu Laboratories of America on the topic “Ontologies: the FIPA perspective”.

The recurring issues raised at the workshop included the following:

- How much of the domain semantics needs to be explicitly encoded? How much is implicit in the agent implementation?
- How crucial and how practical is inference? What trade-offs should be made between expressiveness and tractability?

- What is the relationship between ontologies and agent communication and content languages?
- How do we achieve “ontological critical mass”? How do we generate enough ontologies and encourage their use? Will they be consistent?
- There is a need for industrial use cases to facilitate technology transfer. These should focus on realistic agent applications and not to try to solve the general information integration problem.
- Ontologies will change over time (particularly in a dynamic agent world)—how will agents deal with this change?

Discussion in these areas and others was then summarised into three points which outline today’s state of the art and captures what are perhaps the immediate needs for the future:

- There is convergence on the use (and perhaps adaptation) of existing representation languages such as DAML+OIL and UML. Researchers recognise that to encourage sharing of ontologies, shared formalisms are important.
- Shared ontologies are needed to build realistic and useful agent systems. We need to find ways to publish, post and host these more widely to begin the sharing process. Initially it is expected there will emerge islands of shared terminology and representation, but these may later become linked.
- Reusable services and tools are emerging for the use of ontologies in an agent context. These include editors, agent platform support, translation and hosting services. Such initiatives should become more visible and widely used to encourage reuse and make it easier for agent researchers to include ontologies in their systems.

3. ACKNOWLEDGEMENTS

The workshop organisers gratefully acknowledge the efforts of Adele Howe, the Workshop Chair for the Autonomous Agents 2001 conference, and wish to thank the programme committee members, other reviewers, and the workshop participants for making this workshop a success.

The following people were involved with running this workshop:

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