ELECTRONIC NEWSLETTER ON
REASONING ABOUT ACTIONS AND CHANGE

Issue 99027 Editor: Erik Sandewall 21.12.1999

Today

Today we have the pleasure of announcing the plans for a special issue based on articles from the IJCAI-99 workshop on Nonmonotonic Reasoning, Action and Change. Six papers have been submitted for this special issue, out of the eight papers that were presented at the workshop itself. Since the workshop itself was quite selective (acceptance rate less than 50 percent), and since several of the papers have been thoroughly revised and extended after the workshop, this is a very strong set of contributions. We will have a discussion period of two months and then proceed to the usual refereeing decisions. Discussion contributions can be sent to me (Erik Sandewall); the refereeing for the special issue will be organized by Michael Thielscher.

The titles and abstracts follows for the submitted articles. By the way, please note that we also have two other articles under discussion. The discussion period is just about to run out for the reference article on the event calculus, authored by Rob Miller and Murray Shanahan. For the paper on "Useful Counterfactuals" by Tom Costello and John McCarthy, we have decided to extend the discussion period on the request of the authors. Discussion contributions are welcome for all eight articles presently under review!

ETAI Publications

Received articles

Permissive Belief Revision (preliminary report)

by **Maria R. Cravo, João P. Cachopo, Ana C. Cachopo, and Joo P. Martins**

Abstract: We point out that current belief revision operations can be used to revise non-monotonic theories and we propose a new operation, called permissive belief revision. The underlying idea of permissive belief revision consists of instead of abandoning some beliefs during a revision, transforming those beliefs into weaker ones, while still keeping the resulting belief set consistent. This framework allows us to keep more beliefs than what is usual using existing belief base-based revision theories.

Tactical Reasoning in Synthetic Multi-Agent Systems: a Case Study

by **Mikhail Prokopenko and Marc Butler**

Abstract: The paper describes a hierarchy of logic-based agent architectures and proposes a framework for formalising tactical reasoning in dynamic multi-agent systems populated by synthetic (software) agents. We first consider basic types of situated agent architectures and their corresponding action theories. Then more complex tactical agent architectures suitable for high-level reasoning are formally defined. This approach is expressive enough to capture a subset of desirable properties from both the situated automata and subsumption-style architectures, while retaining the rigour and clarity of logic-based representation. In addition, it allows us to systematically and uniformly embed reactive plans, ramifications, task-oriented and, potentially, goal-directed behaviour. The framework is successfully realised in the RoboCup Simulation League domain.

Action Languages, Temporal Action Logics and the Situation Calculus

by **Enrico Giunchiglia and Vladimir Lifschitz**

Abstract: In the first part of the paper, we investigate the relationship between the action description language $\mathcal{C}$ and the situation calculus. Action description languages are based on the model of time that includes only two time instants: 0 for the beginning of the execution of an action and 1 for the end. The ontology of time in the situation calculus is much more elaborate. We show how to bridge the gap between these two ontologies by defining a translation from $\mathcal{C}$ into the situation calculus. The second part of the paper relates $\mathcal{C}$ to the formalism of temporal action logics (TAL) by showing how a fragment of $\mathcal{C}$ can be embedded into TAL.

An Approach to Perception in Theory of Actions: Part I

by **Fiora Pirri and Alberto Finzi**

Abstract: We present a preliminary approach to the coordination and control of sensing for action oriented perception in the Situation Calculus. We essentially consider visual perception, although the approach can be generalized to other forms of perception. We show that perception is an inference process that uses different levels of refinement, namely, direct perception, selective sense perception and, finally, meaningful perception. We take a cautious poiunt of view to perception which means that we see it as a reasoning process that can be ambiguous and mistaken. Agents can

be committed to be attentive so as to make no mistakes. Wehn the theory does not entail that a mistake occurred then perception is considered veridic. Ambiguity is resolved via hypothetical reasoning; we call this non monotonic reasoning process that combines sensing, logical inference and hypotheses, meaningful perception.

Minimal Knowledge Approach to Reasoning about Actions and Sensing

by **Giuseppe De Giacomo and Riccardo Rosati**

Abstract: We present an autoepistemic approach for reasoning about actions in the presence of incomplete information and sensing. Specifically, we introduce a logical formalism that combines a very expressive logic of programs, the modal mu-calculus, with a minimal knowledge modality. We show that reasoning in such a formalism can be done by integrating model checking for modal mu-calculus and propositional inference. This allows for exploiting existing model checking techniques and systems for sophisticated forms of reasoning about actions, without renouncing to deal with incomplete information about the dynamic system.

Object-Oriented First-Order Logic

by **Eyal Amir**

Abstract: This paper describes a novel logic that extends First-Order Logic (FOL) to create counterparts of the Object-Oriented paradigm. We call it Object-Oriented First-Order Logic (OOFOL). FOL provides richness of representation, but is unwieldy in modeling large, complex tasks. On the other hand, the Object-Oriented paradigm has been successful at treating large, complex tasks in both software and knowledge engineering.

In OOFOL, objects are theories that are connected via interface vocabularies to other objects, classes are used to provide a reusable logical template, and inheritance is used to adapt classes to specialized tasks. We show that such a logic can be given simple semantics using FOL. A variant of the logic that allows links between the objects to be unidirectional is also examined. This variant is called Directed Object-Oriented First-Order Logic (Directed OOFOL). We show that such a system can be given semantics using Circumscription.

Our new tools facilitate the object-oriented design of theories. We demonstrate this through a few applications taken from model-based reasoning, theories of action and cognitive robotics. These examples also demonstrate the use of the object-oriented methodology and tools for the construction of first-order theories. We conclude with proposed inference algorithms for these logics.

This newsletter is issued whenever there is new news, and is sent by automatic E-mail and without charge to a list of subscribers, in plaintext format. The present postscript issue is a bona fide rendering of the same information in alternative typography. Instruction for contributors and other additional information is found at the following URL:

`http://www.etaij.org/rac/`