Electronic Transactions on Artificial Intelligence 307
Vol. 2 (1998): *307-329*
http://www.ep.liu.se/ej/etai/1998/010/

Refereed Reference Article

Erik Sandewall:

Cognitive Robotics Logic and its Metatheory: Features and Fluents Revisited

Author's affiliation: Linköping University, Sweden.

Abstract: *Cognitive Robotics Logic (CRL) is an extensible logic language for characterizing actions and change, in particular for use in cognitive robotics. Its development emphasizes the issues of syntax, expressivity, underlying semantics and entailment methods (defined in terms of the semantics). Development of proof methods is de-emphasized. The salient results from this approach refer to the range of applicability and other related properties of the entailment methods. These results constitute a metatheory of actions and change.*

CRL is syntactically defined as a base language and a surface language. The base language is characterized by the following aspects:

- *its three major predicates Holds, Occurs, and Occlude, which provide coherence when the language is extended;*
- *its reportoire of categorial functions, which is augmented when additional expressiveness is required in the language.*

The surface language provides additional notational convenience, and is defined by translation to the base language.

The range of expressivity includes actions with duration, nondeterministic actions, actions in hybrid worlds with piecewise continuous fluents, some forms of ramification and causation, imprecise sensors and actuators, action failure, and some aspects of goal-directed agent behavior.

Entailment methods are functions that map scenario descriptions to sets of intended models. *They are defined using a reportoire of set-theoretic operations on sets of formulas and sets of models, including but not restricted to minimizing a set of models with respect to a preference relation.*

A progression of underlying semantics is defined, beginning with the partial state-transition semantics and its immediate generalization, the trajectory semantics. These underlying semantics are used for the formal analysis of the range of applicability of various entailment methods, including both those proposed by the others in this research, and those that developed in the course of the present work.

Publication and review history

1. First version *published* by Linköping University Electronic Press on 15.10.1998 and permanently available at
   http://www.ep.liu.se/ea/cis/1998/017/
2. *Received* by the research area "Reasoning about Actions and Change" of the Electronic Transactions on Artificial Intelligence, posted on its web site, and advertised in its Newsletter on 11.10.1998.
3. Available for *discussion* in the ETAI area of Reasoning about Actions and Change until June, 1999. The discussion protocol is available and will be retained in the Article Interaction Page at
   http://www.etaij.org/ra/rac/016/
4. First version *accepted* after due refereeing and according to scientific journal standards by the Electronic Transactions on Artificial Intelligence (ETAI) on 12.6.1999. Comments by the referees are included in the Article Interaction Page.
5. Revised version, with minor corrections according to the suggestions of the referees, *published* by Linköping University Electronic Press on 12.7.1999 and permanently available at
   http://www.ep.liu.se/ea/cis/1998/017/
   under the label "Revised publication 1999-07-12".
6. Revised version appears in Electronic Transactions on Artificial Intellligence, Volume 2 (1998), Issue 3-4, pages 307–329. The issue and the annual volume are made permanently available at
   http://www.ep.liu.se/ej/etai/1998/
7. Paper editions of the ETAI issue and the ETAI volume containing this artice *republished* by the Royal Swedish Academy of Sciences.

The review policy and the quality requirements for acceptance are documented at http://www.etaij.org/info/

Article maintenance

The Electronic Transactions on Artificial Intelligence maintains an Article Interaction Page for this article at
http://www.etaij.org/ra/rac/016/
Besides the publication and review history, it contains links for contacting the author(s), as well as to amendments and other related information for the article. It is intended to keep these links up-to-date in the future.

Copyright conditions