ELECTRONIC NEWSLETTER ON
REASONING ABOUT ACTIONS AND CHANGE

Issue 98077 Editor: Erik Sandewall 9.10.1998

Today

Murray Shanahan has received several sets of questions to his ETAI submitted article, which equals his invited paper at ECAI 1996. In today's issue he answers two sets of questions from Paulo Eduoardo Santos.

ETAI Publications

Discussion about received articles

A Logical Account of the Common Sense Informatic Situation for a Mobile Robot

by **Murray Shanahan**

Comment from: **Murray Shanahan**

> *I agree that Separation avoids the Hanks-McDermott problem , but doing so you get a restriction in the theory, since you are not able to write formulae using Initiates (or Terminates) and Happens together (on the contrary it won't be clear where to place such formulae in the circumscriptions). Thus, we are not able to express (and infer) some facts.*

It's true that there are some (very few) kinds of formulae that we cannot write using this method. For example, if we wanted to express the fact that **either** flicking the switch terminates the light being on **or** it was initially dark, then there's no obvious way to do it. (This is Tom Costello's example.)

However, I'm a little sceptical that we do ever want to mix these different kinds of information in this way. In this example, I suspect that another layer of reasoning is called for, which explains observations (such as the fact that it is dark), and this may update the Initiates/Terminates part of the theory, or may update the initial situation description.

On the other hand we can, and often do, write other sorts of formulae that mix *Initiates*, *Terminates* and *Happens* predicates. In particular, triggered events can be described using formulae of the form:

$$Happens(a,t) \text{ if } Initiates(a,f,t)$$

These formulae can be included in the circumscription of *Happens*, and this doesn't cause a problem, since the assumption is that the meaning of *Initiates* is already fixed by separate the circumscription of the *Initiates* and *Terminates* part of the theory, and that this formula is, so to speak, just a "consumer" of the *Initiates* predicate.

> *Then, why do not use negation-as-failure instead, since, for the particular case of circumscription we are interested in, the former is equivalent to the later*
>
> *In which sense circumscription is more powerful than negation-as-failure in this framework?*

We could use negation-as-failure (or rather, say, predicate completion). Using circumscription does allow for the addition of, for example, disjunctive facts, however. Predicate completion is only defined for a certain class of theories. Event though this class encompasses most of what we're interested in, there doesn't seem any point in ruling out exceptions.

> *I could not understand the last formula of page 14. There a biimplication is used defining the region g with the formula* Π *. My interpretation of this is that* Π *is not an approximation of g but it describes exactly g . Is that what it means?*

This is exactly what it means. Formula (5.7) on the same page is an example.

> *My question is: what do you do if there is no M2 that explains* Ψ *?*

Then there really is no explanation. The robot is stuck.

Murray Shanahan

Comment from: **Murray Shanahan**

> *Why didn't you circumscribe Initially and Happens in parallel in the first conjunctive term of the expression?*
>
> *Why do we have to circumscribe Abspace letting Initially vary, and not circumscribe only Initially (or both Initially and Abspace)?*

Well, it may be possible to do things that way. I was trying to follow as closely as possible the approach I'd taken in my AIJ paper "Default Reasoning about Spatial Occupancy", where I introduced a predicate similar to *AbSpace*.

But anyway, I think you may have uncovered a bug in my formalisation. As you'll see in other papers and in Chapter 15 of my book, usually when I present the event calculus I use two *Initially* predicates: *Initiallyp* to say that a fluent holds and *Initiallyn* to say that it doesn't hold. A counterpart to axiom (EC1) for $\neg$*HoldsAt* and *Initiallyn* is also included. (Using two predicates like this allows us to distinguish fluents that (1) are inertial and true from time 0, (2) are inertial and false from time 0, and (3) are non-inertial from time 0.) I tried to get away with just one predicate here, because I thought the examples didn't need the *Initiallyn* predicate. I need to look into it properly, but I suspect that I need to reintroduce *Initiallyn* to get the minimisation of *AbSpace* right. It's only a minor modification, but at the moment I don't think it works.

Murray Shanahan

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.ida.liu.se/ext/etai/actions/njl/`