ELECTRONIC NEWSLETTER ON
REASONING ABOUT ACTIONS AND CHANGE

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Today

Today's issue contains an additional question/ comment to Camilla Schwind's ETAI submitted article, this time by Judea Pearl, as well as Camilla's answer. We also report on a renewed reference article by Murray Shanahan and Rob Miller for the event calculus, replacing the previous, retracted reference article.

ETAI Publications

Received articles

The Event Calculus in Classical Logic - Alternative Axiomatisations

by **Rob Miller and Murray Shanahan**

Abstract: We present several alternative classical logic axiomatisations of the Event Calculus, a narrative based formalism for reasoning about actions and change. We indicate the range of applicability and key characteristics of each alternative formulation.

ETAI Publications

Discussion about received articles

Causality in Action Theories

by **Camilla Schwind**

Comment from: **Judea Pearl**

I have some comments on recent ENRAC discussions of Camilla's paper, "Causality in Action Theories".

Axioms are good for detecting and summarizing differences among theories, but not so good as means of evaluating adequacy of theories. Camilla's list of axioms illustrates this observation relative to theories of causation. Even some of the most innocently-looking axioms on her list are not free from objections.

Take for example Right Weakening, with $A \Rightarrow B$ standing for "A causes B". The axiom says:

> *8. Right weakening: from $A \Rightarrow B$ and that C logically follows from B (in classical logic), one concludes that $A \Rightarrow C$.*

I have not heard anyone challenge this axiom; Fangzhen Lin approved of it, Hector Geffner let it stand, and, indeed, the axiom appears immaculate and harmless. *But* here is a counterexample.

Let C stand for some true and irrelevant fact, say C is "my eyes are brown". Being true, C logically follows from any B. Yet, from "A causes B", we would NOT wish to conclude that "A causes my eyes to be brown".

The same goes for transitivity. If we ask a person on the street if causality is transitive, the answer would be: Of course. If we ask any causal analyst, the answer would be: Of course not. (e.g., my whistle causes Joe to shoot. When Joe shoots he kills birds. However, my whistle frightened the birds away).

So what assumptions must a person on the street be making, when asked to judge if an axion is plausible or not?

Here is a suggestion (for transitivity). Our person-on-the-street interprets transitivity to mean: If

1. A causes B and
2. B causes C regardless of A, then
3. A causes C

The suggestion is that questions about transitivity bring to mind chain-like processes, where A influences B and B influences C, but A does not have *direct* influence over C. Under such qualification, we have indeed a theorem that transitivity holds. This theorem is sound in both the counterfactual and manipulative interpretations of "A causes B" (that is "A and B are true, and B would be false if A were made false") as well as in every semantically clear theory of causation that I have seen.

Conclusion: testing axioms against intuition is a dangerous enterprise; formal semantics is safer.

Judea

PS. Structural semantics of cause and counterfactuals is proposed in my IJCAI-99 paper; posted on

`http://bayes.cs.ucla.edu/jp_home.html`

Slides and (part of) the lecture transcript are on http://bayes.cs.ucla.edu/IJCAI99/ijcai99_files/v3_document.htm>http://bay

Comment from: **Camilla Schwind**

Dear Judea,

Thank you for your remarks on my paper.

I am not sure that in my paper I have been sufficiently clear. I do not think that I discussed axioms, but something weaker: postulates, or just criteria, i.e. properties of a causal relation. I find this approach useful for studying different theories for causality and actions and I beliefe that it is useful to question whether a theory for causal reasoning has these properties or not. As I have shown in my paper, and partly in my answer to Fangzhen Lin, this study allows to exhibit general properties for actions and causality and to show the advantages and limits of several approaches.

In more detail:

I do not agree with your counter-example concerning right weakening.

Let C stand for "my eyes are brown". Obviously, C is not logically true, but just true in some model (and can be false in some other model, namely in every model where my eyes are not brown). Then it is not true that any B follows from C.

I have not advanced a special opinion on transitivity. As I pointed out, I think there are arguments for having transitivity as well as for not having transitivity. I think your example is interesting, because it illustrates, that the presence of transitivity may relate in some way to two different readings of causality:

1. A causes always B
2. A causes sometimes B

In the interpretation of (1), causality is probably transitive ? in (2) most certainly, causality is not transitive ?

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