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ELECTRONIC NEWSLETTER ON
REASONING ABOUT ACTIONS AND CHANGE

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Today

A few days ago, Pat Hayes argued in this Newsletter that a representation of time can best be developed using only intervals as the primitive notion. Today, Jixin Ma and Brian Knight return with a contrary point of view.

Debates

Ontologies for time

From: Jixin Ma

After reading Pat's answers to our claims/arguments about the ontology for time, we would like to raise the following questions/arguments:

1. First of all, it is not clear what's the exact role that time points play in Pat's formulation, although, according to Erik's understanding, Pat Hayes "argues in favour of an ontology for time where intervals are the only elementary concept and timepoints play a secondary role". As Pat points out in his answers (in agreement with our opinion as stated in our claims), "if we take points and intervals as basic, there is no need to do this", i.e., deal with the question of whether intervals are open or closed. However, it is not clear what's the exact meaning of "taking points and intervals as basic". Are they both taken as primitive temporal objects, or, as Allen suggests, points are thought as places where intervals meet each other?

2. Pat argues that "the question is whether it makes sense to say that something is true at points". However, his argument is quite confused: in the first place, he claims "truths hold not at points but during intervals" (as for the case when one insists that interval endpoints are "in" the interval). Later, he states "Some truths may be instantaneous, ie true only at points; others make sense only when asserted to hold during noninstantaneous intervals". So, what's the answer to the question "whether it makes sense to say that something is true at points"?

3. Pat's claims that one may identify interval $\langle t, t\rangle$ with point t, or distinguish $\langle t, t\rangle$ from t, or even forbid instantaneous intervals completely. However, what's the choice? Do we need points (instantaneous intervals) or not? Let's consider the case that we do (in fact, for general treatments, we **do** need them). For this case, Pat's states that if $meets(\langle a, b\rangle, \langle b, b\rangle) \wedge meets(\langle b, b\rangle, \langle b, c\rangle)$ then $meets(\langle a, b\rangle, \langle b, c\rangle)$. (In fact, it seems in Pat's formulation, we always have $meets(\langle a, b\rangle, \langle b, c\rangle) \wedge meets(\langle a, b\rangle, \langle b, b\rangle)$ etc., since the intervals are uniquely defined by their endpoints). Below are some problems with this formulation:

I. As noted by Pat himself, "an instantaneous interval meets itself", though the "basic" points are totally ordered. How to characterise the relation between them? Pat's gives a suggestion: to characterise them without mentioning points explicitly. Then, what's the relationship between points and intervals?

II. How to define other relationships between intervals like those introduced by Allen? For instance, it is intuitive to say that $meets(\langle a,b\rangle,\langle b,c\rangle) \wedge meets(\langle b,c\rangle,\langle c,d\rangle) \rightarrow before(\langle a,b\rangle,\langle c,d\rangle)$. However, in this case, one would have both $meets(\langle a,b\rangle,\langle b,b\rangle)$ and $before(\langle a,b\rangle,\langle b,b\rangle)$, and hence "meets" and "before" would not be exclusive to each other.

III. By saying $meets(\langle a,b\rangle,\langle b,b\rangle)$, $meets(\langle b,b\rangle,\langle b,c\rangle)$, and $meets(\langle a,b\rangle,\langle b,c\rangle)$, one can only express the first case, that is case a), but not the other two cases, that is case b) and case c), as we demonstrated in our former arguments.

4. Pat argues that "I'm largely in agreement with Jixin about points and intervals, although I dont think its got anything to do with knowledge". But it does. In fact, as pointed out by Pat himself, "if you want to know whether the light was on or not, you have to say which interval you are talking about". In other words, if the (additional) knowledge of "which interval you are talking about" is given (e.g., in terms of which interval is open/closed at the switching point, or in terms of the corresponding meets relations - "knowledge"?), we can say whether the light was on or not.

5. Pat also argues that his formulation is simpler (and elegant). In what aspects, compared with which formulation? It seems that it still needs a lot of axioms to characterise the formal structure, especially when issues such as density, linearity, boundness, etc, are to be addressed.

Jixin & Brian

Calendar

Forthcoming conferences and workshops

TARK-98: Theoretical Aspects of Rationality and Knowledge.
Evanston, Ill., USA, 22-24.7, 1998. Papers due: 31.3 1998.
INFO: http://www.tark.org/
MSG: http://www.ida.liu.se/ext/brs/confi/cfp/TARK-98.txt

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