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Today

This issue advertises an additional ETAI submitted article, this time by by Marc Denecker, Daniele Theseider Dupré and Kristof Van Belleghem (from Leuven, Torino, and Leuven, respectively). The article proposes a generalised inductive definition principle to define an intended semantics for causal theories. The abstract follows below; the full paper is accessible via the ETAI web pages as usual. The three-month discussion period for this article is hereby opened.

ETAI Publications

Received research articles

An Inductive Definition Approach to Ramifications

by **Marc Denecker, Daniele Theseider Dupré, and Kristof Van Belleghem**

In the current state of the art on the ramification problem, the purpose of causal laws is to restore the integrity of state constraints. In contrast with this view, we argue that causal laws should be seen as representations of how physical (or logical) forces and effects propagate through a dynamic system.

We argue that in order to obtain a natural and modular representation of the effect propagation process, a causal rule language is needed which allows for *recursion* to model effects on mutually dependent fluents, for *negation* to model effects which propagate in the *absence* of other effects, and with *complex fluent formulae* to model causality in a compact and natural way.

A fundamental property of the process of effect propagation in a dynamic system is that it is *constructive*: effects and change propagations do not spontaneously appear without an external cause. To adequately model the constructive nature of the physical change propagation process, we base the semantics of the formalism on the principle of inductive definition, the main mathematical constructive principle. We use a generalised inductive definition principle, generalising Clark completion and circumscription, to define a unique intended semantics for causal theories. Our approach can deal in particular with cyclic dependencies between effects, in such a way that to some definitions, in spite of syntactic cycles, we can assign a unique intended semantics in a constructive way, while other "actually cyclic" definitions are explicitly detected by the semantics as bad definitions.

Our formalism allows to express the effect propagation process with high precision. Evidence for this is found in the fact that in many applications, a

representation is obtained which - almost as a side effect - correctly models the interacting effects of simultaneous actions. Our approach is presented independent of a specific time structure, such as situation calculus, $\mathcal{A}$, or Event Calculus, but we briefly discuss how it can be embedded in different time structures.

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