

Grounding of Causality to The Present

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In this paper I use the Time Interpretation of Path Semantical Logic to ground causality to the present.

For any theorem of Propositional Logic^[1], there is a relative equivalence class of the law.

For example:

$$\begin{array}{ll} (a \Rightarrow b) \wedge a \Rightarrow b & \text{Modus ponens} \\ ((a \Rightarrow b) = c) \wedge (a = c) \Rightarrow (b = c) & \text{Modus ponens relative to `c`} \end{array}$$

In the Time Interpretation^[2] of Path Semantical Logic^[3], there is a question that comes to mind: What if truth is grounded relative to different moments?

In particular, what I am interested in is how causality is grounded. Causality is an implication \Rightarrow from one layer to some later layer.

The core axiom is a theorem in Path Semantical Logic:

$$\begin{array}{l} (a_1, a_2) (b_1, b_2, t_2, d): \\ (a_1 = a_2) \wedge (b_1 = b_2) \\ (a_1 \Rightarrow b_1) \wedge (a_2 \Rightarrow b_2) \\ \hline b_1 = b_2 \end{array}$$

Investigating the core axiom relative to different propositions:

$$\begin{array}{l} (a_1, a_2, t_1, c) (b_1, b_2, t_2, d): \\ (a_1 = a_2) = t_1 \wedge (b_1 = b_2) = t_2 \\ \\ \text{for } x, y \text{ in } \{t_1, t_2, c, d\} \{ \\ \quad (a_1 \Rightarrow b_1) = x \wedge (a_2 \Rightarrow b_2) = x \\ \quad \hline \quad (b_1 = b_2) = y \\ \} \end{array}$$

Here, the propositions t_1 and t_2 might be thought of as a clocks in which different moments different equalities hold. Some simple physical system is changing over time from $a_1 = a_2$ to $b_1 = b_2$.

The propositions c and d are added as a control reference.

On the next page I will take a look at the generated truth table.

The previous program generates the following truth table over `x` and `y`:

	$x = t_1$	$x = t_2$	$x = c$	$x = d$
$y = t_1$	true	false	false	false
$y = t_2$	true	true	true	true
$y = c$	false	false	false	false
$y = d$	false	false	false	false

The cells with **turquoise** background are tautologies, because of the assumption $(b_1 = b_2) = t_2$.

What is interesting the cells with **blue** background, because they show that the equality does not propagate to the later layer when causation is relative to some proposition other than t_1 .

When $x = t_1$, it synchronises t_1 with t_2 . The equality $b_1 = b_2$ becomes true in both moments.

This means that causality is grounded to the present moment.

Philosophically, this could have implications for how we think about time.

If the current moment was caused by some previous moment,
it must have been true that it was caused in the previous moment.

With other words, causation “knows about” the next moment in every moment.

It the current moment, it does not matter whether the causation from the past is “true” in the same sense. This is because if the causation from the past is “true” in the previous moment, then it is “true” in the current moment. However, if the causation from the past is “true” in the current moment, one can not prove that it was “true” in the previous moment. It is unprovable as long the previous equality is not provable in the current moment.

References:

- [1] “Propositional calculus”
Wikipedia
https://en.wikipedia.org/wiki/Propositional_calculus

- [2] “Time Interpretation”
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https://github.com/advancedresearch/path_semantics/blob/master/papers-wip2/time-interpretation.pdf

- [3] “Path Semantical Logic”
AdvancedResearch – Reading sequence on Path Semantics
https://github.com/advancedresearch/path_semantics/blob/master/sequences.md#path-semantical-logic