

SEMANTICS FOR CONDITIONALS

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ABSTRACT

Model theoretic "possible worlds" analyses of conditionals were first developed in the late 1960's as a response to a philosophical problem - the problem of counterfactuals. Since then, they have been seen to be relevant to a range of problems that are of interest to the participants of this conference: knowledge representation, belief revision, probabilistic reasoning, nonmonotonic reasoning, deliberation and contingency planning. In this tutorial talk, I review the basic semantic apparatus, the logics of conditionals, and some of the applications are refinements of conditional semantics.

The basic idea of the analysis was very simple: a conditional statement, *if Φ then Ψ* , is true in a possible situation α if and only if the consequent Ψ is true in a possible situation (or a class of possible situations) that is a function of α and of the antecedent Φ . So to interpret conditional statements the semantical apparatus must contain a selection function taking a possible world and a proposition into a possible world or set of worlds representing the way the world would be if the antecedent were true. Alternative developments of this simple idea impose different constraints on such selection functions.

The logics of conditionals validated by this kind of semantic theory had some surprising properties, properties that distinguished them from logics of both the strict and material conditionals. Standard conditional inferences such as contraposition and hypothetical syllogism were invalidated by all versions of this semantics, and the logics all have a nonmonotonic character: the inference from *if Φ then Ψ* to *if $(\Phi \wedge \theta)$ then Ψ* is invalid.

Philosophers have long distinguished two kinds of conditionals, usually called (with perhaps some grammatical impropriety) indicative and subjunctive conditionals. That there are semantic differences between the two kinds is demonstrated by contrasting pairs of examples, such as this famous one used by Ernest Adams to make the point:

If Oswald didn't shoot Kennedy, someone else did

If Oswald hadn't shot Kennedy, someone else would have.

Subjunctive conditionals are the main target of the semantic theories, but the same abstract analysis has been applied to indicative, epistemic, or

"open" conditionals as well. I will review some of the issues concerning the relationship between the two kinds of conditionals.

There are some striking parallels between conditional propositions, as represented in the semantic theories, and conditional probabilities. A number of different strategies have been used to clarify and explain the relationship between conditionals and probability. The most straightforward hypothesis about this relation: that the absolute probability of a conditional proposition is always equal to the probability of the consequent on the condition of the antecedent - was shown to be untenable by David Lewis. I will review the Lewis triviality results and discuss what they show about the relation between probability and conditionals.

Conditionals interact with a range of concepts that have received analyses within the possible worlds framework. I will sketch very briefly some of the developments that show promise of helping to clarify, within this framework, the relationships between causal, temporal, epistemic and decision theoretic concepts.