

An interactive demonstration of counterfactual truth conditions

Bachelor Thesis

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1 The semantic game of counterfactuals

1.1 Counterfactual logic

Counterfactual logic is an extension of propositional modal logic, that adds the binary operators $\Box \rightarrow$, $\Diamond \rightarrow$ and atomic formulas. The introduction of the *counterfactual would* $\Box \rightarrow$ and *counterfactual might* $\Diamond \rightarrow$ operators [?] aims to model the counterfactual conditional constructions of ordinary language, while atomic formulas serve as a way to represent states of affairs that may or may not be the case at a world in possible world semantics.

Definition 1 (Counterfactual formula). May $Atoms = \{x, y, \dots\}$ be the set of atomic formulas and $\Phi = \{\varphi, \psi, \dots\}$ the set of all formulas. Formulas are of the form:

$\varphi, \psi ::= \perp \mid x \mid \neg\varphi \mid \Box\varphi \mid \Diamond\varphi \mid \varphi \vee \psi \mid \varphi \wedge \psi \mid \varphi \Box \rightarrow \psi \mid \varphi \Diamond \rightarrow \psi.$

Definition 2 (Atoms). $Atoms = \{x, y, \dots\}$ is an infinite set of symbols.

Definition 3 (Alphabet of counterfactual logic). The alphabet of counterfactual logic $A = \{\perp, \top, \neg, \vee, \wedge, \Diamond, \Box, \Diamond \rightarrow, \Box \rightarrow\} \cup Atoms$ is an infinite set of symbols.

Definition 4 (counterfactual formula). A counterfactual formula is a finite sequence of symbols from the alphabet A .

Definition 5 (well-formedness). A counterfactual formula is called well-formed, iff it takes the form described by $\varphi, \psi ::= \perp \mid x \mid \neg\varphi \mid \Box\varphi \mid \Diamond\varphi \mid \varphi \vee \psi \mid \varphi \wedge \psi \mid \varphi \Box \rightarrow \psi \mid \varphi \Diamond \rightarrow \psi$

Subsequently every counterfactual formula is assumed to be well-formed.