Conditional presuppositions and direction of dependence
Modeling causal dependencies in formal semantics

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WHATIF
WASWÄREWENN

Backtrackers and non-backtrackers

(1) Backtracker

    a. If Jim were to ask Jack for help today, there would have to have been no quarrel yesterday.

    b. If Jim had come out smiling, it would have (to have) been a good interview.

(2) 'Causal'/directed counterfactual

    a. If the alarm had gone off, everybody in the house would have been awake.

The antecedents in (1) provide evidence for some cause, whereas the antecedents in (2) provide causes and state their effects in the consequent.

Evidential and causal indicative conditionals

Same interpretational differences in indicative conditionals

(3) Evidential
   a. If Jack asks Jack for help today, there was no quarrel yesterday.
   b. If Jim comes out smiling, the interview was good.
   c. If the butler's clothes are stained, he is the murderer.

(4) Causal/directed
   a. If the butler is the murderer, his clothes are stained.
   b. If you push the button, the alarm goes off.

General questions

- How do these different readings arise? How to model the differences?
- Does the difference between evidential and causal/directed play a further role in language?
    - Discourse connectives
    - Projection of presuppositions, especially in conditionals

Dynamic interpretation of conditionals

Stalnakerian model of communication

- State of mutual acceptances gets updated by utterances represented by the context set c - a set of possible worlds
- Assertions eliminate worlds with the aim of localizing and single out the actual world in logical space

Dynamic interpretation of conditionals

Conditional update in two steps

- The antecedent α of an indicative conditional $\alpha \to \beta$ sets up a supposition by restricting the view on the context set to worlds where the antecedent is true
- This local context $c + \alpha$ gets updated by the content of the consequent β
- Afterwards, the supposition is discarded. The new context set c' comprises $c - \alpha \wedge \neg\beta$-worlds.

What are presuppositions?

- ϕ presupposes χ if from the utterance of ϕ one can reasonably infer that the speaker takes for granted χ, i.e. $c \subseteq \chi$ (van Rooij (2007)[p. 294])

What is the projection problem?

- Give generalizations about how the presuppositions of the utterance of a complex sentence can be predicted on the basis of the 'normal' presuppositions of the clauses, were they uttered stand-alone

The so-called proviso problem

Generalizations by now

- The dynamic interpretation of a conditional would predict that presuppositions of the consequent clause would only project to the local context set up by the antecedent, i.e. the presupposition of the whole conditional would be a conditional

Projection non-conditionalized

(5) If Theo's wife hates sonnets then *his* manager does too.

    a. ↝̸ If Theo's wife hates sonnets, he has a manager.

    b. ↝ Theo has a manager.

(6) If Bill is flying to Toronto, his sister picks him up at the airport.

    a. ↝̸ If Bill is flying to Toronto, he has a sister.

    b. ↝ Bill has a sister.

Projection conditionalized

(7) If Bill takes a bath, Jane will be annoyed that there will be no more hot water.

    a. $\rightsquigarrow$ If Bill takes a bath, there will be no more hot water.

    b. $\not\rightsquigarrow$ There will be no more hot water.

(8) If Hanna is a scubadiver, she will bring her wetsuit on vacation.

    a. $\rightsquigarrow$ If Hanna is a scubadiver, she has a wetsuit.

    b. $\not\rightsquigarrow$ She has a wetsuit.

Van Rooij's account

- (!) Projection in conditionals is not about the presupposition having the form of a conditional, rather the crucial factor is whether antecedent and presupposition of the consequent are taken to be dependent or independent w.r.t. the context set
- Van Rooij's claim: Providing a notion of independence that predicts unconditional presuppositions
- Van Rooij's hypothesis: 'conditional'/dependent presuppositions if antecedent and consequent-presupposition are taken to be dependent
- My claim against his hypothesis: not with the notion of dependence following from his account

Independence as orthogonality

Two propositions are independent if they and their consequents are pairwise compatible w.r.t. an information state, here, the context set c

Formalization

$\forall X \in \{\phi, \overline{\phi}\}, \forall Y \in \{\chi, \overline{\chi}\} :$ if $\Diamond_c X$ and $\Diamond_c Y$ then $\Diamond_c(X \cap Y)$

Independence as orthogonality

1. If $\Diamond\phi$ and $\Diamond\chi$, then $\Diamond(\phi \cap \chi)$
2. If $\Diamond\phi$ and $\Diamond\overline{\chi}$, then $\Diamond(\phi \cap \overline{\chi})$
3. If $\Diamond\overline{\phi}$ and $\Diamond\chi$, then $\Diamond(\overline{\phi} \cap \chi)$
4. If $\Diamond\overline{\phi}$ and $\Diamond\overline{\chi}$, then $\Diamond(\overline{\phi} \cap \overline{\chi})$

plus

1. $\phi \rightarrow \psi_\chi$
2. $\Diamond\phi$ (presupposition of the antecedent)
3. $\phi \rightarrow \chi$ (satisfaction of the presupposition of the consequent in the local context), i.e. $\neg(\Diamond(\phi \cap \overline{\chi}))$

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Independence as orthogonality

1. If $\Diamond\phi$ and $\Diamond\chi$, then $\Diamond(\phi \cap \chi)$
2. If $\Diamond\phi$ and $\Diamond\overline{\chi}$, then $\cancel{\Diamond(\phi \cap \overline{\chi})}$
3. If $\Diamond\overline{\phi}$ and $\Diamond\chi$, then $\Diamond(\overline{\phi} \cap \chi)$
4. If $\Diamond\overline{\phi}$ and $\Diamond\overline{\chi}$, then $\Diamond(\overline{\phi} \cap \overline{\chi})$

plus

1. $\phi \rightarrow \psi_\chi$
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3. If $\Diamond\overline{\phi}$ and $\Diamond\chi$, then $\Diamond(\overline{\phi} \cap \chi)$
4. If $\Diamond\overline{\phi}$ and $\Diamond\overline{\chi}$, then $\cancel{\Diamond(\overline{\phi} \cap \overline{\chi})}$

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1. $\phi \rightarrow \psi_\chi$
2. $\Diamond\phi$ (presupposition of the antecedent)
3. $\phi \rightarrow \chi$ (satisfaction of the presupposition of the consequent in the local context), i.e. $\neg(\Diamond(\phi \cap \overline{\chi}))$

Weak notion of independence

- The presented notion of independence is rather weak
- It is not like probabilistic independence: On learning that the antecedent is true, nothing is learned about the truth (or probability) of the consequent
- All that is asked for is, that the propositions in question are compatible with respect to c
- That means, it is enough for independence to be satisfied, if there is at least one world in for each condition (1-4)
- Independence holds **in both directions**, i.e. it is symmetric

Weak notion of independence

This makes right predictions for cases where we take to be an evidential dependence relation, but where we find strengthening:

   (9)   If I torture him, Boris regrets laughing at me.

         a. $\not\leadsto$ If I torture him, Boris has laughed at me.

         b. $\leadsto$ Boris has laughed at me.

Prediction of dependent presuppositions?

The question is, when are dependent presuppositions presupposed?
Why do we have a dependent presupposition in this case?

 (10)   If Bill takes a bath, Jane will be annoyed that there will be no more
        hot water.
        a. $\rightsquigarrow$ If Bill takes a bath, there will be no more hot water.
        b. $\not\rightsquigarrow$ There will be no more hot water.

If there is only one world in the context where Bill makes sure that there is
more hot water, we would have the independent presupposition.

Prediction of dependent presuppositions?

Furthermore, the formalization also makes dependence a symmetric affair. This seems not to be right.

(11)   If Hanna is a scubadiver, she will bring her wetsuit.
    a. $\rightsquigarrow$ If Hanna is a scubadiver, she has a wetsuit.
    b. $\not\rightsquigarrow$ She has a wetsuit.

(12)   If Hanna brings her wetsuit on vacation, she is the one in the group, who is a scubadiver.
    a. $\not\rightsquigarrow$ If Hanna brings her wetsuit on vacation, someone is a scubadiver.
    b. $\rightsquigarrow$ Someone is a scubadiver.

Desiderata for dependent presuppositions

1. Asymmetric notion of dependence/independence like in causal models

   - Effects are causally independent of their causes
   - This is why evidential relations never get presupposed

2. However, needs to be broader: analytic dependencies (grounding), part-whole relations
   - NB: Might be accounted for in the same formal setting: Wilson (2017)

3. Ground contextual dependence/independence in shared knowledge of laws

More evidence from examples

Also for recent alleged counterexamples to strengthening accounts brought up by Mandelkern (2016)

(13) It is common ground that Smith has gone missing, and we don't know whether he is still alive. A detective enters and says:

    a. If the butler's clothes contain traces of Smith's blood, then it was the butler who killed Smith.

    b. ↝̸ If the butler's clothes contain traces of Smith's blood, then someone killed Smith.

    c. ↝ Someone killed Smith.

Generalization over his counterexamples: 'Conditional' presuppositions are **evidential** presuppositions

Theoretical and experimental evidences

- Pearl (1988) argued for the following point: Reasoning with causes is cognitively extremely efficient, because it reduces computational load
- Domaneschi et al. (2016) experimentally showed that two factors are relevant in the computation of presuppositions in conditionals
    - Dependence between the antecedent and the presupposition of the consequent
    - Cognitive load of the speakers/interpreters
- Hypothesis: Reasoning from effects to causes takes more cognitive effort (intuitively observable in backtrackers), whereas reasoning from causes to effects might be easier.

Laws in the common ground?

- Knowledge about laws has to be represented in the model of context
- Factual and law knowledge will be incomplete, i.e. we don't want to exclude the possibility that new laws can be learned
- But if we leave that open, how do we explain that dependencies do not get accommodated?
- We would want to say that a system of laws is incompatible with certain causal dependencies

Appendix I: More Mandelkern

(14) Is John in good health? Is he taking care of himself? [I'm not sure, but we should be able to tell at dinner:]

    a. If he's restricting his sugar intake, then his diabetes is under control.

    b. ↝̸ If John is restricting his sugar intake, John has diabetes.

    c. ↝ John has diabetes.

Appendix I: More Mandelkern

(15) Why did some of the professors wear waterproof coats to work today? [I don't know who did, and I can't tell you for all of them, but:]

    a. If Jack wore his waterproof coat to work today, then he's aware that it's raining out.

    b. ↝̸ If Jack wore his waterproof coat to work today, it's raining out.

    c. ↝ It's raining out.

Appendix I: More Mandelkern

(16) What were the kids up to today? [I don?t know, but:]

    a. If they were playing baseball in the backyard earlier, then they?re the ones who broke the dining room window.

    b. ↝̸ If the kids were playing baseball in the backyard earlier, someone broke the dining room window.

    c. ↝ Someone broke the dining room window.

Appendix II: Discourse connectives 'since' and 'because'

- 'Since' allows for evidential relations, not for causal relations (not clear about analytic relations)
- 'Because' allows for causal and analytic relations, not for evidential ones

Appendix II: Discourse connectives

(17) a. Liz has left, since her coat is not on the rack.
   b. # Liz has left, because her coat is not on the rack

(18) a. Liz has left, because she was tired.
   b. # Liz has left, since she was tired. (not sure about the judgement)

(19) a. Liz is a scubadiver, since she has a wetsuit.
   b. Liz is a scubadiver, because she has a wetsuit.
   c. #Liz has a wetsuit, since she is a scubadiver.
   d. Liz has wetsuit, because she is a scubadiver.

Evidential interpretations of indicative conditionals

Like for backtracker following Biezma and Arregui (2016): evidential conditionals do not perfect, they answer QUDs about the antecedent, not about the consequent.

Bibliography I

Biezma, María, and Ana Arregui. 2016. Discourse rationality and the counterfactuality implicature in backtracking conditionals. *Proceedings of SuB 20* .

Domaneschi, Filippo, Elena Carrea, Carlo Penco, and Alberto Greco. 2016. Selecting presuppositions in conditional clauses. results from a psycholinguistic experiment. *Frontiers in Psychology* 6:2026. URL `http://journal.frontiersin.org/article/10.3389/fpsyg.2015.02026`.

Mandelkern, Matthew. 2016. A note on the architecture of presupposition. *Semantics & Pragmatics* .

Pearl, Judea. 1988. *Probabilistic reasoning in intelligent systems: Networks of plausible inference*. San Francisco, CA, USA: Morgan Kaufmann Publishers Inc.

van Rooij, Robert. 2007. Strengthening conditional presupposition. *Journal of Semantics* 24:289–304.

Wilson, Alastair. 2017. Metaphysical causation. *Noûs* n/a–n/a. URL `http://dx.doi.org/10.1111/nous.12190`.