

24.903 Week #13 – 2022-05-02 and 2022-05-04

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1 Some more on conditionals

The basic idea of how conditionals work is this: the *if*-clause whisks us away to a particular set of possible worlds and the consequent clause is asserted to be true of those worlds.

What worlds we are taken to depends on what the conditional is about in the actual world.

We will treat *if* as a higher-order operator that together with the antecedent creates an intensional operator with a semantics very similar to the final analysis we gave to *in* “*A Study in Scarlet*”. But where the fiction operator directly encoded what features of the actual world it’s sensitive to (the Sherlock Holmes fiction), conditionals rely on context for this job. Here’s a first draft of the proposal:

$$\llbracket \text{if} \rrbracket^{c,w} = \lambda p_{\langle s,t \rangle}. \lambda q_{\langle s,t \rangle}. \\ \forall w' : p(w') = 1 \ \& \ w' \text{ is relevantly like } w \rightarrow q(w') = 1.$$

FINGER EXERCISE: Calculate the truth-conditions of a sample conditional: *if it rains, I will stay home*. (NB: we see that because *if* wants to combine with two propositions (provided by the antecedent and the consequent), we need two occurrences of the “ \wedge ”-operator.

The contextual anchoring to features of the evaluation world w is here effected by the placeholder “relevantly like w ”. This is crucial because otherwise the conditional would talk about any world whatsoever where the antecedent is true. This would make the truth-conditions not just not contingent on the actual world but also far too strong to allow most sensible conditionals to be true ever.

Think about the earthquake conditional *if there’s an earthquake, this house will collapse*: we would derive the absurdly strong truth-conditions that the conditional is true iff *all* of the worlds where there is a major earthquake in

Cambridge tomorrow are worlds where my house collapses. This is not correct. For one, while it's easy to imagine circumstances where the conditional is judged to be true, there surely are possible worlds where there's an earthquake but my house does not collapse: perhaps, the builders in that world used all the recommended best practices to make the building earthquake-safe, perhaps it's a world where I'm simply unreasonably lucky, or the house is immediately adjacent to much sturdier neighboring buildings which keep it propped up, or Harry Potter flies by and protects the house at the last minute (he owes me a favor, after all). This problem (that the house doesn't in fact collapse in *all* possible worlds where there's an earthquake but that the conditional can still be judged true in some worlds) is accompanied with another problem: whether the conditional is true depends on what the world is like. Was the house built to exacting standards? Is it propped up by its neighbors? Does Harry Potter owe me a favor?

That is the problem solved by restricting the quantifier over worlds to world “relevantly like w ”.

Obviously, this is a semantics with a “placeholder”, because what does “relevantly like” mean precisely? Now, just because the semantics is therefore rather vague and context-dependent doesn't mean it is wrong. As [Lewis 1973](#): p.1 writes:

Counterfactuals are notoriously vague. That does not mean that we cannot give a clear account of their truth conditions. It does mean that such an account must either be stated in vague terms which does not mean ill-understood terms or be made relative to some parameter that is fixed only within rough limits on any given occasion of language use.

A famous example for the context-dependence of conditionals is a pair attributed by [Quine 1960](#): p. 221 to Nelson Goodman (imagine these being said while the Korean War was going on):

- (1) a. If Caesar were in command, he would use the atom bomb.
- b. If Caesar were in command, he would use catapults.

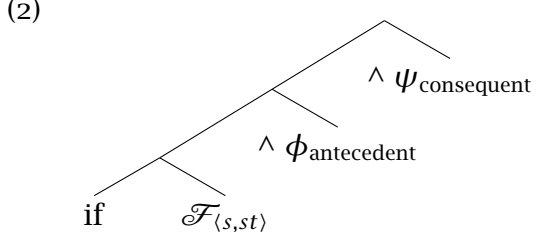
The insight articulated by Lewis is very important. Applying mathematical or logical methods to analyzing natural language meaning often arouses severe skepticism, precisely because natural language is often vague and context-

dependent. But that just means that an adequate analysis needs to not ignore vagueness and context-dependence and rather be clear about where they enter.

All the more reason to refine our initial draft of the proposal. We put a placeholder for context-dependence in the meta-language (“worlds relevantly like the evaluation world”) but that is not really sufficient. We would like to embed the analysis in a general framework for how context enters the semantics. And of course, we have an idea in place: we can locate context-dependency in the presence of elements whose value is determined by the contextually supplied assignment function. We used this device for pronouns and the contextual “glue” in nominal compounds and genitive constructions.

If we want to describe the context-dependency of conditionals in a technically analogous fashion, we can think of their representations as incorporating or subcategorizing for a kind of invisible pronoun that effects the anchoring of the conditional claim to relevant features of the evaluation world.

Concretely, we posit structures where *if* doesn’t just take two propositions as its arguments but also an additional element of type $\langle s, \langle s, t \rangle \rangle$:



We have written the silent pronoun as “ \mathcal{F} ” to evoke “(modal) flavor”, a term sometimes used to describe the anchoring of intensional operators. So, we have a variable over flavor functions that will return a set of worlds when applied to a given world.

$\llbracket \mathcal{F} \rrbracket^{c,w} = \lambda w'. \lambda w''. w''$ is considered in c to be relevantly similar to w'

We will give *if* the job of telling \mathcal{F} that what we need is the set of worlds that \mathcal{F} assigns to the evaluation world:

$\llbracket \text{if} \rrbracket^{c,w} = \lambda f_{\langle s, \langle s, t \rangle \rangle}. \lambda p_{\langle s, t \rangle}. \lambda q_{\langle s, t \rangle}. \forall w': f(w)(w') = 1 \ \& \ p(w') = 1 \rightarrow q(w') = 1.$

Together this means that a conditional says about the evaluation world w that among the worlds that are \mathcal{F} -related to w , the ones where the antecedent is true are all worlds where the consequent is also true.

We get different flavors of conditionals from different contextual resolutions of \mathcal{F} . Consider for example the earthquake conditional *if there's an earthquake, this house will collapse*. Context might assign to \mathcal{F} the function that when given an evaluation world w returns the set of worlds that “agree” with w on how sturdy this house is, what the local geology is like, and what the laws of physics are. Then, the conditional claims that the actual world is such that all the worlds that agree with it via \mathcal{F} and where there is an earthquake are worlds where this house collapses.

2 Propositional attitudes

In pset#10, we saw lexical entries for a couple of propositional attitude verbs. Here they are again in a slightly different format:

(3) For any context c and any world w :

- a. $\llbracket \text{believe} \rrbracket^{c,w} = \lambda p. \lambda x. \forall w' \in \text{DOX}(x)(w): p(w') = 1$
- b. $\llbracket \text{hope} \rrbracket^{c,w} = \lambda p. \lambda x. \forall w' \in \text{HOP}(x)(w): p(w') = 1$

These entries contain “flavor” functions, DOX and HOP, that map any individual x and world w into the set of worlds compatible with x ’s beliefs/hopes (respectively) in w .¹

We then see these items in action in sentences like:

- (4) a. Debinha believes that the team will win.
- b. Jessica hopes that the team will win.

These sentences are claims about the mental states of the subjects and their truth-conditions are that all of the worlds compatible with the respective mental state are worlds that make the prejacent true.

It is striking that all of the intensional operators we have studied so far involve universal quantification. We saw why they involve quantification: there

¹ DOX stands for “doxastic” (from the Greek word for “belief”), which is commonly used for belief-related terms in linguistics and philosophy. HOP is just made up for current purposes.

can't be a single world that is determined by objects with intensional contents (mental states, representational works, etc.), so we need to quantify over a set of worlds compatible with the relevant object. But why does it seem to be always *universal* quantification? What would an existential propositional attitude express?

There *are* existential intensional operators: “modal operators” like *maybe*, *perhaps*, *might*. And there are intensional operators that mean something in between existential and universal, like *probably*, *should*. We can express an existential belief attitude with a complex expression like *consider it possible that*. But lexicalized existential attitude predicates are exceedingly rare. One exception is a lexical item found in Russian, Slovenian, and other Slavic languages, which does mean something like “consider it possible that”, see for discussion and further interesting cases: [Močnik & Abramovitz 2020](#) and references therein.

3 Conditional attitudes

As you explored in pset#10, intensional operators can be iterated and our system smoothly composes meanings. Consider for example:

(5) According to Silvia, \wedge Ludmila hopes (that) \wedge the game will be easy.

Both *according to* and *hopes* want propositions as their arguments. So, as long as there is an “ \wedge ” operator on top of the two clauses, (5) will compose.

Now, let's put together conditionals and attitudes:

(6) If \wedge Marina looks confident, \wedge she believes (that) \wedge the team will win.

(As indicated, we will need to assume three occurrences of the \wedge -operator so that the two clausal arguments of *if* and the preadjacent of *believes* yield propositions.) The example in (6) means exactly what our analysis predicts it will mean: in worlds where Marina looks confident, (we can deduce that) she believes that the team will win.

But things don't work as smoothly in the following case:

(7) If I become a zombie, I hope you will shoot me.

As discussed in class, (7) does not mean that in worlds where I become a zombie, I (the zombie I) hope that you will shoot me. Rather, (7) expresses that when given the restricted choice between various worlds in which I become a zombie, the current actual I's hopes favor those worlds in which you shoot zombie-me.

To work this out compositionally is an immensely interesting and difficult task, which has been undertaken in [von Fintel & Pasternak 2020](#).

And that's where we'll end this semester.

References

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