

On Tensed Conditionals

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0. Introduction

In this paper we attempt to analyze some typical problems involving indicative and subjunctive conditionals in English within the framework of Barwise's(1985) situation semantics approach. Concentrating on commonly quoted conditional statements about Oswald's assassination of Kennedy, we first review and criticize Davis's(1979) possible worlds approach based on the notion of partial similarity and then Ellis's(1978) unified account of conditionals based on a theory of rational belief systems. Here we argue against Davis's truth conditional approach that differentiates indicative conditionals from subjunctive conditionals.

We, on the other hand, agree with Ellis on the claim that both an indicative and its corresponding subjunctive conditional in general express the same conditional knowledge or belief but do so from different temporal vantage points. But we reject his treatment because of its failure to account for some critical problems.

Having rejected Davis's and Ellis's approaches, we finally adopt Barwise's approach with its emphasis on the informative rather than truth-conditional aspect of statements. By clearing up some points in Barwise's(1985) treatment of conditionals, we show that those classic examples which have been claimed to be counterexamples to a unified theory are nothing but temporal instantiations of one and the same general conditional.

1. Arguments against Davis's Possible worlds Approach

In order properly to interpret a natural language conditional, Stalnaker (1968) adds a selection function to a model structure which maps a proposition and an actual world into the closest possible world. Unlike a material conditional in truth-functional logic, he claims that the truth value of a conditional in natural language depends on the truth value of its consequent relative to some possible world in which the antecedent is true and which otherwise differs minimally from the actual world. However, he holds

the position that indicative and subjunctive conditionals have the same truth condition.

Rejecting this equivalence position, Davis (1979) modifies Stalnaker's possible worlds framework by introducing the notion of partial similarity. He adopts two selection functions, an *i*-function for defining the truth condition of an indicative conditional and an *s*-function for a subjunctive conditional. In selecting the closest possible world in which the antecedent is true, the *i*-function reviews the whole actual history, while the *s*-function considers only its part, that part of the history prior to the time referred to in the antecedent. He then defines the truth conditions of an indicative and a subjunctive conditional.

(1)

The indicative conditional $A \rightarrow C$ is true iff C is true in $i(A)$, where $i(A)$ is the closest possible world in which A is true.

(2)

The subjunctive conditional $A > C$ is true iff C is true in $s(A)$, where $s(A)$ is the A -world that is most similar to the actual world before $t(A)$, the time reference of A .

Consider now how these truth conditions apply to the interpretation of the following conditionals:

- (3) a. If Oswald didn't kill Kennedy, someone else did.
 b. If Oswald didn't kill Kennedy, Kennedy is still alive.
- (4) a. If Oswald hadn't killed Kennedy, someone else would have.
 b. If Oswald hadn't killed Kennedy, Kennedy would have been still alive.

In interpreting these conditionals, Davis assumes that Oswald acted alone in killing Kennedy so that in his assumed actual world, the following do not hold:

- (5) a. X : Oswald did not kill Kennedy.
 b. Y : Someone else killed Kennedy.
 c. Z : Kennedy was not killed.

Then there should be two possible worlds in which X does hold but which otherwise is minimally different from this actual world, a world w_1 in which Y does not hold but Z does and a world w_2 in which Y holds but Z does

not. Here Davis claims that w_2 is closer to the actual world than w_1 because he thinks that it is less unlikely that Kennedy be found alive than that no one killed Kennedy. Accordingly, the $i(X)$ should be w_2 such that we have:

- (6) a. $X \rightarrow Y$ is true.
 b. $X \rightarrow Z$ is false.

This means that (3a) is true while (3b), false.

However, Davis shows that the corresponding subjunctive conditionals (4a) and (4b) have the opposite truth values, namely:

- (7) a. $X > Y$ is false.
 b. $X > Z$ is true.

This is so because the s -function only reviews that part of the history before Kennedy's assassination took place. Prior to this event, w_1 is the only possible alternative. This the s -function selects for interpreting the subjunctive conditionals.

We argue against Davis's possible worlds approach based on the notion of partial similarity on two grounds, one technical and the other realistic. From a technical point, his selection function is not fine-grained enough to provide a clear basis for preferring one possible world to the other as the closest possible world $i(A)$, say for choosing w_2 over w_1 . Depending on his attitude or prejudice, one may consider w_1 to be more likely than w_2 . Suppose, for instance, one can never accept Kennedy's assassination as most of us could not imagine. In this case, the most conceivable situation should be the world w_1 in which no one attempted to kill Kennedy. So, if we assume that Kennedy is still alive, then (3a) is false and (3b), true.

From a realistic point, one may disagree with Davis as to what the actual history is. Some people still believe in various conspiracy theories and then there are some who believe that Kennedy is alive somewhere. Suppose we accept the conspiracy theory that Oswald was to shoot Kennedy first and then X would if he failed. In this case, in contrary to Davis's prediction (7), the subjunctive conditional (4a) is true. If we further assume that this conspiracy has succeeded, then (4b) will be false, which is again contrary to Davis's prediction.

Davis's argument is based on a set of fallacious assumptions. He first assumes erroneously that we all know the actual history and have the same attitude towards the interpretation of the whole or parts of the history. Secondly, he assumes that conditional statements have intuitively justifiable fixed truth values like simple facts or laws. This second assumption is possi-

ble only if the first assumption is accepted. In reality there may be a unique actual world for each moment of the history, but we can perceive or know only some small part of it around us, the rest remaining as parts of our belief. With these questionable assumptions, Davis has fixed the truth values of those indicative and subjunctive statements involving Kennedy's assassination and claimed that his definition of the truth conditions correctly would predict their truth values.

In our paper, we claim that a truth-conditional approach like Davis's is fruitless for treating conditionals. As we have seen, the truth value of a conditional depends on one's background belief or knowledge and so it is meaningless to ask whether a certain conditional statement is true or false as if everyone had a fixed set of pieces of common belief or knowledge. It should be more fruitful to ask what kind of belief or knowledge the speaker is going to convey by making a conditional statement. If taken into account from this point of view, both indicative and subjunctive conditionals are seen to convey the same information content. Consider Kennedy's assassination examples again. Both (3a) and (4a) convey the information that Kennedy is bound to be killed possibly because of some conspiracy in which Oswald is one of the would-be assassins. The same information can also be conveyed by the following conditionals:

(8) If Oswald doesn't kill Kennedy, someone else will.

(9) If Oswald hasn't killed Kennedy, someone else will have.

But there is a difference in vantage point among these conditionals: the present tensed conditional (8) is appropriately uttered before the planned assassination time, but the past or perfect conditionals (3a), (4a) and (9) only after that time. Furthermore, each of the latter statements may convey an additional piece of information about the speaker's background knowledge: from (9) we learn that the speaker does not know whether Oswald has succeeded or not, nor whether Kennedy was killed or not; from (3a), that the speaker knows that Kennedy was killed, but does not know whether Oswald was the assassin; finally, from (4a), that the speaker may know both that Kennedy was killed and that his assassin was Oswald.

Unlike the truth-conditional approach, the information searching approach thus shows that various tensed types of a conditional convey the same information about some relation between the antecedent and the consequent situations. Their differences are shown to be due to differences in the speaker's temporal vantage point. In the following section, we discuss Ellis (1978), who takes a similar approach to the analysis of conditionals.

2. Arguments against Ellis's Approach

Adopting a theory of rational belief systems, Ellis(1978) proposes a general theory of conditionals that treats both indicative and subjunctive conditionals as expressing the same beliefs but doing so in different ways and against different backgrounds of knowledge or belief. He defines the truth or acceptability condition of a conditional as follows:

(10)

A conditional $A \rightarrow C$ is accepted as true in a rational belief system B only if the belief that C is false does not occur in any complete-extension of a belief system B'_A which is obtained from B in some way making the supposition that A .

Types of conditionals are differentiated according to how B'_A is defined from B . If the extended belief system B'_A consists of the set of original beliefs B plus a belief about A , then we have a material conditional. On the other hand, both indicative and subjunctive conditionals are claimed to be of the same type, the variably strict type with B'_A consisting of the set of necessarily true beliefs and possible beliefs with the supposition that A . These two are regarded as variant locutions of the same type of conditional.

In order to show this, he discusses conditionals of the following forms:

- (11) a. If X occurs on occasion O , then Y will occur on this occasion.
 b. If X occurred on occasion O , then Y (would have) occurred on this occasion.
 c. If X had occurred on occasion O , then Y would have occurred on this occasion.

They all contain the same piece of information concerning a conditional prediction, but differ from each other in tense and mood, and hence only in the circumstances in which it would be appropriate to assert them. The indicative present tensed conditional (a) makes an conditional prediction that is to be confirmed if and only if both X and Y are found to occur. Its past tense version (b) expresses the same conditional belief, but does so only in retrospect. The past subjunctive conditional (c) is again the same conditional prediction made retrospectively, but against the background knowledge that X did not occur.

However, Ellis fails to see how his theory applies to ordinary conditionals in English. He, for instance, considers the following set of indicative and subjunctive conditionals as a counterexample to his theory that they ex-

press the same belief.

- (12) a. If Oswald did not kill Kennedy, then someone else did.
 b. If Oswald had not killed Kennedy, then someone else would have.
 c. If Oswald does not kill Kennedy, then someone else will.

Here, he claims that (a) and (b) do not express the same belief, for he thinks that a rational man may accept (a) while rejecting (b). He argues that (a) is possibly a material conditional epistemically equivalent to

- (13) Someone killed Kennedy.

He continues to argue that only (c) and its past tense version (b) express a conditional prediction, but that (a) does not.

We, however, reject Ellis's analysis of these conditionals. We claim that they all can express the same belief or knowledge of a conspiracy concerning Kennedy's assassination. (c) conveys the information about a conspiracy of killing Kennedy in which Oswald is involved and (b) also conveys the same information from a different temporal vantage point, that is, long after the plot was conjured. Just like (b) and (c), (a) may convey the exactly same information about Oswald's involvement in killing Kennedy and does so only after the time of the conspiracy has passed. The only difference between (a) and (b) is found in the speaker's attitude: (a) can be appropriately uttered only if the speaker knows that Kennedy was killed, whereas (b) may be appropriately uttered even if the speaker does not know it. To adopt Ellis's terminology, these differences affect the assertibility condition only, but not the acceptability condition.

The conditional (a) may also describe a situation in which Oswald was supposed to kill Kennedy without implicating his involvement in a conspiracy. Because of this possible interpretation, (a) is often regarded as totally different from (b) in expressing a conditional belief. However, this interpretation should not be confused with Ellis's interpretation of (a) as a material conditional. If (a) were to be a material conditional based on (13), then it should not be different from the following statement:

- (14) If his brother didn't kill Kennedy, someone else did.

But they are two different statements, one about Oswald and the other about the brother. We know that the statement (14) has no ground for justification unless his brother was also involved in the assassination attempt.

Secondly, we argue against Ellis's claim that a past tensed subjunctive conditional is appropriately uttered only against the background knowledge

that the situation described by its antecedent did not occur. But as we pointed out, a subjunctive like (b) may be uttered simply to convey the information about a past conspiracy in which Oswald participated without knowing Oswald's success in the assassination and even without implicating any overall success of the plot.

Thirdly, we argue against Ellis's centering requirement on a rational belief system:

- (15) a. weak requirement: $E(B) \in (B'_A)$ if $TA \in B$
 b. strong requirement: $B'_A = B$ if $TA \in B$

Consider the strong requirement that the extended belief system B'_A remains the same as the original belief system B if A is already accepted as true in B . According to this requirement, the following statement is found to be accepted as true with respect to B if the consequent is accepted as true

- (16) If the weather is fine today, then I had bacon and eggs for breakfast yesterday.

As Ellis points out, this is counterintuitive. He, however, claims that this is not a real problem because statements like (16) are rarely asserted or denied. He does not explain why this is the case. His theory of conditionals fails to show why conditionals like (16), the antecedents and consequents of which are 'epistemically and theoretically unrelated', should not be accepted as true. This problem involving irrelevance between the antecedent and the consequent of a conditional can easily be resolved in Barwise's situation semantics approach. This and other problems involving Kennedy's assassination examples shall be treated in the next section within the framework of situation semantics.

3. Extension of Barwise's Approach

Barwise(1985) shows how various types of conditionals can be accommodated into one unified theory. He claims in particular that there is no theoretical difference between mathematical and natural language conditionals because the language of mathematics is part of natural language. He also treats both indicative and subjunctive conditionals as expressing the same conditional knowledge. He then proposes that the semantics of conditional statements can best be developed within situation semantics which takes the notion of subject matter seriously.

A conditional statement of the form [if A , the B] is treated as describing a constraint C , an involvement relation between a situation type describ-

ed by the antecedent A and a situation type described by the consequent C. Consider the following example:

(17) If Oswald does not kill Kennedy, then someone else will.

This conditional is interpreted as stating that Oswald's not killing Kennedy means someone else's doing it. Such an involvement may be represented formally as follows:

(18) $C17 = (S17 = \Rightarrow S'17)$

$S17 = [s/ \text{ in } s: \text{ at } \dot{l}; \text{ killing, Kennedy, Oswald}; 0]$

$S'17 = [s/ \text{ in } s: \text{ at } \dot{l}; \text{ killing, Kennedy, X}; 1]$

where the location \dot{l} is temporally preceded by the present location l_d referred to by the speaker of (17).

As a parameterized constraint, this involvement means that for every anchoring of \dot{l} to some real location l' , any situation s_1 of the type $S17(l')$ is part of some s_2 of the type $S'17(l')$. In other words, when the parameter \dot{l} is fixed to some real location l' , every situation of Oswald's failing to kill Kennedy at the location l' in the future is part of some situation in which someone else X will kill him at that time l' . So, cases like (16) whose antecedent is irrelevant to its consequent are not allowed in situation semantics. (Here, we are ignoring for the moment the possibility of a sequential reading of (17): only after Oswald fails, someone else will kill Kennedy.)

But this kind of a general conditional usually expresses a conditional, or parametric constraint which depends on the prevailing background condition to be actual. Such a parametric constraint C taking B as its parameter is represented as C/B . To be an actual constraint, the conditional knowledge described by $C17$ again depends on the prevailing background condition $B17$ that includes such facts as:

- (19) a. Kennedy is bound to be killed.
b. Oswald is supposed to kill Kennedy.

On the basis of this kind of a general conditional expressing a parametric constraint, we can obtain various types of specific conditionals by assigning values to each parameter in the antecedent and consequent situation types and the background condition. These specific conditionals thus can convey information if there is an anchoring function f for the parameters of B such that the utterance situation s_u is of the type $B(f)$ and, in addition, if it conveys the information that C/B is actual.

By examining various problematic cases, Barwise demonstrates that various kinds of conditionals can be treated adequately with this one general theory. In his case study he includes the Kennedy assassination examples. From the perspective of informative communication he sees no difference between indicative and subjunctive conditional statements. First, he points out that the past subjunctive conditional (20) corresponds to the present perfective indicative (21), not to the past indicative (22).

- (20) If Oswald had not killed Kennedy, then someone else would have.
- (21) If Oswald has not killed Kennedy, then someone else will have.
- (22) If Oswald did not kill Kennedy, then someone else did.

From different vantage points, (20) and (21) could convey the same information about Oswald's involvement in assassinating Kennedy. Suppose there has been a conspiracy in which Oswald or, if he fails, someone else is supposed to kill Kennedy. This information may be conveyed by (21) and later at the end of the appointed time by the assertion of (20). Barwise, however, simply dissociates the past indicative conditional (22) from the past subjunctive (20) accepting a possible difference in truth value between them. He has also failed to show how (22) is instantiated from its corresponding general conditional, although all specific conditionals are, according to his claim, instances of some general conditionals.

Besides the corresponding pair (20) and (21), we can easily set up the following pairs of the present and its corresponding past conditionals:

- (23) a. If Oswald does not kill Kennedy, then someone else will.
b. If Oswald did not kill Kennedy, then someone else would.
- (24) a. If Oswald does not kill Kennedy, then someone else does.
b. If Oswald did not kill Kennedy, then someone else did.

Now consider under what conditions these conditionals are informative and what kind of information they convey. For (23a) to be actual, we must have the prevailing background condition that Kennedy is bound to be killed, for instance, either because of his unpopularity or by some conspiracy and that Oswald is supposed to kill him, again either because of his personal grudge against Kennedy or because he has been hired by some crooks. Against this background condition, (23a) conveys the information that Oswald's failure to kill Kennedy means, or involves, someone else's killing him. Just as in the case of (20) and (21), (23b) has the same prevailing condition to be informative and conveys the same information as conveyed by (23a) but does so from a different temporal vantage point. Because of

this temporal shifting to the past, the prevailing background condition of (23b) is temporally anchored to the past so that it is presumed at the time of utterance that Kennedy was bound to be killed and that Oswald was supposed to kill him.

Our treatment of (24b = 22), however, differs from Barwise's. Against his claim that dissociates (22) from (20), we argue that the past indicative (24b = 22) is again an instance of a general conditional conveniently expressed by the present indicative (24a). We claim that they both convey the same information condition and content except that, as in those cited cases (20-21) and (23a, b), they do so only from different temporal vantage points. But note that their prevailing background conditions include the same facts about Kennedy and Oswald as required for the other conditionals to be actual. We thus find the following discourse acceptable:

- (25) Kennedy is a crook, so he must be eliminated. Luckily we got hold of a fellow named Oswald. If he doesn't kill Kennedy, someone else does/will.

We also find its past tense version acceptable.

- (26) Kennedy was a crook, so he had to be eliminated. Luckily we had got hold of a fellow named Oswald. If he did not kill Kennedy, someone else did/must have done, (for he swore that either he himself or someone else would kill him).

On the other hand, the following are unacceptable:

- (27) a. *Kennedy is heavily guarded, so he can't be killed. If Oswald doesn't kill him, then someone else does/will.
 b. *Kennedy was heavily guarded, so it was impossible to kill him. If Oswald did not kill him, someone else did.

Hence, we consider all these variant types of conditionals specific instances of one and the same general conditional expressed either by (23a) or (24a).

But unlike the other conditionals, the past indicative (24b) is often claimed to be a material conditional. This interpretation is possible, according to our treatment, if the part of its background condition that Kennedy was to be killed is treated as an accomplished fact that Kennedy was killed. In this case, the conditional (24b) is equivalent to the disjunctive expression:

- (28) Either Oswald killed Kennedy or someone else did.

But note that the other part of the prevailing background condition that Oswald was supposed to kill Kennedy must remain valid if (24b) is to express an actual constraint. If this difference in background condition is, however, regarded to be significant, as is insisted by Barwise, then the past conditional (24b) should be treated as being ambiguous: in one case, it is a case instantiated from (24a) and in another case from some different constraint. Since these seem to be no present tense conditional statement in English describing this particular constraint, the conditional (24b) might be considered to be a counter example to the claim that every conditional, whether material, indicative, or subjunctive, is an instance of some general conditional. One possible solution is to lay a restriction P on the location \bar{l} , \bar{l}/p , in particular, by restricting the parameterized location in a constraint to the past, not by anchoring it to the past. If so, we obtain a general parametric constraint that is instantiated always into a particular past location only. But we wish to make a stronger claim that types of conditional which is claimed to be a material conditional is also an instance of the same general constraint from which other types of conditional are instantiated by temporal anchoring. Because of our cognitive structure, the knowledge of what is bound to occur requires it to be realized and become actual if time passes. If this constraint applies to the prevailing background condition B17, then it must be the case that Kennedy's being bound to be killed implies his actual death if the time \bar{l} is anchored to some past.

The problem of relevance mentioned at the end of section 2 is no problem at all in a situation semantics approach for it takes the notion of subject matter seriously. Since a conditional expresses a constraint between situation types, nothing irrelevant comes into a statement which purports to express some involvement relation.

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