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On conditional if-*sentences**

1 Introduction

The present paper is part of a bigger enterprise, the ultimate aim of which is to provide a semantic and pragmatic analysis of conditional *if*-sentences (to be defined in **§2.2**). After a concise demonstration of the often imprecise use of the term 'conditionals' in the literature, the set of conditional *if*-sentences is defined in a way that is operational not only from a theoretical linguistic but also from a corpus linguistic point of view. Then a brief description of the logic-based concept of meaning is given and some aspects of the classical truth-functional account (to be described in **§3.2**) are mentioned that are not covered in Bottyán (2003).

2 The data

2.1 'Conditionals' in the literature

The term CONDITIONAL is common in the literature, yet one often encounters the problem that scholars use intuitive semantic criteria to identify a range of sentences, which they call 'conditionals', as the objects of their inquiry, although what they are after is exactly the meanings of these sentences.

For example, Dancygier remarks that the least marked of English conditional conjunctions is *if* (1998 : 1) and that the linguistic form of conditional constructions "seems to escape elegant, uniform descriptions [...], because conditionals have an imposing variety of forms, and a still more overwhelming variety of interpretations" (1998 : 2).

Declerck and Reed admit that "it is extremely difficult, if not impossible, to give a precise definition of 'conditional meaning' or 'conditional interpretation'" and it is "impossible to identify a common denominator" (2001 : 8). Nevertheless, they have "decided to adopt a very broad definition of 'conditional (sentence)', which corresponds with the way the term is *intuitively used* by most linguists: a conditional is a two-clause structure in which one of the clauses is introduced by *if* (possibly preceded by *only*, *even* or *except*) or by a word or phrase that has a meaning similar to *if*, *only if* (e.g., *provided*) or *except if* (viz., *unless*)" (2001 : 9; emphasis mine).

Leech (1987 : 116) is even less precise when he identifies 'conditional sentences' with the help of their property that "the proposition expressed by the main clause is qualified by a condition expressed by an *if*-clause or some *equivalent* construction (e.g., a clause introduced by *unless*, *lest*, or *whether*)" (emphasis mine).

* I would like to express my gratitude to Ferenc Kiefer, my dissertation supervisor, and Lajos Marosán, the instructor of most of my electives in ELTE's English Linguistics Doctoral Programme, for their support and encouragement. I also thank Beáta Gyuris, the teacher of a formal pragmatics course I attended in ELTE's Theoretical Linguistics Doctoral Programme, for valuable study materials. The usual disclaimers apply, of course.

Logicians and philosophers of logic, such as Sanford (1989), Jackson (1991) and Read (2001), for example, are only concerned with statements of the form "If A, then B." Yet, as it will be shown in **§3.4**, it is far from clear how statements are to be unambiguously identified.

2.2 Conditional *if*-sentences

Instead of following the practice of the above scholars and delimiting the observed data on the basis of intuitive semantic criteria, the present paper will provide an *operational definition* of CONDITIONAL IF-SENTENCES. That is, a sentence-set will be defined "in terms of clearly observable operations that anyone can see and repeat" (Ray 1993 : 60).

That is to say, conditional *if*-sentences will refer to

(1) All and only those sentences that contain *at least* one *if*-clause in which the conjunction *if* cannot be replaced by *whether* if the resulting sentences are to remain grammatical.

For instance, of the sentences

(2) If Shakespeare was born in 1564, he would be 440 years old this year.

(2′) *Whether Shakespeare was born in 1564, he would be 440 years old this year.

(3) They've got a lot of nice things, if you know what I mean.

(3′) *They've got a lot of nice things, whether you know what I mean.

(4) If you're hungry, there's food in the fridge.

(4′) *Whether you're hungry, there's food in the fridge.

(5) If you like her so much, you should invite her to tea if you see her again.

(5′) *Whether you like her so much, you should invite her to tea if you see her again.

(5″) *If you like her so much, you should invite her to tea whether you see her again.

(6) I won't tell if he has voted for George W. Bush, if you don't want me to.

(6′) *I won't tell if he has voted for George W. Bush whether you don't want me to.

(7) The story, if so it may be termed, is weak and loose.

(7′) *The story, whether so it may be termed, is weak and loose.

(8) There will be very few people present, if any at all.

(8′) *There will be very few people present, whether any at all.

(9) If he's not intelligent, at least he's reliable.

(9′) *Whether he's not intelligent, at least he's reliable.

(10) [If he really did it on purpose] is still unknown.

(10′) Whether he really did it on purpose is still unknown.

(11) He wondered/didn't know/couldn't tell if everybody heard him.

(11′) He wondered/didn't know/couldn't tell whether everybody heard him.[1]

(2)–(9) count as conditional *if*-sentences, while the sentences in (10) and (11) do not.

Two expository remarks are in order here. The attribute 'conditional' in 'conditional *if*-sentences' is simply a convenient label referring to the fact that the above definition includes only such sentences that contain at least one clause introduced by a *non-interrogative if.* The phrase 'at least' is important in the definition because, as (5) shows, there are grammatical sentences having more than one non-interrogative *if*-clause.

One could object that the definition of conditional *if*-sentences provided in (1) is problematic, because it is not operational from a computational linguistic point of view. The reason why this could be so is that it appeals to grammaticality judgements, which require either native speaker informants or a not yet existent perfect grammatical algorithm.

And if the specification of the sentence-set to be studied is not implementable computationally, examples cannot be drawn from the now widely accessible computerized corpora.[2] Consequently, the study, which aims to describe the pragmatics of conditional *if*-sentences as well, cannot be comprehensive or empirically adequate.

Rather than casting aside the definition of conditional *if*-sentences because of the above difficulties, let us take a closer look at the sample sentences in (2)–(11). The data show that with the exception of sentence-initial *if*-clauses that are the

[1] Sentences (2), (3), (6) and (7), (8), (9) have been adopted from Haegeman (1984 : 486) and Declerck & Reed (2001 : 9), respectively, while (4) comes from Haegeman & Wekker (1984 : 48). The rest are my own examples.

[2] For example, the British National Corpus. See Declerck & Reed (2001 : 16) for a selective list of other resources.

subjects of the whole sentence (cf. (10)), whenever *if* is replaceable by *whether*, it introduces complement clauses of certain cognitive verbs (those of *wonder*, *know* and *tell*, for example, cf. (11)).

Since the set of such cognitive verbs is a closed class, with the aid of a list of the word-forms of these verbs[3] one can computationally specify a set of sentences that will include *all* conditional *if*-sentences, as defined in (1), as well as some sentences with interrogative *if*-clause subjects, such as (10).

In order to retrieve this body of data from the available computerized corpora, one merely needs to run a query that collects all sentences containing *if*, of which it holds that

(12) The conjunction *if* does *not* immediately follow any element of the set of the word-forms of cognitive verbs taking complement *if*-clauses.[4]

The only problem that remains to be tackled is that this computationally retrievable set will include examples like (10) in addition to conditional *if*-sentences. Since *if* is perfectly replaceable by *whether* in these sentences, they are excluded by (1). Yet, these examples can be discarded manually so that we get the requested sentence-set, that is, all and *only* conditional *if*-sentences.

3 Conditional *if*-sentences and logical semantics

3.1 The logic-based concept of meaning

In logical semantics it is generally accepted that

(13) One knows what a sentence means provided that one knows the conditions under which the proposition expressed by that sentence is true—i.e. its truth-conditions (cf. Pinkal 1985 : 24 and Goddard 1998 : 37).[5]

This proposal might seem counter-intuitive, yet, as Goddard (*ibid.*) notes, "one could certainly not be said to know what, say, *Snow is green* means unless one understood how the world would have to be in order for that sentence to be true."

[3] 'Word-form' is meant to refer to "the particular shape that a word [or, more precisely, a lexeme; GB] has on a particular occasion" (Bauer 1983 : 12). That is to say, a list of the word-forms of particular cognitive verbs includes all members of the inflectional paradigms belonging to these verbs.

[4] Naturally, such a query contains the elements of this set rather than its definition, i.e., {wonder, wonders, wondering, wondered, tell, tells, telling, told…}. Note that if all word-forms in the corpus are annotated for their lexemes (known as LEMMAS in corpus linguistics), 'the set of the word-forms of cognitive verbs taking complement *if*-clauses' has to be modified to 'the set of the lemmas of cognitive verbs taking complement *if*-clauses' in (12).

[5] Some recent logical frameworks, collectively referred to as 'dynamic semantics', do not restrict the logical concept of meaning to truth-conditions. For an outline of these theories, see Kálmán & Rádai (2001 : 52–104).

Furthermore, for those sentences that only express propositions, that is, subject–predicate statements about how things are in the world,[6] it is valid that

(14) Whenever a sentence A is true and another B false, A and B do not mean the same thing,

where 'mean' is to be understood in the word's everyday sense (cf. Cresswell 1992 : 404). Therefore, the traditional logical definition of meaning, in this restricted domain at least, seems to be justified.

3.2 The classical truth-functional account

As already noted at the end of §**2.1**, for logicians and philosophers of logic, conditional *if*-sentences have been of interest because by means of such sentences one can make conditional statements. What range of sentences count as conditional statements, what their properties are and what ingredients a theory about the meaning of such sentences should have are moot points (cf. Jackson 1991 and Read 2001 : 83–117).

For the sake of clarity, I will first review the approach that is a reference point for all recent accounts of conditional statements as well as why it can be called 'the classical truth-functional account'. Then, in sections **3.3** and **3.4**, I will discuss what aspects of that approach are and are not usually treated in logic and semantics textbooks directed to students of linguistics.

Let us start with truth-functionality. As early as in the 4th century B.C., the Stoic philosopher Philo of Megara claims that a true conditional statement is one that does not have a true ANTECEDENT (also called 'protasis') and a false CONSEQUENT (a. k. a. 'apodosis'). In other words, he regards a statement of the form 'If A, then B' as true unless the proposition denoted by A is true and that referred to by B is false at the same time (cf. Sanford 1989 : 19).

This *classical* account is reinvented and elaborated by the German mathematician Gottlob Frege (1848–1925). In his terminology, the Philonian interpretation of conditional statements is TRUTH-FUNCTIONAL, because it considers the truth-value of 'If A, then B' to be a mathematical function of those of the component propositions that A and B stand for, and nothing else (cf. Sanford 1989 : 46).

The British logicians Bertrand Russell (1872–1970) and Alfred North Whitehead (1861–1947) adopt Frege's account of conditional statements. While the authors of *Principia Mathematica* (1910–1913) do not develop any logical notions for the description of conditional statements that were not already present in Frege's *Begriffsschrift*[7] (1879), they modernize its space-consuming notational system and introduce some new terminology.

[6] This is a somewhat simplistic view of propositions, yet it is suitable for the time being. The issue of propositions will be taken up again in §**3.4**.

[7] 'Concept-script'. According to the book's English translator, Van Heijenoort (1970 : 1) and many others, "it is perhaps the most important single work ever written on logic."

In their seminal work, the truth-functional SENTENTIAL CONNECTIVE[8] that they symbolize with '$\supset$' (horseshoe) and read as 'implies' or 'if... then' is called the MATERIAL IMPLICATION OPERATOR (cf. Sanford 1989 : 46–52). The logical properties of '$A \supset B$' (read: 'A implies B' or 'If A, then B') can be most easily discussed with the help of the following TRUTH TABLE:[9]

(15) Truth-table for material implication

	A	B	$A \supset B$
(i)	T	F	F
(ii)	T	T	T
(iii)	F	F	T
(iv)	F	T	T

Since every proposition must have exactly one of the two truth-values, there are 2^n mutually exclusive and jointly exhaustive variations of 'true' (T) and 'false' (F) values for n propositions.[10] Consequently, if a proposition, such as '$A \supset B$', has 2 elementary propositions as components, there are four (2^2) possibilities for assigning the values 'T' and 'F' to these elementary propositions (A and B).

The possible cases are shown in the first two columns of the rows (i)–(iv) in (15). The third column of the truth table indicates that the composite proposition '$A \supset B$' is false only on the assignment in row (i), otherwise it is true (cf. Sanford 1989 : 54–56).

3.3 Material implication and conditional statements

All recent linguistic introductions to propositional logic (cf., for example, the relevant chapters of Allwood et al. 1977; Van Dijk 1977; McCawley 1981; Cann 1993 and Lyons 1995) discuss some of the differences between the fixed and definite truth-functional meaning of composite propositions of the form '$A \supset B$' given in (15), and that of their comparatively elusive natural or ordinary language counterparts.

Normally, these primers also contain sections that, to varying degrees of explicitness, apply elements of the British philosopher Herbert Paul Grice's (1913–1988) theory of communicative language use[11] to explain away some of the difficulties

[8] 'Sentential connectives' (a. k. a. propositional connectives) are the logical counterparts of the natural language elements corresponding to the English *and*, *or* and *if... then*.

[9] Truth tables first appear in the Austrian-British logician, Ludwig Wittgenstein's (1889–1951) early work *Tractatus logico-philosophicus* (1921). Although the validity of the philosophical claims of this book is highly debated, some of its logical innovations form an integral part of present-day standard symbolic logic courses. The development of truth tables and the truth-functional notion of tautologies are such innovations (cf. Sanford 1989 : 54–56).

[10] Some more recent systems incorporate a trivalent rather than a *bivalent* theory of truth. This means that a proposition can be assigned not only either of the values 'true' and 'false' but, alternatively, the value 'indeterminate' as well. In such systems, there are 3^n mutually exclusive and jointly exhaustive variations for n propositions.

[11] Grice (1975) and all the author's "further notes on logic and conversation", implicature and "indicative conditionals" are reprinted in the posthumous volume Grice (1989). A

that arise if one identifies the conventional content of the English conjunction pair *if...then* with the truth-functional meaning of material implication.[12]

Since some suggestions on how explanations of a Gricean sort are meant to save the classical truth-functional account are offered in Bottyán (2003) and elsewhere,[13] instead of repeating the points made therein, I will make mention of some aspects of the classical truth-functional account that are not treated or treated misleadingly in one or another of the above sources. Rather than providing in-depth analyses, I will simply designate some areas that would deserve closer scrutiny.

3.4 What is a conditional statement?

All the points to be made here are related to the question: What is a conditional statement? It might have struck the eye that although much effort had gone into arriving at an operational definition of conditional *if*-sentences (cf. §**2.2**), the term 'conditional statement', despite its repeated occurrence in the paper, was left undefined.

By way of an excuse, it can be said that none of the scholars whose work on the semantics of 'conditional statements' have been outlined aims at exactly specifying this sentence-set, and that the phrase has been used throughout as an abbreviation of 'statements of the form "If A, then B"'.

Yet, as it was anticipated at the end of §**2.1**, it is difficult to demarcate sentences that are *statements* from those that are not. The reason why this is so is that there is no uniformly accepted definition of 'proposition'. Nevertheless, one needs to define this notion at least tentatively, if one wishes to make sense of the logic-based concept of meaning described in §**3.1**:

(16) = (13) One knows what a sentence means provided that one knows the conditions under which the *proposition* expressed by that sentence is true—i.e. its truth-conditions.

From our point of view, coming to terms with a definition is essential, because (15) and (16) can only be profited from in the semantic description of conditional *if*-sentences if they express nothing other than a composite proposition.[14]

brief exposition of the role that the philosopher assigns to his "conversational maxims" in everyday verbal communication as well as a review of some of his theory's recent reception can be found in Turner (1999, 2001).

[12] Of the above-mentioned textbooks, Cann (1993 : 229–232) provides the most valuable treatment of the non-truth-functional aspects of the meaning of conditional statements in terms of Gricean pragmatics, complemented with a list of further readings. McCawley (1981 : 57–69) argues convincingly that the two alternatives to the claim that the oddity of sentences like *If 6 is an even number, then Kathmandu is in Nepal* is attributable to their being pragmatically anomalous rather than to their being false are untenable. That is to say, neither can we rightly contend that (i) the conventional content of conditional statements is not truth-functional at all, nor is it possible to maintain that (ii) it is truth-functional but has a different truth table from (15).

[13] For elaborate treatises on this topic consult Strawson (1986), Thomson (1990) and Adams (1992).

[14] For a brief outline of the three principal conceptions of propositions, see Kazmi (1992 : 284–287).

Let us investigate the content of the following sentences:

(17) If a set has only finitely many subsets, it is finite.

(18) If butter is heated, it melts.

(19) If it rains, then the match will be cancelled.

(20) If it had rained, the match would have been cancelled.[15]

(17) is a TAUTOLOGY, since the composite proposition that it expresses is "true for all the truth-possibilities of the elementary propositions" (Wittgenstein 1961 : 4.46, cited in Sanford 1989 : 56).[16] The reason for this is that it is impossible for (17)'s consequent ('the set is finite') to be false while its antecedent ('the set has only finitely many subsets') is true. In other words, concerning (17) the variation that row (i) of (15) describes is excluded.

The same can be said about (18), which, being an objective generalization, can only be true. (19) is CONTINGENT rather than tautological, since it can be disproved should it rain and the match nevertheless not be cancelled.

While the conditional *if*-sentences (17)–(19) are in the indicative mood, (20) is an example of what are commonly called COUNTERFACTUAL CONDITIONALS, that is, "sentences whose grammatical structure indicates that the antecedent is false" (Howson 1997 : 161).[17]

Although (20) is usually said to express a composite proposition and is given a truth-functional interpretation,[18] it is also possible not to regard it as the expression of a proposition. Namely, if we take 'it had rained' and 'the match would have been cancelled' for (20)'s antecedent and consequent, respectively, instead of their indicative counterparts,[19] we can rightly claim that neither of them expresses a complete proposition.[20]

[15] Sentences (17) and (18) have been taken from McCawley (1981 : 49), while (19) comes from Jackson (1991 : 2). (20) is my own example.

[16] Wittgenstein's *Tractatus logico-philosophicus* is usually cited with reference to the numbered paragraphs rather than page numbers. See also footnote No. 9.

[17] Note that the falsity of the antecedent is not always shown by subjunctive verbal mood, as in *If Chicago is in India, I am the Queen of Rumania* (Geis & Zwicky 1971 : 563). In this case, it is one's knowledge of the world rather than the grammatical structure of 'Chicago is in India' that triggers to interpret it as false (cf. also Kiefer 1983 : 345).

[18] By advocates of possible-world semantics. For accessible accounts of counterfactual conditionals in terms of this framework, see McCawley (1981 : 311–326) and Howson (1997 : 161–174). Stalnaker (1999) analyzes indicative conditionals in this framework as well.

[19] Which is the uniform practice of possible-world semanticists. See footnote 17.

[20] Space prevents me from enumerating all those areas related to the classical truth-functional account that I consider worth a more thorough investigation. The rest will be included in a separate paper.

4 Conclusion

We have shown that the set of sentences called 'conditionals' in the literature are often identified on the basis of intuitive semantic criteria. The present paper, instead of following this undesirable procedure, provided a definition of conditional *if*-sentences that is operational not only from a theoretical linguistic but also from a corpus linguistic point of view.

In the second half of the paper the logic-based concept of meaning and the most important characteristics of the classical truth-functional account were described. Then, some issues related to this account were catalogued that need to be revisited in a later phase of the present research.

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Bottyán, Gergely. 2003. Truth conditions vs. use conditions: Some aspects of the semantics of conditional *if*-sentences. Ms. Written version of the presentation given at the research seminar of ELTE DELG on 4 December 2002.

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