Presuppositions as Beliefs

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Abstract

Most theories of presupposition implicitly assume that presuppositions are facts, and that all agents involved in a discourse share belief in the presuppositions that it generates. These unrealistic assumptions can be eliminated if each presupposition is treated as the belief of an agent. However, it is not enough to consider only the beliefs of the speaker; we show that the beliefs of other agents are often involved. We describe a new model, including an improved definition of presupposition, that treats presuppositions as beliefs and considers the beliefs of all agents involved in the discourse. We show that treating presuppositions as beliefs makes it possible to explain phenomena that cannot be explained otherwise.

1 Introduction

In addition to its literal meaning, a sentence or utterance conveys a host of indirect information that can be pragmatically inferred. Presuppositions, which we mark "$\gg$", are one part of that information. Table 1 gives several examples of presupposition with their traditional analyses[1].

Roughly, a presupposition is a proposition that is conveyed by a sentence or utterance[2] but is not part of the main point, and must be consistent with the established context in order for that sentence or utterance to be felicitous. For example, the following is infelicitous because the second sentence presupposes that Angie quit, which contradicts the first sentence:

(1) *Angie didn't quit. It's surprising that she quit.

Other types of pragmatic inference include entailment, conversational implicature, and conventional implicature (see Levinson (1983) for detailed descriptions). Presuppositions can be distinguished from other sorts of pragmatic inference by their unique behavior when the sentence from which they originate is negated. These basic ideas are generally agreed upon; however, their formalization into a theory of presupposition has been difficult. We will now introduce two problems and our approach to solving them.

Horton (1987) reviews several theories, including those of Karttunen (1973, 1974), Karttunen and Peters (1979), Weischedel (1975, 1979), Gazdar (1979a, 1979b), Wilson and Sperber (1979), and Atlas and Levinson (1981). One problem is that many theories of presupposition implicitly make the following unrealistic assumptions[3]:

- Truth Assumption: If sentence S (or its utterance) presupposes proposition P, then P is true.
- Shared Belief Assumption: If sentence S (or its utterance) presupposes proposition P, then all agents involved share the prior belief that P is true.

Weischedel and Gazdar are exceptions; each of them attributes presuppositions to the speaker as either knowledge or belief. However, we will show that the beliefs of agents other than the speaker must be considered in order to correctly express many presuppositions. Our approach is to treat presuppositions as beliefs, but also to consider the beliefs of *all* agents involved in discourse.

A second difficulty has been in finding an adequate definition of presupposition. Many definitions state that the presuppositions of a sentence must be known prior to the utterance of that sentence to avoid infelicity. Some have the stronger constraint that the presuppositions must be mutually known by all participants. The following definition (Levinson 1983, 205) has these properties:

DEFINITION 1: An utterance A **pragmatically presupposes** a proposition B iff A is *appropriate* only if B is *mutually known* by participants.

These requirements, which reflect the Shared Belief Assumption, are too strict — presuppositions are often used to introduce *new* information. Conversely, many definitions accept inferences from the other inference classes as presuppositions. Our definition, to be presented in section 3.2, weakens the overly strict prior knowledge condition so that it does not reject valid presuppositions, and avoids accepting inferences from other classes by checking whether each candidate exhibits the distinctive behavior under negation that signifies a presupposition. Hence, the new definition captures presupposition more precisely.

The next section describes the unique behavior of presuppositions under negation. In section 3 the details of our

[1] Throughout this paper, we use the sentence itself as short form for its semantic representation, in order to avoid addressing the orthogonal issue of semantic representation.

[2] The sentence/utterance distinction will be made clear in the presentation of our approach.

[3] Here both sentences and utterances are mentioned because the assumptions are generally made when either is analyzed.

Trigger	Example
Factive verb	*Rita is upset that Jenny lied.* ≫*Jenny lied.*
It-cleft	*It was Pauline who told Arthur about Michelle.* ≫*Someone told Arthur about Michelle.*
Change-of-state verb	*Tom finished making dinner.* ≫*Tom had been making dinner.*
Non-restrictive relative clause	*Kerry, who is Jay's son, was married last month.* ≫*Kerry is Jay's son.*
Implicative verb	*Mom forgot to call.* ≫*Mom intended to call.*
Definite description	*The person who stole Dr. Legg's file used a key.* ≫*There is a person who stole Dr. Legg's file.*
Verb of judging	*I congratulated Lois when she finished her thesis.* ≫*For Lois to finish her thesis was a good thing.*

Table 1: Some common triggers of presupposition, with examples.

approach are presented. We then compare our analysis with that of Gazdar, and conclude with a summary.

2 Behavior under Negation

It is often stated that presuppositions are constant under negation, as in example 2, but are also defeasible. By this view, the presupposition in example 3 remains constant under the negation in the first sentence, but is later defeated by the second sentence.

(2) Calvin {did | didn't} stop going to college.
≫Calvin had been going to college.

(3) I don't wish I had a Porsche — I already have one.
⋡I don't have a Porsche.

Our explanation of this behavior is different. Before presenting it, some terminology must be introduced.

We will make the following semantic distinction between two kinds of negation. **Internal negation** has a particular element of its *scope* as its *focus*, in the sense of the terms defined by Quirk and Greenbaum (1973, 187–188). **External negation** focuses on an unspecified component of its scope and therefore has several possible interpretations. The following sentence contains external negation. It has at least three interpretations:

(4) The boogieman didn't blow the door shut.
(a) It's still open.
[*negating the main proposition*]
(b) There is no boogieman.
[*negating a presupposition*]
(c) It was already shut.
[*negating a felicity condition*]

The focus of internal negation is unambiguous. If that focus is on a presupposition, the presupposition, of course, does not survive the negation, as in the following:

(5) Mark, who has a Ph.D., is the president.
≫Mark has a Ph.D.

(6) Mark, who doesn't have a Ph.D., is the president.
⋡Mark has a Ph.D.

Internal negation that focuses on anything other than a presupposition does not affect that presupposition, because presuppositions do not depend on the truth of any other thing expressed by the sentence. For example, the presupposition of sentence 7 still holds when the main proposition is negated.

(7) Debbie, who has a dog, {does | doesn't} have cats.
≫Debbie has a dog.

External negation is inherently vague. We argue that it is handled as follows. One first checks to see if there is any evidence favoring one of the possible interpretations. If a presupposition contradicts any established information, one assumes the intended reading negates that presupposition; hence the presupposition is never believed to hold. We will call this the **blocking** of a presupposition. In the absence of any evidence to guide one in choosing an interpretation, one assumes that negation of the main proposition was intended, and hence that the presupposition stands. This assumption might be either supported or refuted by information to follow. If it is refuted, then the incorrect presupposition must be **retracted**.

Our analysis of example 3 then, is as follows. The negation in the first sentence is ambiguous and, on hearing that sentence alone, the hearer assumes a reading where the focus of negation is on *wish* and the presupposition is left intact. That is, the hearer assumes the intended reading was *I don't have a Porsche, and I don't want one.* On hearing the second sentence, the hearer learns that this assumption was incorrect, and the presupposition that *I don't have a Porsche* is retracted.

In summary, a presupposition survives semantically internal negation exactly when the negation does not focus on the presupposition itself. It is assumed to survive semantically external negation unless there is evidence to the contrary, in which case it is blocked. If not blocked, it

may be retracted later if the assumption is shown to be incorrect by evidence that follows. We use the term **defeat** to subsume both blocking and retraction. Horton (1987, sec. 1.2) shows that this behavior distinguishes presuppositions from entailments and implicatures.

3 Presuppositions as Beliefs

The approach proposed here is to treat each presupposition as the belief of some particular agent in order to avoid the assumptions of truth and shared belief and thereby attain a more realistic account of presupposition. In addition, we propose considering all agents when deciding to whom the belief should be attributed.

Before continuing, we will point out our assumptions. Following Grice (1975), we assume first that no speaker will deliberately try to deceive the listener, and second that no speaker will use irony or sarcasm. Deceit, irony, and sarcasm can affect presuppositions, and the possibility of handling them is discussed by Horton (1987).

3.1 A Logic for Modeling Context

In (Horton 1987) a formal logic of belief is defined. Its syntax allows the expression of propositions such as $B_{John}B_{Mary}\neg P$ (that is, *John believes that Mary believes P is not true*). Its semantics is based on **belief structures**, a variant of Fagin, Halpern, and Vardi's **knowledge structures** (1984). A belief structure encodes what will be called a **state** — the truth value of each proposition, as well as the beliefs of each agent regarding these propositions, their beliefs about the other agents' beliefs, and so on. If a proposition P is true for a belief structure s, we write $s \models P$; if not, we write $s \not\models P$. We also informally describe operations *Add Proposition*, which updates a belief structure to encode a new belief for some agent, and *Retract Proposition*, which retracts a proposition from an agent's beliefs. These operations can be used to model the acquisition and retraction of presuppositional information by agents. Formal definitions of these operations raise difficult problems that we have not solved. See (Horton 1987, 37–42). However, the logic does provide a notation and formal semantics for the expression of beliefs.

3.2 The Definition of Presupposition

We now present a definition of presupposition that embodies the idea of attributing presuppositions to specific agents, and incorporates our view of the behavior of presuppositions under negation.

The presuppositions of an utterance depend not only on the sentence uttered, but also on the speaker, the listener, and the listener's beliefs, since only the listener's beliefs affect the cancellation of presuppositions for him. One sometimes wishes to speak of presuppositions when not all of this contextual information is known. In particular, it is desirable to be able to discuss presuppositions of a sentence independent of any context of utterance. In such cases, it is not possible to perform a consistency check to determine whether or not a candidate will actually turn out to be a presupposition; but one *can* say that if the necessary information were available and if the proposition were consistent with established information, then the proposition would be a presupposition. We will define **potential presupposition** to capture this notion of a candidate presupposition that may turn out to hold when the sentence is completely situated, and **actual presupposition** to denote a potential presupposition that does turn out to hold[4].

In the definitions below, S^+ is used to represent the affirmative form of sentence S, and S^- to represent the externally negated form of the sentence. We will use the term **state** to refer to a state of affairs, as represented by a belief structure.

Potential Presupposition

The definition of potential presupposition for when only the sentence is known is as follows:

DEFINITION **2:** Sentence S **potentially presupposes** proposition P iff for any speaker Sp, listener L, and state s,

- **(a)** The utterance of S^+ by Sp to L in state s would allow L to infer $B_{Sp}P$.
- **(b)** The utterance of S^- by Sp to L in state s would allow L to infer $B_{Sp}P$ unless L already believed $B_{Sp}\neg P$, *i.e.*, unless $s \models B_L B_{Sp}\neg P$.

Clause (a) says that if the affirmative form of the sentence were spoken, any listener could infer that the speaker believed P. Clause (b) says that even if the negative form of the sentence were spoken, any listener could still infer that the speaker believed P, unless the listener already believed otherwise. A definition with clause (a) alone would capture other pragmatic inferences as well as presupposition. Since clause (b) requires that the candidate exhibit the behavior under negation that is unique to presupposition, it excludes the others. See (Horton 1987, sec. 4.5) for examples.

Actual Presupposition

An actual presupposition of a sentence completely situated in context must be a potential presupposition of that sentence and consistent with the context.

DEFINITION **3:** The utterance of sentence S by speaker Sp in state s **actually presupposes** proposition $B_{Sp}P$ for listener L iff

- **(a)** P is a potential presupposition of S.
- **(b)** If $S = S^-$, $s \not\models B_L B_{Sp}\neg P$.

In keeping with our philosophy of treating presuppositions as beliefs, clause (b) checks whether the speaker believes the potential presupposition *according to the listener*. Since blocking can only occur in negative sentences,

[4] See section 4 for a comparison of our concepts of potential and actual presupposition with Gazdar's "pre-supposition" and "actual presupposition."

this check is only performed on negative sentences (see section 3.4 for a qualification).

Example

Consider the utterance of S = *I'm not glad that Chris is leaving* by Tom. Let P be *Chris is leaving*, and the state be s where $s \not\models B_{Diane}B_{Tom}P$, $s \not\models B_{Diane}B_{Tom}\neg P$, and $s \models B_{Cathie}B_{Tom}\neg P$. The sentence is already externally negated, so $S^- = S$, and S^+ = *It is not true that I'm not glad that Chris is leaving*, which is equivalent to *I'm glad that Chris is leaving.*

For any speaker Sp, listener L, and state s, the utterance of S^+ by Sp would allow L to conclude $B_{Sp}P$. We can confirm this by noting that the utterance of *I'm glad that Chris is leaving, but he isn't* would be infelicitous. In addition, the utterance of S^- by any speaker Sp would also allow any listener L to conclude $B_{Sp}P$, unless it were inconsistent with L's beliefs. Therefore, P is a potential presupposition of sentence S.

P may or may not be an actual presupposition of the utterance of S by Tom in this state, depending on who is the listener. Diane has no particular belief about whether or not Tom thinks Chris is leaving. In particular, $s \not\models B_{Diane}B_{Tom}\neg P$. Therefore, $B_{Tom}P$ is an actual presupposition to Diane of the utterance of sentence S by Tom, in this state. However, Cathie has the previous belief that Tom thinks Chris is not leaving, *i.e.*, $s \models B_{Cathie}B_{Tom}\neg P$. Therefore, $B_{Tom}P$ is not an actual presupposition to Cathie of the utterance of sentence S by Tom, in this state.

3.3 Applying the Definitions

Horton (1987, ch. 5) applies the definitions, in the manner shown above, to a representative set of simple sentences, and shows that the presuppositions of many sentences must be treated as beliefs. For example, sentence 8 does not potentially presuppose *Brian's leaving was bad*, as shown by the felicity of 9. However, under our assumption that all speakers are sincere, it does potentially presuppose B_{Percy}(*Brian's leaving was bad*).

(8) Percy criticized Brian for leaving.

(9) Percy criticized Brian for leaving, but there was nothing wrong with him leaving.

In the case of utterances, all presuppositions must be treated as the beliefs of the speaker, but many can be correctly expressed only if the beliefs of agents other than the speaker can also be mentioned. For example, consider the following utterance of 8:

(10) *Mavis:* Percy criticized Brian for leaving.
$\not\gg$Brian's leaving was bad.
$\not\gg B_{Mavis}$(*Brian's leaving was bad*)
$\gg B_{Mavis}B_{Percy}$(*Brian's leaving was bad*)

Because our approach models the beliefs of all agents, it is capable of correctly handling these cases.

For complex sentences, one can either again apply the definitions directly or attempt to find rules for determining the potential presuppositions of the sentence from those of its constituents. Horton (1987, chapter 6) examines this **projection problem** and shows that beliefs are again important. For example, when sentence 11 is embedded in the context of the verb *hopes*, another level of belief is necessary to express the potential presupposition correctly.

(11) Lofty is sorry that he upset Willie.
$\gg B_{Lofty}$(*Lofty upset Willie*).

(12) Ethel hopes Lofty is sorry that he upset Willie.
$\gg B_{Ethel}B_{Lofty}$(*Lofty upset Willie*).

The felicity of sentence 13 below shows that 12 does not simply carry the potential presupposition, B_{Lofty}(*Lofty upset Willie*), of its constituent 11.

(13) Ethel hopes Lofty is sorry that he upset Willie. She doesn't realize that Lofty doesn't even know he did.

Any account that does not treat presuppositions as beliefs cannot capture the presupposition in 12 and must incorrectly consider verbs of propositional attitude such as *hopes* (as well as verbs of saying) to block this projection. Even an account that treats presuppositions as beliefs, but considers only the beliefs of the speaker, cannot capture this presupposition.

The initial motivation for treating presuppositions as beliefs was to avoid two unrealistic assumptions. We have now seen that some cases of projection cannot be handled otherwise, and that many presuppositions do involve beliefs of agents other than just the speaker.

3.4 Defeat in Affirmative Sentences

The presuppositions of an affirmative sentence usually cannot be defeated without an infelicity. For example, *It's a good thing that Tom didn't fall* presupposes that Tom didn't fall. There is no context for this sentence in which the presupposition does not hold and hence no context in which it can be contradicted. However, there is a small class of affirmative sentences in which defeat is possible. For example, sentence 14 potentially presupposes 15 because of the definite reference *Barney's loud music.*

(14) If Fred's in his office, Barney's loud music will bother him.

(15) Barney is playing loud music.

However, in the context of 16, the presupposition does not hold.

(16) Barney plays loud music when Fred's in his office, just to bother him.

In this case, the contextual information combines with the *if*-clause of 14 to establish that the potential presupposition of the *then*-clause, 15, is merely a possibility, thereby blocking it as an actual presupposition of the sentence. We argue that a presupposition of an affirmative sentence can be defeated only in this manner, *i.e.*, only if it is established as hypothetical by a clause of the sentence in combination with contextual information. Horton (1987) enumerates these relatively infrequent cases.

Definitions 2 and 3, given above, correctly handle the cases in which attempted defeat of a presupposition arising from an affirmative sentence leads to an infelicity; however, they do not handle those cases where such defeat is possible. In this section we discuss two ways to do so. Both are compatible with our approach.

We define an **anti-condition** to be any background information that helps to establish as hypothetical, and therefore to defeat, a potential presupposition of an affirmative sentence. Clauses involving anti-conditions are added to the definitions as follows:

DEFINITION 4: Sentence S **potentially presupposes** proposition P with anti-condition Q iff for any speaker Sp, listener L, and state s,

(a) The utterance of S^+ by Sp to L in state s would allow L to infer $B_{Sp}P$ unless L already believed $B_{Sp}Q$, *i.e.*, unless $s \models B_L B_{Sp}Q$.

(b) The utterance of S^- by Sp to L in state s would allow L to infer $B_{Sp}P$ unless L already believed $B_{Sp}\neg P$ or $B_{Sp}Q$, *i.e.*, unless $s \models B_L B_{Sp}\neg P$ or $s \models B_L B_{Sp}Q$.

DEFINITION 5: The utterance of sentence S by speaker Sp in state s **actually presupposes** proposition $B_{Sp}P$ for listener L iff

(a) P is a potential presupposition of S, with anti-condition Q.

(b) If $S = S^-$, $s \not\models B_L B_{Sp}\neg P$.

(c) $s \not\models B_L B_{Sp}Q$.

For example, sentence 14 potentially presupposes 15 with 16 as an anti-condition. As long as the anti-condition is not believed, the presupposition is actual.

As mentioned above, defeat can only occur in a few types of positive sentence, so the anti-condition is usually nil; in such cases the simpler definitions, 2 and 3, suffice.

An alternative method of handling the phenomena regarding defeat in affirmative sentences is to treat affirmative and negative sentences uniformly, that is, to perform the consistency check on both types of sentence. This approach, adopted by Gazdar (1979a, 1979b), requires no special mechanism to account for felicitous defeat in affirmative sentences. To explain the infelicity that arises in *most* cases when defeat of a presupposition of an affirmative sentence is attempted, the help of entailments is enlisted. For example, Gazdar's theory says that *I didn't see Les Misérables* is a "pre-supposition"[5] of 18, but not an actual presupposition in the context of 17, because this would be inconsistent. So far no infelicity is detected.

(17) I saw Les Misérables.

(18) I'm sorry that I didn't see it.

However, *I didn't see Les Misérables* is also an entailment of 18 (because factive verbs entail their complements). This entailment introduces an inconsistency into the cumulative context and sentence 18 is therefore predicted to be infelicitous in the context of 17.

Unfortunately, Gazdar does not say exactly where such entailments occur. We argue that the entailments exist exactly where anti-conditions do not, and thus that the distinction between affirmative sentences that allow defeat and those that do not can be drawn either by anti-conditions or by the existence of entailments.

Casting the "uniform" approach in our terms, we get the following definitions:

DEFINITION 6: Sentence S **potentially presupposes** proposition P iff for any speaker Sp, listener L, and state s, the utterance of S by Sp to L in state s would allow L to infer $B_{Sp}P$ unless $s \models B_L B_{Sp}\neg P$.

DEFINITION 7: The utterance of sentence S by speaker Sp in state s **actually presupposes** proposition $B_{Sp}P$ for listener L iff

(a) P is a potential presupposition of S.

(b) $s \not\models B_L B_{Sp}\neg P$.

We are at present undecided as to which of these two methods to prefer. Both explain the phenomena. Treating affirmative and negative sentences uniformly leads to simpler definitions; in addition, the use of entailments to explain defeat phenomena in positive sentences is more general than relying on anti-conditions, which are specific to the type of sentence under question. However, this approach does not capture the intuition that defeat differs in negative and affirmative sentences. In addition, uniform definitions do not capture only presupposition, because they do not mention the unique behavior of presupposition under negation. In contrast, the earlier definitions 4 and 5 *can* distinguish presupposition from other kinds of implication.

It is important to note that the choice between these two methods is orthogonal to our goal of developing a model that treats presuppositions as beliefs.

4 Comparison with Gazdar's Approach

Gazdar's (1979a, 1979b) is perhaps the most influential theory of presupposition. It attempts to explain diverse phenomena regarding the behavior of presuppositions in context[6] with a single rule, based on consistency. Consistency is also central to our analysis. In addition, the structure of our account is similar to Gazdar's. In particular, both accounts first compute preliminary propositions — in our case potential presuppositions and in Gazdar's, "pre-suppositions" — and then perform a consistency-based context check to find the presuppositions of the sen-

[5] Gazdar's "pre-suppositions" correspond roughly to our potential presuppositions (see section 4). We will use quotation marks to distinguish his hyphenated term from the generic one.

[6] Gazdar refers to this as the projection problem. We use the term differently, as Levinson does, to mean the problem of finding the presuppositions of a complex sentence from the presuppositions of its constituents.

tence or utterance in context. Despite the structural similarities, there are important differences between the two approaches. We will now describe some of these.

First, for Gazdar a sentence may "pre-suppose" a proposition that it can never, on any occasion of use, presuppose. His "pre-suppositions" are simply convenient intermediate results. In our theory, on the contrary, to say that a sentence S potentially presupposes proposition P is to make a general statement about sentence S: it tends to imply P. Second, Gazdar computes his "pre-suppositions" using a set of unconnected and unmotivated rules, whereas our definition of potential presupposition lends coherence to the diverse class of potential presuppositions. The key difference between the present work and Gazdar's is that our emphasis is not on the behavior of presuppositions in context, but on the relevance of agents' beliefs to all aspects of presupposition. Gazdar does not address this issue.[7] We consider our integration of beliefs into an account of presupposition to be our main contribution.

5 Summary

We have found that agents' beliefs are relevant to an account of presupposition, and that it is necessary to consider *all* agents involved in discourse when deciding to whom belief in a presupposition should be attributed. We have described an account of presupposition that therefore makes beliefs central. This account includes a new definition of presupposition that captures it more precisely than earlier ones.

Treating presuppositions as beliefs — with full consideration given to *all* agents' beliefs — not only allows a more correct analysis by avoiding the Truth Assumption and the Shared Belief Assumption; it also makes it possible to account for presuppositional phenomena that could not be explained otherwise.

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[7] As mentioned above, Gazdar does treat all presuppositions as knowledge of the speaker; however, he does not consider the knowledge or beliefs of other agents, or examine the relevance of beliefs or knowledge to a theory of presupposition.

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