Solving Some Persistent Presupposition Problems

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Abstract

/Soames 1979/ provides some counterexamples to the theory of natural language presuppositions that is presented in /Gazdar 1979/. /Soames 1982/ provides a theory which explains these counterexamples. /Mercer 1987/ rejects the solution found in /Soames 1982/ by reappraising these insightful counterexamples. By reappraising these insightful counterexamples, the inferential theory for natural language presuppositions described in /Mercer 1987, 1988/ gives a simple and straightforward explanation for the presuppositional nature of these sentences.

1 Introduction

/Soames 1979/ provides some intriguing counterexamples to the method for deriving natural language presuppositions presented in /Gazdar 1979/. A proposed modification to Gazdar's method (/Landman 1981/) which attempts to solve the problem exhibited by these countereamples by introducing extra clausal implicatures has been effectively argued against in /Soames 1982/.

Motivated by the lack of explanation for these reasonably simple counterexamples, /Soames 1982/ constructs a mechanism that derives presuppositions that is a superset of the approaches suggested by /Gazdar 1979/ and /Karttunen and Peters 1979/. /Mercer 1987/ contains methodological and empirical arguments against Soames' approach to the derivation of natural language presuppositions.

This paper presents a reappraisal of some of the insightful counterexamples to Gazdar's method given in /Soames 1982/. Given an appropriate representation of the sentences in question, the default logic approach to natural language presuppositions described in /Mercer 1987, 1988/ gives a simple and straightforward explanation for the presuppositional nature of these sentences.

2 General Background

There has been a long history of attempts to define methods that would produce the presuppositions of a sentence. The default logic approach that is highlighted here follows the general framework set out in /Gazdar 1979/. One feature of this framework is that the speaker's interpretation is governed by Grice's Principle of Cooperative Conversation. Assuming these general guidelines allows a competence model of the hearer's interpretation to generate the appropriate presuppositions of sentences with the forms 'a or b' and 'if a then b'. Details of this process is given later.

2.1 Linguistic Presuppositions

Being implied by a natural language sentence and the natural (or preferred) interpretation of its simple negation is the primary quality that qualifies an inference as a presupposition. This evaluation

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1. The method is based on inferring in a logical system, although the logic is not a classical one.

2. The method uses semantic representations of the natural language sentence. In the case of "if a then b" the semantic representation that is used directly is a derived representation (a → b can be derived from a > b, where > is Stalnaker's connective for "if . . . then").

3. All presuppositional environments that generate presuppositions must be within the scope of a negation either in the representation of the sentence or some logical form derived from this representation.

How the method interacts with sentential adverbs is the main theme of this paper. The definition of presupposition and the working of the inference procedure in /Mercer 1987, 1988/ solves the scopmg problems caused by the interaction of negation and other environments. In the discussion of sentential adverbs it will be shown that the normal sentence-seope for negation is circunwented in certain circumstances. This circumvention of the normal rule explains the presuppositional behaviour of the sentential adverb environment.

2.3.1 Logical Representation of Presuppositions Using Default Rules

A normal default rule is a rule of inference denoted

\[
\alpha(x) : \beta(x) \quad \frac{\beta(x)}{\gamma(x)}
\]

where \( \alpha(x) \) and \( \beta(x) \) are all first order formulae whose free variables are among those of \( x = x_1, \ldots, x_n \). Intuitively, a default rule can be interpreted as: For all individuals \( x_1, \ldots, x_n \), if the prerequisite \( \alpha(x) \) is believed\(^1\) and if \( \beta(x) \) is consistent with what is believed, then the consequent \( \gamma(x) \) may be conjectured. A normal default theory is a set of first order formulae together with a set of normal defaults. A fixed point of a normal default theory is the deductive closure of the set comprised of the first order formulae and some maximal set of consequents that are consistent with the fixed point. The CONSEQUENCES\((D)\) is the set of all consequents of the default rules in the default theory.

For the purposes of this paper, I shall change slightly the interpretation of the default rule to mean: if the speaker says '\( \alpha(x) \)' and \( \beta(x) \) is consistent with the hearer's knowledge base, \( KB_H \), then the hearer can conjecture \( \gamma(x) \). It is not absolutely clear what the verb 'saa' means or should be represented. For the purposes of this paper I only require those notions first presented in /Grice 1975/ under the title Principle of Cooperative Conversation and formalized in /Gazdar 1978/.

The default logic approach the clausal implicatures are used to control the division of the original theory into its first order cases.

Because default logic proof theory does not display any analogue to the law of the excluded middle (the antecedents of the default rules must be provable and there is no equivalent to the deduction theorem) and because presuppositions do arise from the clauses of complex sentences, some form of analysis by cases is required. Since a statement is provable in a case analysis only if it is provable in all cases, the choice of cases is critical. As in the case of a first order theory, too few cases would allow inappropriate statements to be proved. In addition because of the non-monotonic nature of default logic, having too many cases could prevent appropriate statements being proved.

In general the choice of cases must reflect two principles. Since the case analysis is a proof theoretic analogue of the model theoretic law of the excluded middle, each case must completely determine the truth values of each of the disjuncts found in the statement to which case analysis is being applied. Also, since the case analysis is justified solely on linguistic grounds (see /Mercer 1987/ for further discussion), the cases must reflect this linguistic situation. To justify a case, the possibility of the statement that distinguishes the case must be provable from the original default theory. Since none of the modal statements take part in the proofs, they are left out of the cases. An example should clarify these ideas.

Example

Suppose the sentence 'A or B' is uttered. The default theory representing this utterance would be

\[
T = \{K(A \lor B), P_A, P_B, \neg P_A, \neg P_B, P_A \Rightarrow P_B, P_B \Rightarrow P_A, \alpha_1, \ldots, \alpha_n, \beta_1, \ldots, \beta_m\}
\]
where \( \alpha_1, \ldots, \alpha_n \) represent the appropriate first order statements and \( \delta_1, \ldots, \delta_k \) represent the appropriate default rules. Since \( A \land \neg B \land \neg A \land B \) completely determine (that is, determine the truth values of both) \( A \) and \( B \), and since the statements \( P_\alpha(A \land \neg B) \) and \( P_\beta(\neg A \land B) \) can be derived, \( A \land \neg B \land \neg A \land B \) distinguish the two cases. Note that although \( P_\alpha(A \land \neg B) \) and \( P_\beta(\neg A \land B) \) are all derivable, none of \( A \land \neg B \), \( \neg A \land B \) are candidates for distinguishing a case because, individually, none of them completely determine the truth values of both \( A \) and \( B \).

Hence the two cases of the original theory, \( T \), are

\[
T_{\text{Case1}} = \{A \land B, \alpha_1, \ldots, \alpha_n, \delta_1, \ldots, \delta_k\}
\]

\[
T_{\text{Case2}} = \{\neg A \land B, \alpha_1, \ldots, \alpha_n, \delta_1, \ldots, \delta_k\}
\]

The simple negated sentence, an example of which is presented in section 2.3.1, is just a special instance of the case analysis procedure. In the simple negated sentence, \( \neg X \) (which is represented as \( K_S(\neg X) \)), the possibility of the only case (distinguished by \( \neg X \)) can be proved using the utterance and the theorem \( K_S(\neg X) \equiv P_S(\neg X) \).

### 2.3.3 A Proof-Theoretic Definition of Presuppositions

**Definition 1** A sentence \( \alpha \) is a presupposition of an utterance \( u \), represented by the default theories \( \Delta_{\text{con}} \cup \ldots \cup \Delta_{\text{com}} \), if and only if \( \Delta_{\text{con}} \cup \ldots \cup \Delta_{\text{com}} \models \alpha \) for all \( i \) and \( \alpha \in \text{Th} \left( \text{CONSEQUENTS} \left( D_i \right) \right) \), but \( \Delta_{\text{con}} \cup \ldots \cup \Delta_{\text{com}} \not\models \alpha \).

This definition can be loosely paraphrased as: if \( \alpha \) is in the logical closure of the default consequents and is provable from the utterance, and all proofs require the invocation of a default rule and in the case of multiple extension default theories, \( \alpha \) is in all extensions, then \( \alpha \) is a presupposition of the utterance.

### 2.4 Important Differences

The previous approaches which have been mentioned above rely on two ideas. Firstly, presuppositions are generated from positive and negative presuppositional environments, if these environments occur in the surface sentence. Secondly, a number of different methods, collectively called projection methods, are used to screen out those potential presuppositions which are not to be projected. A brief description of Soames' method is given in section 4.1.

The default logic theory described in detail in /Mercer 1987, 1988/ approaches the problem of presupposition-generation from the level of logical representation. Presuppositions are generated from the logical representation if negated presuppositional environments occur in the logical representation of the natural language sentence or some logical form which can be derived from this representation. Many of the results that the modified projection methods achieve are just proof theoretic results in the default logic approach to natural language presuppositions. In addition, once the logical representation of sentential adverbs is presented, it will be shown that the solution to the problem of presuppositions derived from sentential adverbs is again obtained in the default logic approach without any modifications.

### 3 Sentential Adverbs

The two sentential adverbs that will be presented are those found in the examples given in /Soames 1982/: 'too' and 'again'. Because one of the defining properties of a presuppositional environment is indicating positive to the negation test\(^1\), I will first look at each when there is a negation present. The interesting property displayed by sentential adverbs is that in addition to any interaction between negation and the underlying form, there is also an interaction between negation and the adverb. This interaction can be captured in two different logical representations.

The sentential adverbs have the added complication that they can take any part of the sentence as their focus of the adverb. The focus of the adverb will be capitalized. Although the verb of the sentence can be focussed, a presentation of this particular focus would require an event-based representation. I do not discuss this focus in the following. However, it, too, would behave analogously.

#### 3.1 Too

The representations of 'kick too' are shown in (3) and (4). These two representations convey the different focus of the adverb, 'too', the subject and the object of 'kick', respectively. I will be only interested in the representation which focuses on the subject, that is (3). The explanation for presuppositions that arise from the adverb focusing on the object is similar to the discussion presented below.

(3) \( \forall x \forall y. \text{KICK-SUBJ}-\text{TOO}(x, y) \equiv \text{KICK}(x, y) \land \exists z. \text{KICK}(z, y) \land y \neq x \)

(4) \( \forall x \forall y. \text{KICK-OBJ}-\text{TOO}(x, y) \equiv \text{KICK}(x, y) \land \exists z. \text{KICK}(x, z) \land y \neq z \)

Sentential adverbs have a most peculiar attribute when they interact with natural language negation. The adverb can be either inside or outside the scope of the negation. Sentences (5) and (6) point out the two possible interpretations in the case of 'too'. One particularly interesting phenomenon is that all of the possible scopes of the negation and the adverb may not occur in surface form. For instance, (6) would normally be uttered as 'BILL didn't kick the ball, either.' I will use the incorrect surface form in the examples, however. The italicized portions of the sentences indicate the portion which is in the scope of 'too'. (5) is to be interpreted as: Although someone else kicked the ball, Bill didn't. (6) is to be interpreted as: Both Bill and someone else did not kick the ball.

(5) BILL didn't kick the ball, too.

(6) BILL didn't kick the ball, too.

The representations for the unnegated 'BILL kicked the ball, too.' and the sentences (5) and (6) are shown in (7)-(9), respectively. As proposed in /Kempson 1975f/, /Wilson 1975f/, and implemented in /Mercer 1987/, the representation of the simple negation of the sentence 'BILL kicked the ball, too.' is just the wide-scope negation as shown in (8). I have shown the right-hand side equivalents of the appropriate representations so that I can contrast the two different negations.

(7) \( \text{KICK}(\text{Bill}, \text{ball}) \land \exists x. \text{KICK}(x, \text{ball}) \land x \neq \text{Bill} \)

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\(^1\)For purposes of this definition, the only defaults in each \( \Delta_{\text{con}} \) are the presupposition generating defaults. In reality the default theory would contain many other kinds of defaults. The definition would have to be changed so that the proof of \( \alpha \), requires the invocation of a presupposition generating default, and that \( \alpha \in \text{Th} \left( \text{CONSEQUENTS} \left( D_i \right) \right) \), where \( D \) is the set of presupposition generating defaults.

\(^2\)All of the examples presented in this paper deal with default theories having single extensions. In those theories which have multiple extensions, some way of stating that a presupposition is in all extensions is required. Since extensions of normal default theories are orthogonal, if \( \Delta_n \) has multiple extensions then there exists a sentence \( \beta \) such that \( \Delta_n \vdash \beta \) and \( \Delta_n \not\vdash \neg \beta \). I will call this situation being split along the \( \alpha \)-dimension. If the extensions do not split along the \( \alpha \)-dimension then either \( \alpha \) is in all extensions or \( \alpha \) is in no extension. So if \( \Delta_n \vdash \beta \) \( \alpha \) (which means that at least one extension contains \( \alpha \)) and \( \Delta_n \not\vdash \neg \alpha \) (which means that no extension contains \( \neg \alpha \), which means that the extensions do not split on the \( \alpha \)-dimension) then \( \alpha \) is in all extensions.
What is important for the presuppositional analysis is that only (8) can be a candidate for the negation test. One of the prerequisites of this test is that the supposed presuppositional environment is within the scope of the logical negation in the logical representation of the sentence. The logical representation of (9) does not meet this requirement.

3.2 Again

The situation for the sentential adverb, 'again', is somewhat similar to that described above for 'too'. The adverb can be inside or outside the scope of the negation. Accordingly, the adverb found in (10) and (11) are the presuppositional and non-presuppositional environments with respect to the positive sentence 'Fred called again'.
4.2 A Default Logic Approach

The default rule schemata which capture the presuppositional inferences for the adverbs, 'too' and 'again', are (21) and (22), respectively. In the case of 'kick too' and 'call again' the appropriate instances of these schemata are shown in (23) and (24), respectively.

(21) \( \neg \phi(x, y) \land \exists z \phi(x, y) \land x \neq z \land 3x \phi(x, y) \land x \neq z \)
(22) \( \neg \phi(x, y, t) \land \exists ! \phi(x, y, t') \land t < t' \land 3 ! \phi(x, y, t') \land t' < t \)
(23) \( \neg \text{KICK-SUBJ-TOO}(x, y) \land 3z \text{KICK}(x, y) \land x \neq z \)
(24) \( \neg \text{CALL-SUBJ-AGAIN}(x, y, t) \land 3! \text{CALL}(x, y, t') \land t' < t \)

Given simple statements such as those in (25) and (26) the preferred interpretations can be derived from the representation of the sentence and the appropriate default rules. I have shown the representation for (25) in (27). The preferred interpretation of (25) is shown in (28). Similar representations can be derived for the preferred interpretation of (26).

(25) Bill didn't kick the ball, too. (In the sense of (5).)
(26) Fred didn't call again. (In the sense of (10).)
(27) \( \neg \text{KICK}(\text{Bill, ball}) \lor \forall z, \neg \text{KICK}(z, \text{ball}) \lor \text{Bill} = z \)
(28) \( \neg \text{KICK}(\text{Bill, ball}) \land 3z, \text{KICK}(z, \text{ball}) \land \text{Bill} \neq z \)

Each of the sentences (16)-(20) requires a case analysis. The representation of 'if a then b' is not equivalent to \( a \lor b \). However \( a \lor b \) can be derived from standard representations for 'if a then b' such as Stalnaker's conditional logic representation, a \( b \) (/Stalnaker 1968/). The theory presented in /Mercer 1987, 1988/ defines presuppositions as inferences derivable from a theory which includes the representation of the sentence. Therefore the logical form \( a \lor b \) will be available to the deductive machinery. For any sentence of the form 'if a then b', the \( KB \cup \{ KS_a \} \) will be

\( \{ KS_a(b \lor \text{,'appropriate default rules'} \} \)

and since \( KS_a(a \lor b) \) is derivable from \( KS_a(b \lor a) \) and since \( KS_a(a \lor b) \) is equivalent to \( KS_a(a \lor b) \) the two cases determined by the algorithm given in section 2.3.2 are

\( \{ a \lor b, \text{,’appropriate default rules'} \} \) and
\( \{ a \lor b, \text{,’appropriate default rules'} \} \)

The complexity arises in the case of sentential adverbs being in either the antecedent or consequent clause of the 'if a then b' sentences under investigation because the negation which appears in one of the cases can be done in two possible ways when a sentential adverb is contained in the clause being negated. If the negation of the consequent clause does not put the sentential adverb in the scope of the negation, the default rule which generates the presupposition cannot be used. The case \( \neg a \land \neg b \) does not infer the presupposition. Consequently, the case analysis cannot generate the presupposition as an inference from the sentence.

How is the method of negation justified? Two assumptions must be made. Firstly, the antecedent of an 'if a then b' sentence is logically prior to the consequent. This logical asymmetry can be derived from Stalnaker's analysis, or the cause and effect relationship that is conveyed by this sentence schema. Secondly, /Stalnaker 1973/ gives an argument that 'if a then b' sentences are to be interpreted in a manner that is similar to conjunctive sentences. Stalnaker's view of conjunctions is that the second sentence is affected by the presence of the first sentence. I will loosely interpret this to include the way the sentence is represented. Therefore if there is a sentential adverb in the second conjunct, it should interact with any negations in such a way as to have the same interpretation as in the first clause. For example, (29) should have the representation given in (30).

(29) JOHN didn't kick the ball and BILL didn't kick the ball, too.
(30) \( \neg \text{KICK}(\text{John, ball}) \land \neg \text{KICK}(\text{Bill, ball}) \land \exists z, \neg \text{KICK}(z, \text{ball}) \land \text{Bill} \neq z \)

However, in (31) since the first clause does not contain any negation that would affect the interpretation of the negation in the second clause, the negation in the second clause would follow the standard clause-scoping negation rule. The representation for (31) is given in (32). This representation together with the appropriate default rule then produces the presupposition 'Somebody (≠ Bill) did not kick the ball.'

(31) Today is not Sunday and BILL didn't kick the ball, too.
(32) \( \neg \text{Today is Sunday} \land \neg \text{KICK}(\text{Bill, ball}) \land \exists z, \text{KICK}(z, \text{ball}) \land \text{Bill} \neq z \)

For any sentence of the form 'if a then b', the two cases determined by the algorithm given in section 2.3.2 are \( a \land b \) and \( \neg a \land \neg b \). The representations for the second case for each of the sentences (16), (18), (19), and (20) are given in (33)-(36), respectively. The negation in (33) is within the scope of the adverb because the adverb occurs in the consequent and because the antecedent is logically (and conversationally) prior to the consequent. Therefore the scoping is dictated by that in the antecedent clause. Similar analyses can be given for (34) and (36). In (34) the adverb occurs in the consequent, hence the scoping is dictated by the logically prior antecedent. In (36) the adverb is in the antecedent, but because the consequent is conversationally prior to the antecedent, it dictates the scoping of the negation in the antecedent. In all of those cases the scope of the negation prevents the use of the presuppositional default rules to derive the presupposition that would be derived from the clause if it appeared in isolation. Only in (35) does the logically and conversationally prior antecedent contain the adverb. The scope of the negation is therefore determined by the normal scoping rule, hence the scope of the negation is the whole clause placing the adverb inside the scope of the negation, and giving the appropriate presupposition.

(33) \( \neg \text{KICK}(\text{John, ball}) \land \neg \text{KICK}(\text{Bill, ball}) \land \exists z, \neg \text{KICK}(z, \text{ball}) \land \text{Bill} \neq z \)
(34) \( \neg \text{KICK}(\text{John, ball}) \land \neg \text{KICK}(\text{Bill, ball}) \land \exists z, \text{KICK}(z, \text{ball}) \land \text{Bill} \neq z \)
(35) \( \neg \text{KICK}(\text{John, ball}) \land \exists z, \text{KICK}(z, \text{ball}) \land \text{Bill} \neq z \land \neg \text{KICK}(\text{Bill, ball}) \)
(36) \( \neg \text{KICK}(\text{John, ball}) \land \exists z, \neg \text{KICK}(z, \text{ball}) \land \text{Bill} \neq z \land \neg \text{KICK}(\text{Bill, ball}) \)

5 Conclusions

/Soames 1979/ provides some counterexamples to the method to derive natural language presuppositions that is presented in /Gazdar 1979/. To circumvent this problem, /Landman 1981/ introduces extra clausal implicatures into the method proposed in /Gazdar 1979/. This proposal has been effectively argued against in /Soames 1982/.

/Soames 1982/ has enlarged the set of counterexamples found in /Soames 1979/. Motivated by the lack of explanation for these reasonably simple examples, he constructs a new approach which is a superset of the methods proposed by /Gazdar 1979/ and /Karttunen and Peters 1979/. This roccoco approach to natural language presuppositions has been argued against on methodological and empirical lines in /Mercer 1987/.

By reappraising the insightful counterexamples to Gazdar's theory given in /Soames 1982/, it is noticed that the semantic representation of 'if a then b' sentences that contain a sentential adverb in either the
antecedent or consequent clause plays an important role in determining the presuppositions of the sentence. The inferential theory for natural language presuppositions described in Mercer 1987, 1988 gives a simple and straightforward explanation for the presuppositional nature of these sentences.

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