

PRESUPPOSITION JUSTIFICATION BY ABDUCTION AND QUANTIFIED PRESUPPOSITIONS*

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Abstract

The presuppositions originating from triggering expressions embedded under quantifiers have been crucial test cases both for projection theories of presupposition and for discourse representation theory and dynamic semantics theories. In this paper some of these data are reviewed. The examples are sometimes considered within context, and projection data are discussed. The conclusion about the data differs from previous assessments in the literature. A simple generalization is argued for which lends support to the satisfaction theory of presuppositions and does not directly involve a notion of sentence or discourse topic.

Although the generalization supports the satisfaction theory, its formal realization demands additional theoretical flexibility. In the theoretical part, a formal tool offering this additional flexibility is presented: presupposition justification based on abduction within discourse representation theory. This formalism is applied to some central data. For each example, the justification problems and their possible solutions are computed and discussed briefly.

1 Introduction

A quantified presupposition is, for the purposes of this paper, a presuppositional inference with a quantificational logical form which is not an elementary presupposition of the sentence.

For instance, one may ascribe the quantified presuppositional inference *Every participant had a handout* to the sentence

- (1) Every participant turned the page of his handout.

although the expression triggering the presupposition (*his handout*) is not inherently quantificational.

The projection theory for presuppositions of Karttunen (1973) generates, for each sentence, a number of presuppositions which are a proper subset of the generated presuppositions, i.e. the presuppositions which are triggered by a presupposing expression in the sentence. The theory does not account for presuppositions which have a different form than those which are triggered by an expression in the sentence¹. Thus it can therefore not account for quantified presuppositions.

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¹A crisp summary of Karttunen's theory can be found in Beaver (1997).

While universal presuppositions for examples like 1 are generally acknowledged, the situation for examples with other quantificational forces is more difficult. The first attempt at clarifying the situation by systematically applying projection tests has been made by Beaver (1994). In that article, Beaver systematically applies the projection tests to cases which are candidates for triggering quantified presuppositions because they contain a presupposition trigger in the scope of a quantifier at some level of embedding. He concludes that universally quantified presuppositions are quite limited in their distribution. This position will be discussed below in section 2. A closer scrutiny of the data seems to support the conclusion that quantified presuppositions are available for almost all the construction types under discussion, and that cases in which they are not perceived can be explained by plausibility considerations.

If universally quantified presuppositions are indeed as generally available as suggested by the empirical discussion below, the question arises how they should be derived systematically from the logical forms of the sentences which induce them. This question is tackled in the second part of the paper (section 3).

2 Observations on quantified presuppositions

In this section, I will argue for the availability of quantified presuppositions as presuppositional inferences in syntactic configurations of the form QNP VP^{pre}, where QNP is a quantified noun phrase, and VP^{pre} is a verb phrase triggering a presupposition. I will first consider the simple case of unembedded constructions, and then consider presupposition projection in more complex environments.

This will involve a comparison with Beaver's arguments *against* quantified presuppositions using projection tests. But first I will introduce the notion of presuppositional inference and some notation which will be used in the data discussion.

2.1 Presuppositional inferences

Judgments about the presuppositions of sentences are sometimes subtle. This can render the construction of a set of hard facts about a given presuppositional phenomenon difficult. In some theories, there is an additional difficulty. The theoretical framework of the projection theories of presupposition (Karttunen 1973) implicitly contains the assumption that there is, for each sentence, a unique presupposition. However, there are examples for which several different presuppositional conclusions can be drawn. Consider the following sentence:

- (2) If the logistics manager advises a company in Italy next week, the company's turnover will increase.

The presupposition of the noun phrase *the company* can either be linked to a company already under discussion (presumably the company employing the logistics manager), or it can be resolved with respect to the company introduced in the antecedent of the conditional.

In such cases, the context is needed to clarify the intended interpretation. If the speaker has expressed him/herself carefully, the context will indeed select just one presuppositional interpretation.

In order to avoid terminological problems, I will therefore speak of *a* presuppositional inference of a sentence, rather than of *the* presupposition. Judgments about presuppositional inferences will be written as follows:

- (3) $\frac{\text{The king of Burundi is bald.}}{\Rightarrow_{pre} \text{There is a king of Burundi}}$

This form can be read as

From an assertion of *The king of Burundi is bald* one can draw the presuppositional inference that *There is a king of Burundi*

2.2 The basic cases

In the simplest configuration, a presupposition trigger occurs in the scope of a quantifier which is the main operator of the example sentence. For universal quantifiers, a universal presuppositional inference is readily available in many cases.

- (4) $\frac{\text{Every mountaineer knows his equipment well.}}{\Rightarrow_{pre} \text{Every mountaineer has some equipment.}}$

Presupposition triggers in the scope of an indefinite description are well-known since Karttunen and Peters (1979). The following example with a possessive description is due to Heim (1983).

- (5) A fat man is pushing his bicycle.

Another important case is constituted by examples with the negative quantifier *no*. Lerner and Zimmermann (1983) discuss the following example with *no* and an aspectual presupposition trigger.

- (6) No woman stops crying.

They judge that it presupposes *A woman has cried*, under the condition that there is any woman at all. This is also consonant with an analysis based on universal presuppositions and the assumption that the domain of the universal quantification may not be empty.

Universal presuppositions of such sentences sometimes need to be relativized to the context. The following example has two interpretations which differ in how the word *bestselling* is read.

- (7) No publisher discontinues his bestselling book series.

Either *bestselling* refers to a book series which is a bestseller when compared to other books on the market, or it picks out the book series of the respective publisher which sells best. In the former case, it is more plausible to assume a contextually relativized interpretation. Not every publisher can be assumed to have a bestselling book series running, so the interpreter will assume that the quantification ranges over publishers which are so successful. In the latter case, an unrelativized universal presupposition is much more plausible².

From the following example, a universal presupposition can be inferred. It is plausible to assume that the speaker believes that every publisher has a favourite book series. The presupposition need not be contextually relativized.

²There may be publishers who have no book series at all, but rather exclusively publish individual books without organizing them in a series. If this is taken into account, the second interpretation also will have to be relativized.

- (8) No publisher discontinues his favourite book series.

But of course it can. The speaker might presuppose that of the publishers of a certain area or segment of the book market, everyone has a favourite book series.

2.3 Projection experiments

Of the environments suitable to test presupposition projection, I will first consider the antecedent of a conditional sentence³.

We have seen above that the presuppositional inference corresponding to the universally quantified presupposition is particularly hard to get in the case of indefinite subject noun phrases. It would be natural to expect this as well for embedded occurrences of this configuration. If any change in predictions would be expected, it would be that the stronger quantified presupposition is still harder to get. However, it seems that the embedding in the conditional antecedent even *facilitates* the interpretation with a quantified presupposition for the sentence as a whole:

- (9) $\frac{\text{If a fat man is pushing his bicycle, then he should find another way to lose weight.}}{\Rightarrow_{pre} \text{Every fat man has a bicycle.}}$

Maybe the facilitation of this reading is due to the possibility to interpret the conditional sentence as not being about any fat man in particular – in this case we would deal with a one-case conditional, according to a terminology used by Kadmon (1987), but rather as an instance of universal case-quantification⁴.

The next example has universal quantificational force. The universal presuppositional inference is readily available. A relativization to the context set consisting of the members of the expedition mentioned in the consequent is very plausible, although a stronger interpretation (the speaker presupposes that mountaineers in general know their equipment well, perhaps because he would not be prepared to call anyone a mountaineer who does not know his equipment) is available as well.

- (10) $\frac{\text{If every mountaineer knows his equipment well, then the expedition will return safely.}}{\Rightarrow_{pre} \text{Every mountaineer (out of a certain set) knows his equipment well.}}$

Similar observations hold for embeddings of the other two quantificational forces we have considered in the protasis environment:

- (11) $\frac{\text{If every mountaineer knows his equipment well, then the expedition will return safely.}}{\Rightarrow_{pre} \text{Every mountaineer (out of a certain set) knows his equipment well.}}$

For reasons of space, I would just like to state without further discussion that the universal presuppositional inference is also available for the following examples (a downward entailing quantifier variant of the previous examples, an embedding into a question, an embedding into an imperative, and an embedding under a possibility operator)⁵.

³In the following discussion, I will refer to the clause in which the relevant presupposition trigger occurs as the *triggering clause*. For instance, the triggering clause in example 9 is example 5.

⁴The one-case reading is possible for this conditional sentence, for instance in a context like *What do you mean? A fat man is pushing his bicycle?* I think that even then the universal presupposition is available.

⁵In the case of the downward entailing determiner *few* the example had to be modified to maintain plausibility of the sentence as a whole:

- (12) a. If few mountaineers know their equipment well, then the expedition will get into trouble.
- b. Is a fat man pushing his bicycle ?
- c. Make a fat man push his bicycle !
- d. It is possible that a fat man is pushing his bicycle.
- e. Did no mountaineer bring his GPS ?
- f. In which expedition did no mountaineer use his GPS ?
- g. Few participants of the expedition used their GPSs.
- h. Most participants of the expedition used their GPSs.

2.4 Weak restrictors

In all examples discussed so far, it was plausible to assume a universally quantified presupposition restricted by the same information as the restriction of the original quantified proposition. There are cases, however, in which a presuppositional inference with a different restrictor is more salient, as in 13.

- (13) Every reference book written by a syntactician has a cubistic painting on its front page.

A natural presuppositional inference that can be drawn from this sentence is

- (14) Every reference book has a front page.

or

- (15) Every book has a front page.

But the following is not readily available:

- (16) Every reference book written by a syntactician has a front page.

Those readers who object that these presuppositional inferences are not interesting because they are part of general background knowledge anyway may replace *book* by some other expression, like *squib*, which leaves it open whether the printed matter is bound or not, and hence also whether there is a front page. Or they may try to put themselves into the situation of a student of English who by chance happens to know the meaning of all the words occurring in the sentence except the word *book*.

2.5 Summary of the data discussion

The main result of the data discussion is recorded in the following empirical generalization.

Generalization 1 (Presuppositions in nuclear scopes of quantified structures)

Presuppositions triggered in the nuclear of a quantified sentence of the form

$$Q C_1, C_2^P$$

where Q ranges over indefinites and other quantifiers may give rise to the universal presuppositional inference

$$\text{Every } C_1' P$$

where C_1' is entailed by C_1 (typically it is one of the conjuncts of C_1).

□

The second interpretation observed for examples with indefinite subject noun phrases is the topic of the following generalization.

Generalization 2 (Local accommodation interpretations)

A sentence of the form

$$\text{Indef } C_1, C_2^P$$

where *Indef* is an indefinite determiner such as *a(n)* or *some* and P is a presupposition triggered by the “scope” C_2 of the indefinite can be interpreted as

$$\text{Indef } C_1 \text{ that } P C_2$$

□

In the following part of the paper, a formal analysis which explains these empirical generalizations is put forward.

3 Analysis using abductive inference

3.1 Presupposition as abduction

The treatment of presupposition as abduction within discourse representation theory will be sketched briefly in this section, and the aspects relevant for the treatment of quantified presupposition and for the example analyses of section 3.2 below will be emphasized. Krause (2001) is a more extensive presentation.

The theory of presupposition justification as abduction (shortly PA) takes over from the satisfaction theory of presuppositions [Heim (1983), Karttunen (1974), Stalnaker (1973)] the important role of local contexts: presupposition triggers must be defined in the local context in which they occur. From the anaphoric binding theory of van der Sandt (1992) and Geurts (1999) it takes over the emphasis on accommodation. Abductive presuppositional inference is a logical reconstruction of the notion of presupposition justification introduced in Kamp and Roßdeutscher (1994).

Utterance interpretation in PA is conceived of as the reconstruction of the context on which the speaker’s utterance was based. The interpreter of a sentence assumes that the context to be

reconstructed is such that the presuppositions of the sentence are all satisfied in their local contexts. This assumption must be explained by making suitable assumptions about the speaker's context (and about the intended local context's which play a role in the logical form of the sentence). If the interpreter already has made assumptions about the context of the speaker (or if interpretation is relativized to an assumed common ground), this boils down to abductive inference with the previous assumptions as the theory and appropriateness of the presupposition trigger in its local context as explanandum.

Formally, the theory consists of (i) a syntax-semantics interface which produces a (unique⁶) presuppositional logical form, (ii) a recursive function computing a system of abduction problems given the context and the presuppositional logical form; and (iii) a definition of solution for a system of justification problems. The presuppositional aspect of the syntax-semantics interface is also called presupposition computation in Kamp (2001). Presuppositions are introduced by lexical items as discourse representation structures under the scope of a presupposition operator α and as context-dependent restricted terms for singular terms such as definite descriptions. The semantic composition is performed as usual in the λ -calculus. The second component, the computation of abduction problems, essentially forms pairs of local contexts and formulas expressing the definedness of presupposition triggers, which can be interpreted as abduction problems. The local contexts are represented in a structured way in order to differentiate the different accommodation possibilities. The third component, the solution definition, encodes mainly general constraints on reasonable solutions to abductive inference problems, together with some specific linguistic constraints on presupposition accommodation. It is supported by a module computing abducible formulas on the basis of the presupposition trigger and the context in which it occurs.

3.2 Application to the examples

It is now high time to consider in detail how quantified presuppositions are derived for some examples. I will always display the initial logical form, the justification system that can be computed on the basis of the initial logical form and the context, and the solution(s). For the initial and final logical forms, I will often use two-dimensional box notation, while intermediate results such as representations occurring in justification systems are typically represented in linear notation. The third component of justification systems in the full formal system, the set of identifiability presumptions needed to account for the uniqueness properties of definite noun phrases, has been left out to simplify the exposition. Justification systems thus just consist of sets of justification problems and a schematic result DRS.

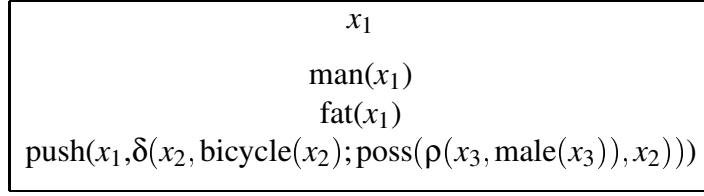
Let us first consider example 5, repeated here:

(17) A fat man was pushing his bicycle.

The following discourse representation structure is the initial formalization of the sentence⁷:

⁶For the purposes of this paper, I abstract away from additional sources of complexity such as scope ambiguity and lexical ambiguity. Presupposition justification with respect to scopally ambiguous contexts is probably best treated using a consequence relation for an underspecified representation language (Reyle 1993).

⁷abstracting away from tense and the representation of eventualities

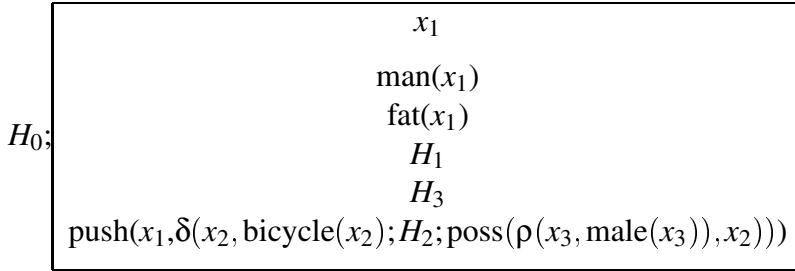


The justification system \mathcal{S} associated with the sentence is given by its three components, $\pi_1(\mathcal{S})$ (the set of justification problems), $\pi_2(\mathcal{S})$ (the schematic result DRS), and $\pi_3(\mathcal{S})$ (the set of identifiability presumptions, which has been omitted because it is not relevant for the following discussion).

$\pi_1(\mathcal{S})$:

$$\{ \langle \langle H_0; x_1; \text{man}(x_1); \text{fat}(x_1); H_1, \epsilon, H_2 \rangle, \text{defined}(\rho(x_3, \text{male}(x_3))) \rangle \rangle, \langle \langle H_0; x_1; \text{man}(x_1); \text{fat}(x_1); H_1, \epsilon, H_3 \rangle, \text{defined}(\delta(x_2, \text{bicycle}(x_2)); \text{poss}(\rho(x_3, \text{male}(x_3)), x_2))) \rangle \rangle \}$$

$\pi_2(\mathcal{S})$:



In the justification problems, H_0 is the global context, H_1 is the intermediate context, and H_2 and H_3 are local contexts. H_2 is an example of a local context embedded within a presupposition trigger.

The justification system \mathcal{S} has the following two solutions:

(A)

1. global accommodation of *Every man has a bicycle.* in H_0 :

$$H_0 \longmapsto \bar{x}_4; \text{man}(x_4); \text{fat}(x_4) \Rightarrow \bar{x}_5; \text{bicycle}(x_5); \text{poss}(x_4, x_5)$$

2. deductive extension of the intermediate context in H_1 :

$$H_1 \longmapsto \bar{x}_6; \text{bicycle}(x_6); \text{poss}(x_1, x_6)$$

3. bindings in H_2 and H_3 :

$$H_2 \longmapsto x_1 \leftarrow x_3$$

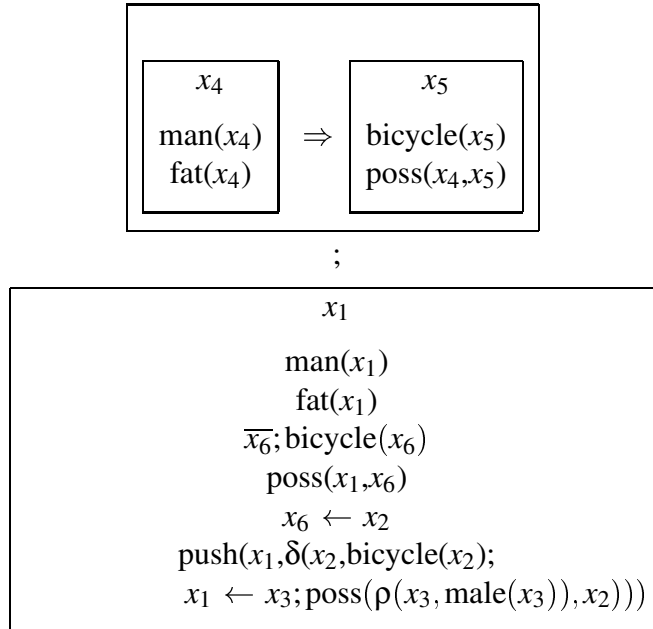
$$H_3 \longmapsto x_6 \leftarrow x_2$$

(B)

1. local accommodation in H_1 of *who has a bike.*

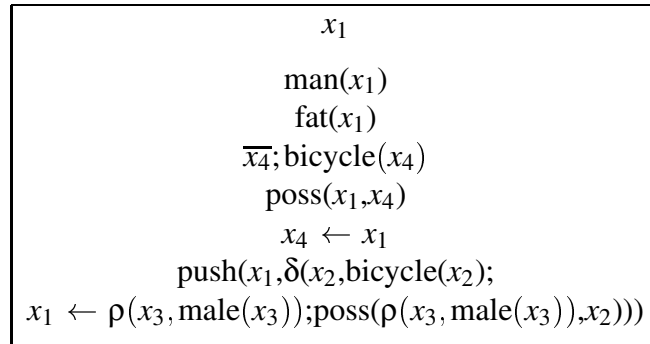
2. bindings in H_2 and H_3

The first solution, the one involving global accommodation, is given by the following resulting discourse representation structure⁸:



This solution is not plausible without contextual relativization of the dynamic existential quantifier. This has been left out to simplify the exposition.

The second solution is the intermediate accommodation solution.



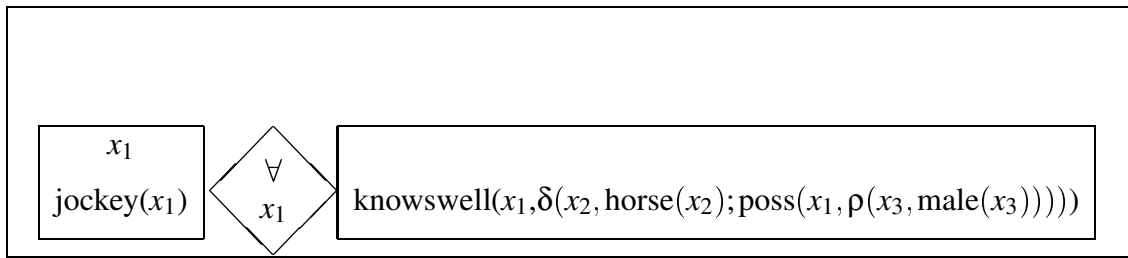
This kind of accommodation has been called local in Heim (1983). The terminology *intermediate accommodation* is from van der Sandt (1992): the presupposition is accommodated in an intermediate position between the global context and the local context of the presupposition trigger.

The following example with a universal quantifier has essentially the same quantificational structure and the same kind of presupposition trigger as example 5.

(18) Every jockey knows his horse well.

⁸In order to visualize the division between the accommodated presupposition and the original logical form, I have used a mixture between linear and two-dimensional notation, connecting the quantified presupposition with the rest using dynamic conjunction.

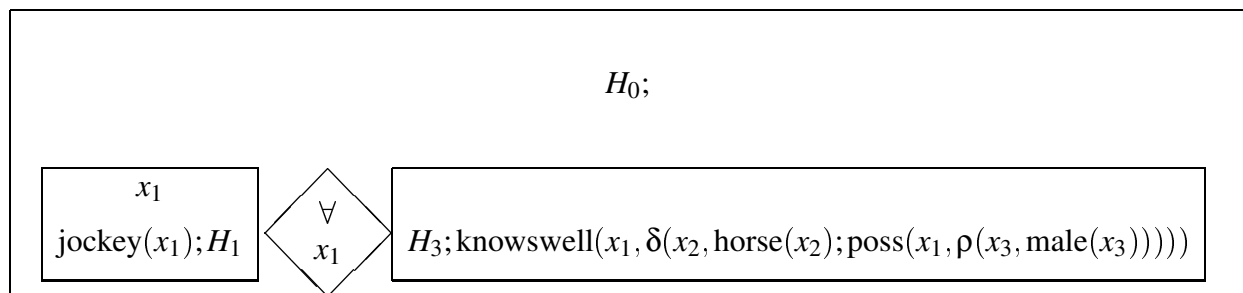
The initial formalization of the sentence is as follows.



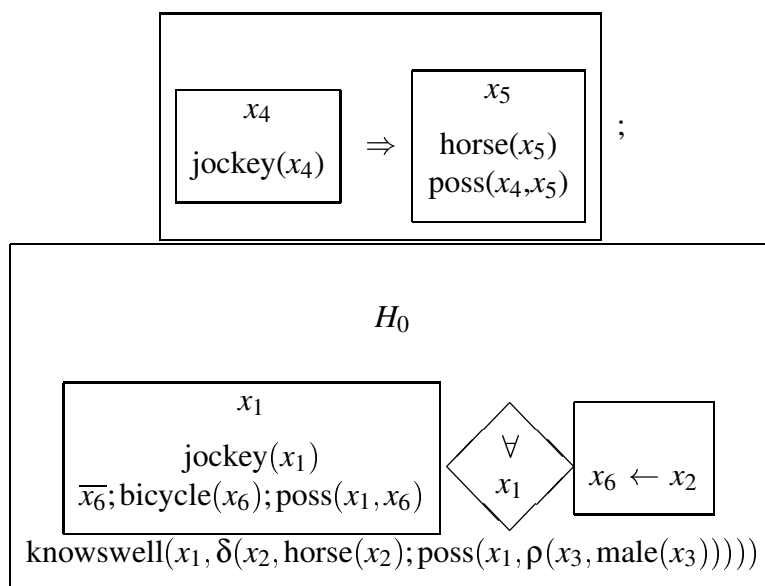
The similarity in the quantificational structure is reflected in the parallel setup of the justification problems:

$$\{ \langle \langle H_0; x_1; \text{jockey}(x_1); H_1, \varepsilon, H_2 \rangle, \text{defined}(\rho(x_3, \text{male}(x_3))) \rangle \rangle, \langle \langle H_0; x_1; \text{jockey}(x_1); H_1, \varepsilon, H_3 \rangle, \text{defined}(\delta(x_2, \text{horse}(x_2)); \text{poss}(\rho(x_3, \text{male}(x_3)), x_2)) \rangle \rangle \}$$

The schematic result DRS contains the three context variables H_0 , H_1 and H_3 :



The quantified presupposition solution is given by



There is also an intermediate accommodation solution. However, its availability is not undisputed for this kind of example.

The following example is a variation on Heim's *fat man* example in which there is no bound variable in the presupposition trigger. The example is from Beaver (1994).

(19) A plane just landed.

The initial logical form in this case is given by the following DRS⁹. The contribution of the temporal adverb *just* is not further analyzed. Presumably it asserts that the time span between the eventuality and the reference point (its two arguments in the logical form below) is shorter than a context-dependent threshold.

$x_1 e n s$
$\text{plane}(x_1)$
$e < n$
$\alpha(s: \text{airborne}(x_1))$
$s \supset e$
$e: \text{land}(x_1)$
$\text{just}(e, n)$

The presupposition of the verb *to land* can only be formulated relative to the prestate of the landing event. We obtain the following justification system:

Justification problems

$$\{\langle \langle H_0; x_1; \text{plane}(x_1), \varepsilon, H_1 \rangle, \text{defined}(\alpha(s: \text{airborne}(x_1))) \rangle \rangle\}$$

Schematic result DRS

$x_1 e n s$
H_0
$\text{plane}(x_1)$
$e < n$
H_1
$\alpha(s: \text{airborne}(x_1))$
$s \supset e$
$e: \text{land}(x_1)$
$\text{just}(e, n)$

In this case, there is just one justification problem, because there is only one presupposition trigger in the example. The third component of the justification system, the identifiability pre-suppositions, have not been listed because there is no relevant singular term in the logical form.

⁹Beaver (1997) gives essentially the following representation (transcribed in linear DRS notation):

$$[x \mid \text{plane}(x); \alpha : \text{was-airborne}(x) \text{ on-ground}(x)]$$

The explicit introduction of temporal referents complicates the representation only minimally, and makes the discussion of the example more transparent.

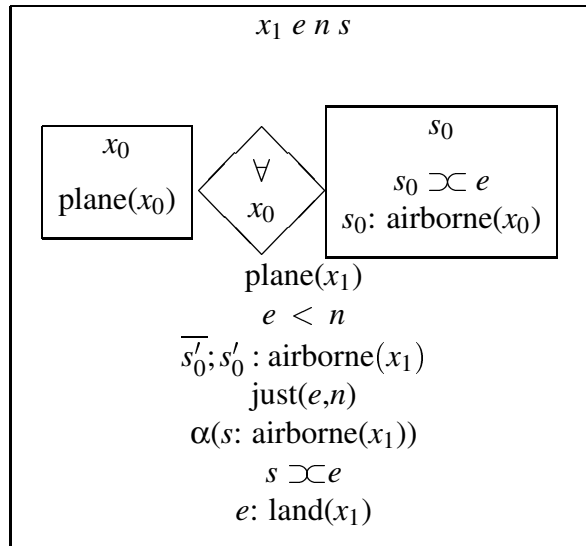
Like in the *fat man* example, there are two solutions, one of globally accommodating a universal presupposition, and a local accommodation solution.

The quantified presupposition solution is given by the following assignment for the context variables.

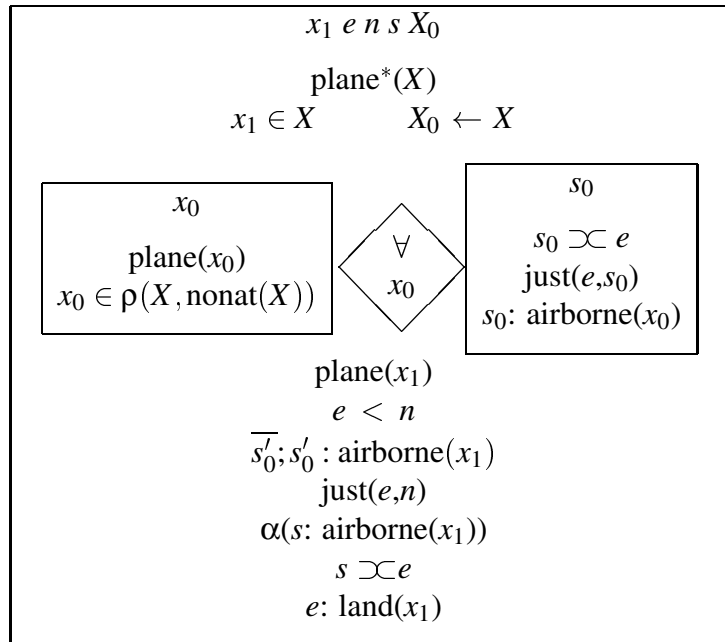
- $H_0 \mapsto \forall x_0(\text{plane}(x_0), \overline{s_0}; s_0 < e; \text{just}(e, s_0); s_0 : \text{airborne}(x_0))$
- $H_1 \mapsto \overline{s'_0}; s'_0 : \text{airborne}(x_1); \text{just}(e, n)$

The global context is augmented with the proposition *Every plane was airborne*. The local context is incremented with the logical translation of *which was airborne*.

Presupposition justification results in the following discourse representation structure with an accommodated universal condition which is not contextually restricted ($\overline{s'_0}$ is the introduction of the discourse referent s'_0 , which is represented locally with respect to the condition characterizing this state discourse referent. This notation corresponds to a dynamic existential quantification).



This interpretation is not very plausible, because a state of affairs in which all planes whatsoever are airborne will occur extremely rarely. However, if the interpretation is relativized to a context set of planes, it becomes much more plausible. In a context in which a suitable antecedent for a context variable is available, we would have obtained the following as well (the context set has been represented as $\rho(X, \text{nonat}(X))$):



4 Conclusion

The quantified presupposition analysis originally proposed by Berman (1995) is a flexible way of accounting for domain restriction by presuppositions triggered in the nuclear scope of an operator. Abductive presupposition justification is a way of systematically deriving these quantified presuppositions as logical inferences. The data are not primarily analyzed in terms of topic or focus, but in terms of presupposition. Additional information structure effects on quantified presupposition accommodation may exist, and it will be interesting to ask how the account of quantified presupposition accommodation can be combined with a presuppositional account of information structure in order to predict topicality effects such as those observed by Beaver (1995). The above discussion has been restricted to nominal quantifiers. The application to adverbial quantifiers will be discussed in a separate paper.

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