

Discourse Linking as (simultaneous) Constraint Solving

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The Problem

- Natural languages contain many devices that impose constraints on the context in which the sentences that contain them can be used.
- Unless the context permits resolution of those constraints, the sentence will be either uninterpretable or infelicitous.
- When the context as it is available to the interpreter does not permit resolution, it is often possible to adjust it to one which does permit resolution. (This process is called 'Accommodation')
- When accommodation is impossible, the interpretation aborts.
- Question: What are the principles that govern the context adjustments that are needed for the resolution of different types of constraints?

Why do languages have constraint-producing devices?

- Usually a message we want to convey in words involves more than one sentence.
- The interpreter must reconstruct the message from the successive sentences used by the speaker.
- This requires understanding how the contribution of each next sentence connects with the interpretation the interpreter has already assigned to the preceding sentences of the discourse or text. This already established interpretation acts as *context* for the interpretation of the current sentence.
- The context constraints generated by the sentence provide the interpreter with clues as to which part of the context the interpretation of the current sentence is to be linked, and in what way.

Terminology

- Many of the context constraints that have been discussed in the literature are known as *presuppositions*.
- The thesis that presuppositions are to be seen as constraints on the context, which must be satisfied/resolved before interpretation can proceed further, goes back to the early seventies (Stalnaker, 1973).
- Milestones along the road to current presupposition theory are: (Karttunen, 1974), (Gazdar, 1976, 1979), (Heim, 1983), (Van Der Sandt and Geurts, 1991), (Van Der Sandt, 1992), (Beaver, 1995, 2001), (Geurts, 1995, 1999).
- Perhaps all constraints that sentences impose on their contexts can be called "presuppositions".

We may call them that as long as we remember that there are different types of presuppositions/constraints, which differ in particular with regard to their accommodation behaviour.

Dynamic Semantics

- Dynamic Semantics was specifically designed to describe the incremental nature of natural language interpretation and meaning. One of its central concerns is the study of context constraints and the devices that introduce them.
- This is true in particular of Discourse Representation Theory (DRT), the form of Dynamic Semantics we will be using.
- A distinguishing feature of DRT:
Both the established interpretation (the *discourse context*) and the interpretation of the current sentence are given in a specific representational format, that of so-called *Discourse Representation Structures* (DRSs).

- The first explicit treatment of presuppositions within DRT led to a revision of its basic architecture.
- In this architecture the interpretation of each new utterance/sentence of a discourse or text involves two steps:

(1) Build a *preliminary representation* of the current utterance/sentence, using just the structure and material from the sentence itself.

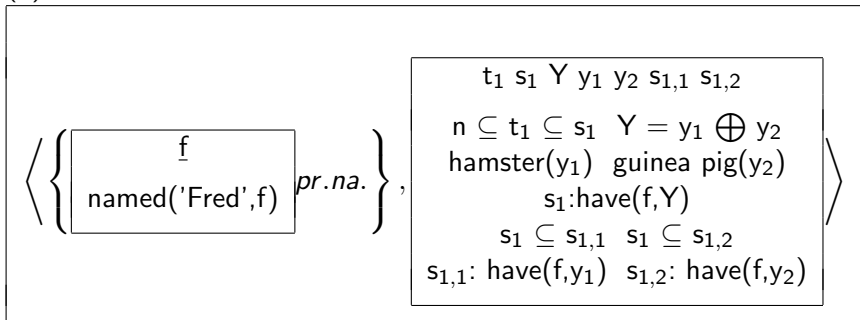
In this preliminary representation all context constraints generated by the sentence are explicitly represented.

(2) Resolve all the constraints of the preliminary representation in the discourse context, and then merge what remains of the preliminary representation with the discourse context.

- (1) (i) Fred has a hamster and a guinea pig.
 (ii) His guinea pig is friendly.

Preliminary representation of (1.i)

(2)



Representation of (1.i) after Resolution of the proper name presupposition

(3)

\underline{f} t_1 s_1 Y y_1 y_2 $s_{1,1}$ $s_{1,2}$

named('Fred',f) $n \subseteq t_1 \subseteq s_1$ $Y = y_1 \oplus y_2$

hamster(y_1) guinea pig(y_2)

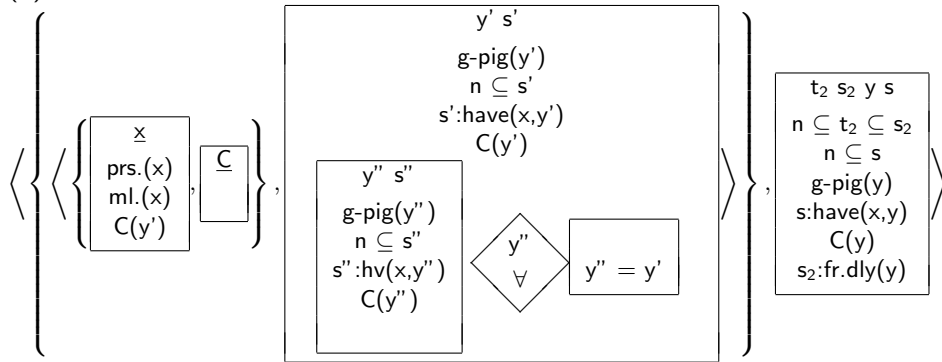
s_1 :have(f,Y)

$s_1 \subseteq s_{1,1}$ $s_1 \subseteq s_{1,2}$

$s_{1,1}$: have(f, y_1) $s_{1,2}$: have(f, y_2)

Preliminary representation of (1.ii)

(4)



Resolution of the presupposition of (4) in the context provided by (3):

$$\underline{x} := f$$
$$C := \{ f, y_1, y_2 \}$$

With these values for x and C the unique satisfaction of the descriptive content of *his guinea pig* can be derived using obviously valid principles of lexical semantics and world knowledge.

In particular, it can be inferred that the individual represented by the discourse referent y must be the same as that represented by y_2

(5) Representation of (1.i,ii):

f t_1 s_1 Y y_1 y_2 y_1 y_2 $s_{1,1}$ $s_{1,2}$ t_2 s_2 y s

Named('Fred',f) $n \subseteq t_1 \subseteq s_1$ $Y = y_1 \oplus y_2$

hamster(y_1) guinea pig(y_2)

s_1 :have(f,Y)

$n \subseteq t_2 \subseteq s_2$

guinea pig(y)

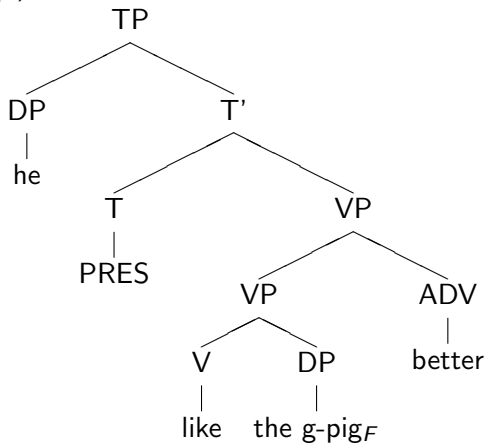
s :have(x,y)

$y \in \{f, y_1, y_2\}$

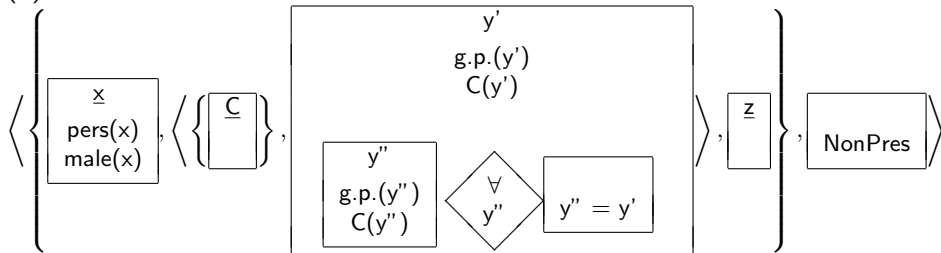
s_2 : friendly(y)

- (6) (i) Fred has a hamster and a [guinea pig]_F.
(ii) He likes the guinea pig better.

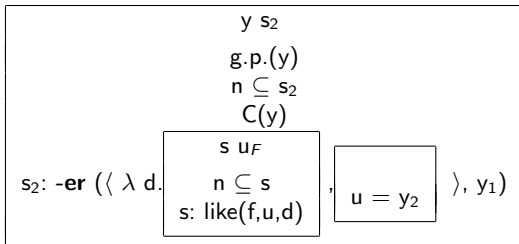
(7)



(8)

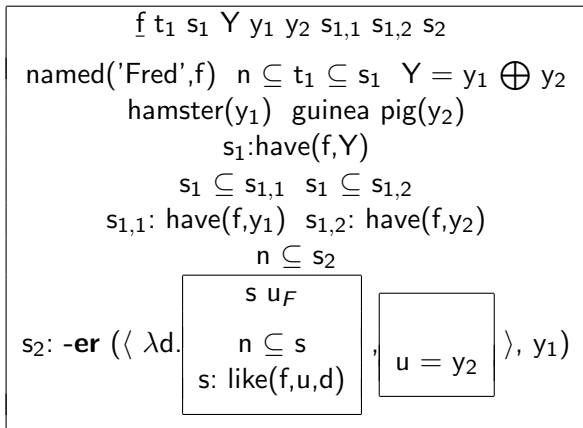


NonPres =

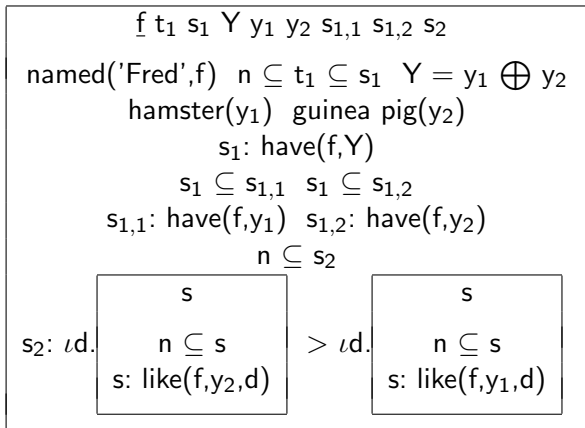


$x := f$
 $C := \{f, y_1, y_2\}$
 $z := y_1$

(9)



(10)



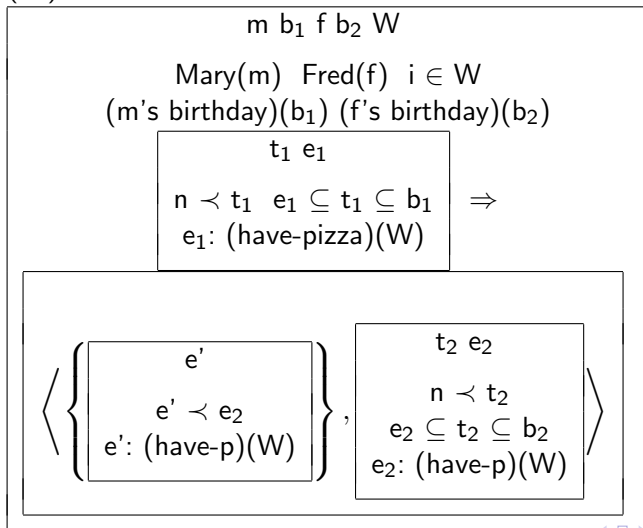
(11) a. We won't have pizza on Fred's birthday, if we are also going to have pizza on Mary's birthday.

b. We won't have pizza again on Fred's birthday, if we are also going to have pizza on Mary's birthday.

c. We already had pizza last week when we celebrated Billie's birthday. So we won't have pizza again on Fred's birthday, if we are also going to have pizza on Mary's birthday.

(12) If we have pizza on Mary's birthday, then we won't have pizza on Fred's birthday.

(13)



Presupposition *construction* isn't a trivial matter either

- (14) a. Mary lost her purse again. (The same purse?)
- b. One of the rabbits has escaped again.
- (i) Each time it is another one.
- (ii) Always that same bloody animal.
- c. Fred is in love with one of my nieces too.

Presupposition Resolution as Quantifier Domain Restriction

(15) a. No, I won't come with you to Disneyland again.

I will come with you tomorrow, but that will be it.

b. # No, I won't come with you to Disneyland.

I will come with you tomorrow, but that will be it.

c. I will come with you to Disneyland tomorrow.

But I will never go there again.

d. I won't come with you to Disneyland tomorrow.

In fact, I will never go there again.

Several presuppositions all targeted on the same context part

(16) (i) I gave the workers a generous tip. (ii) One thanked me. (iii) The other one left without saying a word.

(17)

$X \text{ a t e y t' e' u}$

worker*(X) the speaker(a) generous tip(y)

$u \in X$

$t \prec n \ e \subseteq t$

e: give(a,y,X)

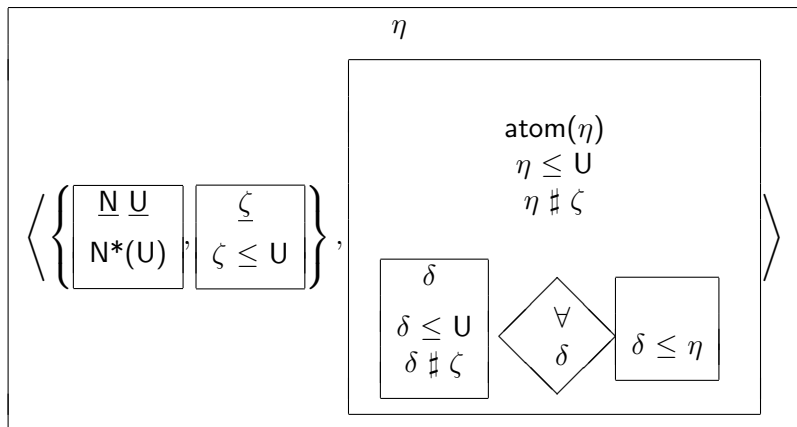
$t' \prec n \ e' \subseteq t'$

(e \prec e')

e': thank(u,a)

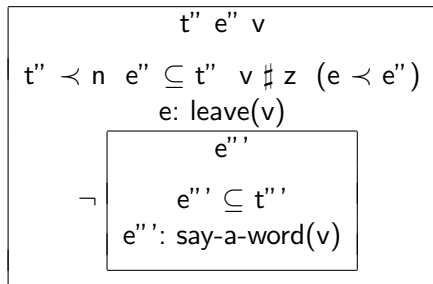
Presupposition Structure of prelim. DRS for (16.iii)

(18.pr)



Non-Presuppositional part of prelim. DRS for (16.iii)

(18.b)



$N := \text{worker}^*$

$U := X$

$\zeta := u$

$\eta := X \setminus \{u\}$

X a t e y t' e' u t'' e'' v

worker*(X) the speaker(a) generous tip(y)

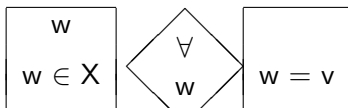
$u \in X \quad |X|=2 \quad t \prec n \quad e \subseteq t$

e: give(a,y,X)

$t' \prec n \quad e' \subseteq t' \quad (e \prec e')$

e': thank(u,a)

$v \# u$



$t'' \prec n \quad e'' \subseteq t'' \quad e \prec e''$

e'': leave(v)

\neg

e'''

$e''' \subseteq t''$

e''': say-a-word(v)

Variations on (16)

a. I gave the workers a generous tip. One thanked me. Another one left without saying a word.

Conclusion: $|X| \geq 2$

b. I gave the workers a generous tip. Two thanked me. The other one left without saying a word.

Conclusion: $|X| = 3$

c. I gave the workers a generous tip. Two thanked me. The other two left without saying a word.

Conclusion: $|X| = 4$

d. I gave the workers a generous tip. the first one thanked me. The second two left without saying a word.

Conclusion: $|X| \geq 3$

e. I gave the workers a generous tip. the first one thanked me. Two others left without saying a word.

Conclusion: $|X| > 3$

f. I gave the workers a generous tip. the first one thanked me. The others left without saying a word.

Conclusion: $|X| \geq 3$

Ambiguity of Tense and Ambiguity of *Again*

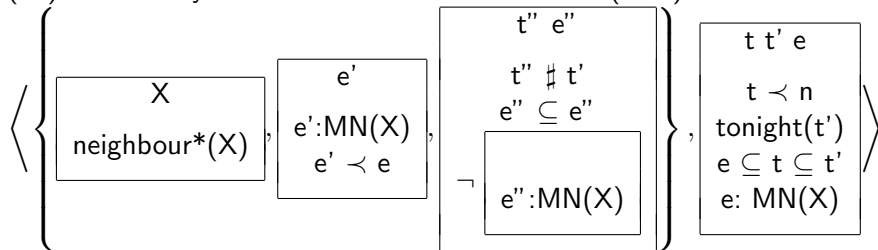
- (20) a. Fred arrived on Monday. He left on Thursday.
b. Fred arrived on Monday. He left again on Thursday.
c. Fred arrived on Monday. He had left on Thursday.
d. Fred arrived on Monday. He had left again on Thursday.

Again and Focus

- (21) a. Last night our neighbours played their new stereo set.
Tonight they made a lot of noise **AGAIN**.

b. Last night our neighbours played their new stereo set.
Tonight they made a lot of **NOISE** again.

(22) Preliminary DRS for the second sentence of (20.b)



Conclusion

What can we learn from these examples?

- Context adjustment is subject to principles of 'economy': Make do with some salient part of the context as long as it gets you at least part of the way towards total constraint resolution; and adjust the context only inasmuch as needed.
- When several constraints compete for the same part of the context, then one constraint may win the competition, even if that leads to an interpretation that is intuitively implausible.
- On the other hand presupposition resolution may also trigger domain restrictions that would not have been without them, and thus yield interpretations that would not have been available otherwise.
- What we need is a general theory of the joint resolution of presuppositional and anaphoric constraints. The examples I have presented give at best a hint of the direction in which should look for such a theory.