HPSG Binding Theory

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January 17, 2008

Structure

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Tasks of a Binding Theory

- Account for the distribution of anaphors, personal pronouns and R-expressions

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- Account for the distribution of anaphors, personal pronouns and R-expressions
- Account for what coindexings are necessary, possible or impossible

Necessary Coindexings

(1) John$_i$ hates himself$_i$

(2) John$_i$ showed Bill$_j$ himself$_{i/j}$ on the picture

(3) John$_i$ thinks Bill$_j$ hates himself$_j$

(4) Mom and Dad$_i$ think they$_j$ hate each other$_j$

Impossible Coindexings

(5) * John$_i$ beheaded him$_i$

(6) * He$_i$ thinks John$_i$ beheaded her

(7) * John$_i$ thinks Bill$_j$ beheaded himself$_i$

GB and HPSG Binding Theories

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- HPSG binding theory is (structurally) modelled on GB binding theory
- Still, there are very significant differences

Structure

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Binding

X binds Y iff X **commands** Y and X and Y are coindexed.

This relation normally holds between NPs. (An exception are PPs in HPSG; more on that soon.)

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- use similar definitions of *binding*:

Binding

X binds Y iff X **commands** Y and X and Y are coindexed.

This relation normally holds between NPs. (An exception are PPs in HPSG; more on that soon.)

- consist of three clauses A, B and C, where A is concerned with anaphors, B with personal pronouns and C with R-expressions.

Structure

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To explain the design of HPSG binding theory, a short review of the GB binding theory is in order.

Structure

C-Command: A Configurational Notion

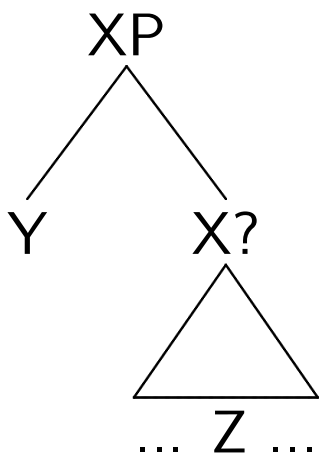
C-command is defined with respect to phrase structure:

C-Command

Y c-commands Z iff Z is contained in the smallest maximal projection containing Y and Z is not contained in Y.

C-Command: Figure

Y c-commands Z:



(A-)Binding

Binding (more precisely *A-binding*, i.e. *argument-binding*), is now defined as:

(A-)Binding in GB

X binds Y iff X c-commands Y and X and Y are coindexed.

Structure

GB Binding Theory

Now the GB Binding Theory can be formulated. This is a simplified version, only covering the aspects of direct relevance.

GB Binding Theory

A An anaphor must be bound, and bound 'as soon as possible', i.e. to something in the smallest clause or NP that contains it and that it can be bound in.

B A pronoun must be free in the smallest clause or NP that contains it.

C
1. An overt R-expression must be free.
2. A *wh*-trace must be free in the smallest projection that does not contain the moved element.

The notion of *government* has been omitted (or rather, used implicitly, perhaps audaciously, but we can make do without it)

Structure

GB Binding Theory

The Explanatory Effects of Clause A

Clause A

An anaphor must be bound, and bound 'as soon as possible', i.e. to something in the smallest clause or NP that contains it and that it can be bound in.

(8) John$_i$ beheaded himself$_i$

(9) John$_i$ thinks Bill$_j$ beheaded himself$_j$

(10) * John$_i$ thinks Bill$_j$ beheaded himself$_i$

GB Binding Theory

The Explanatory Effects of Clause A

Clause A

An anaphor must be bound, and bound 'as soon as possible', i.e. to something in the smallest clause or NP that contains it and that it can be bound in.

(11) John$_i$ showed Bill$_j$ himself$_{i/j}$ on the picture.

(12) The men$_i$ wanted each other$_i$'s heads

(13) Mary$_i$ wanted for herself$_i$ to get his head

All these anaphor bindings are explained by the theory.

GB Binding Theory

The Explanatory Effects of Clause B

Clause B

A pronoun must be free in the smallest clause or NP that contains it.

(14) * John$_i$ beheaded him$_i$

(15) John$_i$ thinks Bill$_j$ beheaded him$_i$

(16) John$_i$ beheaded his$_i$ friend.

The ungrammaticality of the first follows from clause B.
Nothing excludes the second and third.

GB Binding Theory

The Explanatory Effects of Clause C

Clause C

1. An overt R-expression must be free.
2. A *wh*-trace must be free in the smallest projection that does not contain the moved element.

(17) * He$_i$ beheaded John$_i$

(18) * He$_i$ knows I beheaded John$_i$

(19) John$_i$, I like$_i$

(20) * John$_i$, he$_i$ said you beheaded t$_i$

The ungrammaticality of the first two sentences follows from clause C1, that of the third from clause C2 (C2 is necessary because in sentences like this, the topicalized NP binds the trace).

Structure

GB Binding Theory
Problems For Clause A

Clause A

An anaphor must be bound, and bound 'as soon as possible', i.e. to something in the smallest clause or NP that contains it and that it can be bound in.

The following data are problematic for clause A of the GB binding theory:

(21) John and Mary$_i$ knew that the journal had rejected each other$_i$'s papers

The theory would require binding the anaphor in the embedded clause.

GB Binding Theory
Problems For Clause A

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The following data are problematic for clause A of the GB binding theory:

(22) John suggested that [tiny gilt-framed portraits of [each other]$_i$ would amuse [the twins]$_i$]

(23) Iran$_i$ agreed with Iraq$_j$ that [each other's]$_k$ shipping rights must be respected. (k = Iran and Iraq)

GB Binding Theory
Problems For Clause A

- *The twins* does not c-command the anaphor. So it cannot be bound as the theory demands.
- Iran&Iraq does not even come as a grammatical unit but has to be inferred. It cannot be bound.

GB Binding Theory
Problems For Clause A

Problems

- C-command does not seem to work quite as intended. It does not hold here.
- The requirement that any anaphor be bound seems to be too strong.

GB Binding Theory
Problems For Clause A

Clause A

An anaphor must be bound, and bound 'as soon as possible', i.e. to something in the smallest clause or NP that contains it and that it can be bound in.

(24) Mary talked [to John] [about himself]

John fails to c-command the anaphor
Problem: once more, c-command seems to be problematic.

GB Binding Theory
Problems For Clause B

Clause B

A pronoun must be free in the smallest clause or NP that contains it.

(25) * Mary talked [to John$_i$] [about him$_i$]

John does not c-command *him*, hence *him* is free as required by clause B. So the sentence should be grammatical.
Problem: c-command again...

GB Binding Theory
Problems For Clause C1

Clause C1

An overt R-expression must be free.

The problem with PPs carries over to clause C1:

(26) * Mary talked [to him$_i$] [about John$_i$]

John is free, just as required by clause C1. So the sentence is wrongly predicted to be grammatical.
Problem: And again.

GB Binding Theory
Problems For Clause C2

Clause C2

A *wh*-trace must be free in the smallest projection that does not contain the moved element.

(27) The Senator doubted that the delegates would endorse his wife. But HIM$_i$, he$_i$ was sure they would support t$_i$

Though grammatical, the sentence is ruled out by Clause C2.
Problem: the trace is not allowed to be bound by *he*.

GB Binding Theory

Reconstruction

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(30) He was sure they would support him

Him is back in the place it came from. The sentence is predicted to be grammatical.

GB Binding Theory
Why Reconstruction Analyses Fail

(31) I wonder [which of Claire$_i$'s friends]$_j$ we should let her$_i$ invite t$_j$ to the party?

(32) We should let her$_i$ invite [which of Claire$_i$'s friends] to the party

Reconstruction leads to a C1 violation.
This problem will have an elegant solution in HPSG (Anas).

Structure

General Approach Of the HPSG Binding Theory

- Not designed to account for all of the data as far as anaphors are concerned

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- Not designed to account for all of the data as far as anaphors are concerned
- Solves problems with c-command by employing o-command instead

Structure

Preliminaries
Nominal Object

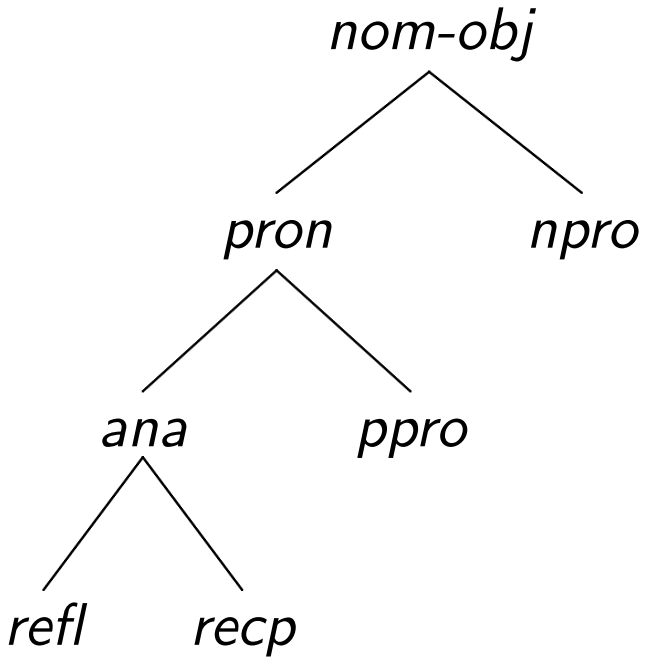
Recall: The CONTENT values of NPs are objects of sort nominal object.

$$\begin{bmatrix} \textit{nom-obj} & & \\ \text{INDEX} & \begin{bmatrix} \text{PER} & \textit{per} \\ \text{NUM} & \textit{num} \\ \text{GEND} & \textit{gend} \end{bmatrix} \\ \text{RESTRICTION} & \{\ldots\} \end{bmatrix}$$

Anaphors, pronouns and R-expressions can be discerned by partitioning this sort (**not** *index*) appropriately.

Preliminaries

The Sort Hierarchy Below *nom-obj*



Structure

A New Command Relation: O-Command

Obliqueness

O-Command is based on the notion of *relative obliqueness*:

Relative Obliqueness

A *synsem* object X is less oblique than some other *synsem* object Y iff X precedes Y on the SUBCAT list of some lexical head.

A New Command Relation: O-Command

Definition Of O-Command

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Local O-Command

For *synsem* objects X, Y, where X is referential (i.e. LOCAL | CONT | INDEX $\sim$ *ref*): X locally o-commands Y iff X is less oblique than Y.

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A New Command Relation: O-Command

Remarks

- Only the definition of non-local o-command makes reference to phrase structure.
  This reference will also be eliminated in a second version of the binding theory.
- The requirement that X be referential will play a role in the treatmeant of expletives. (Anas)

A New Binding Relation

Definition

O-Binding

X (locally) o-binds Y iff X (locally) o-commands Y and X and Y are coindexed

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The distinction between local and non-local carries over to the notion of binding

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B A personal pronoun must be locally o-free

C A nonpronoun must be o-free

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B A personal pronoun must be locally o-free
C A nonpronoun must be o-free

- Clause A no more requires all anaphors to be bound
- Only clause C makes reference to phrase structure via *o-free*

Structure

Accounting For The Data

Preliminaries: the Treatment of PP Complements

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- As a result, PP complements do not differ from NP complements with respect to binding theory

General description:

$$\left[\begin{array}{l}\text{SS}|\text{LOC}\left[\begin{array}{ll}\text{CAT} & \left[\begin{array}{ll}\text{HEAD} & \textit{prep}\\ \text{SC} & \langle \text{NP}:\boxed{1}\rangle\end{array}\right]\\ \text{CONT} & \boxed{1}\end{array}\right]\end{array}\right]$$

Accounting For the Data

Clause A - Anaphors

Clause A

A locally o-commanded anaphor must be locally o-bound

(33) a. John hates himself

b. SUBCAT list of *hates*: $\left[\text{SUBCAT } \langle \text{NP:}npro_i, \text{ NP:}ana_i \rangle\right]$

(34) a. John depends on himself

b. SUBCAT list of *depends*: $\left[\text{SUBCAT } \langle \text{NP:}npro_i, \text{ PP:}ana_i \rangle\right]$

Due to the figurehead analysis, the same argument applies to both examples:

- The anaphor is locally o-commanded
- So it must be locally o-bound
- *John* is the only possible binder

Accounting For the Data

Clause A - Anaphors

Clause A

A locally o-commanded anaphor must be locally o-bound

(35) a. John showed Bill himself on the picture

b. *show* SC: $\left[\text{SUBCAT } \langle \text{NP:}npro_i, \text{NP:}npro_j, \text{NP:}ana_{i/j} \rangle\right]$

- The anaphor has two o-commanders
- So it must be bound by one of them.

Accounting For the Data

Clause A - Anaphors

Clause A

A locally o-commanded anaphor must be locally o-bound

(36) a. John thinks Bill beheaded himself

b. *thinks* SC: $\left[\text{SUBCAT } \langle \text{NP:}npro_i, \text{ S} \rangle\right]$

c. *behead*, the lexical head of the S, SC: $\left[\text{SUBCAT } \langle \text{NP:}npro_j, \text{ NP:}ana_j \rangle\right]$

Since the anaphor is locally o-commanded, it must be locally o-bound. The only possible binder ist the NP *Bill*.

Accounting For the Data

Exempt Anaphors

The anaphor in the following sentence is exempt from clause A of the binding theory:

(37) The childern$_i$ like each other$_i$'s friends

In GB, the coindexing shown would be obligatory. But no such constraint can exist:

(38) John and Mary$_i$ knew that the journal had rejected each other$_i$'s papers

Accounting For the Data

Clause B - Personal Pronouns

Clause B

A personal pronoun must be locally o-free

(39) a. * John$_i$ hates him$_i$

b. * $\left[\text{SUBCAT } \langle \text{NP:}npro_i, \text{ NP:}ppro_i \rangle\right]$

(40) a. * John$_i$ depends on him$_i$

b. * $\left[\text{SUBCAT } \langle \text{NP:}npro_i, \text{ PP:}ppro_i \rangle\right]$

- *Him* is locally o-commanded
- Coindexing *him* with *John* would make *him* locally o-bound
- So, by clause B, *him* and *John* cannot be coindexed

Accounting For the Data

Clause C - Nonpronouns

Clause C

A nonpronoun must be o-free

(41) a. * He$_i$ hates John$_i$

b. * $\left[\text{SUBCAT } \langle \text{NP:}ppro_i, \text{ NP:}npro_i \rangle\right]$

(42) a. * He$_i$ knows that she hates John$_i$

b. * *knows* SC: $\left[\text{SUBCAT } \langle \text{NP:}ppro_i, \text{ S} \rangle\right]$

c. * *hates*, lexical head of S, SC: $\left[\text{SUBCAT } \langle \text{NP:}ppro_j, \text{ NP:}npro_i \rangle\right]$

In both cases, the *John* is o-commanded, locally in the first, non-locally in the second. Thus clause C rules the examples ungrammatical.

Accounting For the Data

Traces

(43) John$_i$, I like t$_i$

(44) * John$_i$, He$_i$ does not like t$_i$

This follows directly from the theory:

- LOCAL values of trace and filler are structure-shared
- So, if the filler is a nonpronoun, the trace also is
- Since the trace is subcategorized for by the *like* in the second sentence, it is o-bound by he.
- The sentence is ungrammatical, since a nonpronoun may not be o-bound