Chapter 20

Anaphoric Binding

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This chapter is an introduction into the Binding Theory assumed within HPSG. While it was inspired by work on Government & Binding in the beginning, it turned out that reference to tree structures alone is not sufficient and that reference to the syntactic level of argument structure is required. Since the argument structure is tightly related to the thematic structure, HPSG's Binding Theory is a mix of aspects of thematic binding theories and entirely configurational theories. This discusses both the advantages of this new view and open issues.

1 Explicit constructions of lists with possible antecedents

The discussion of early HPSG approaches to binding revealed a number of problems. The proposals are based on tree configurations and on command relations. This is basically the conceptual inheritance of the GB Binding Theory, of course with a lot of improvements. The general problem seems to be that the command relations are defined in a uniform way not taking account of special configurations like coordinated structures and so on.

Now, there is a more recent approach to binding that looks technical at first, but it is the solution to the problems caused by an approach assuming that one command relation that is supposed to work for all structures in all languages. Branco (2002) suggested an approach that collects indices that are available for binding in certain binding domains. Since the way in which indices relevant for binding are collected can be specified with reference to specific constructions the problems mentioned so far can be circumvented.

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Branco (2002) argues that sentences with wrong bindings of pronouns and/or reflexives are not syntactically ill-formed but semantically deviant. For the representation of his Binding Theory he assumes Underspecified Discourse Representation Theory (UDRT, Reyle 1993; Frank & Reyle 1995) as the underlying formalism for semantics (see also Koenig & Richter (2020: Section 6), Chapter 22 of this volume).

Similar to the notion assumed in Minimal Recursion Semantics (MRS, Copestake, Flickinger, Pollard & Sag 2005) there is an attribute for distinguished labels that indicate the upper (L-MAX) and lower (L-MIN) bound for quantifier scope, there is a set of subordination condition for quantifier scope (the HCONS set in MRS), a list of semantic conditions (the RELS set in MRS). In addition, Branco suggests a feature ANAPH(ORA) for handling the Binding Theory constraints. Information about the anaphoric potential of nominals is represented here. There is a reference marker represented under R(EFERENE)-MARK(ER) and there is a list of reference markers under ANTEC(EDENTS). The list is set up in a way so that it contains the antecedent candidates of a nominal element. Furthermore, Branco adds special lists containing antecedents for special types of anaphora. The lists are named after the binding principles that were already discussed in previous sections: LIST-A contains all reference markers of elements that locally o-command a certain nominal expression *n* ordered with respect to their obliqueness, LIST-Z contains all o-commanders also including everything from LIST-A possible binders. The elements in LIST-Z may come from various embedded clauses and are also ordered with respect to their obliqueness. The list LIST-U contains all the reference markers in the discourse context including those not linguistically introduced. The list LIST-LU is an auxiliary list that will be explained below.

(1)
$$\begin{bmatrix} \textsc{loc}|\textsc{cont} & \begin{bmatrix} \textit{udrs} & \\ \textsc{ls} & \begin{bmatrix} \textsc{l-max} & \boxed{1} \\ \textsc{l-min} & \boxed{1} \end{bmatrix} \\ \textsc{subord} & \{\ldots\} \\ \textsc{conds} & \{\ldots\} \\ \textsc{anaph} & \begin{bmatrix} \textsc{r-mark} & \textit{refm} \\ \textsc{antec} & \textit{list}(\textit{refm}) \end{bmatrix} \end{bmatrix} \\ \textsc{nonloc}|\textsc{bind} & \begin{bmatrix} \textit{bind} & \\ \textsc{list-a} & \textit{list}(\textit{refm}) \\ \textsc{list-z} & \textit{list}(\textit{refm}) \\ \textsc{list-u} & \textit{list}(\textit{refm}) \\ \textsc{list-lu} & \textit{list}(\textit{refm}) \end{bmatrix} \end{bmatrix}$$

The lists containing possible antecedents for various nominal elements are represented under nonlocal as the value of a newly introduced feature BIND. These binding lists differ from other NONLOCAL features in that nothing is ever removed from them (on unbounded dependencies and nonlocal features in general see Borsley & Crysmann (2020), Chapter 13 of this volume).

Branco (2002) defines the Binding Domains Principle, which consists of various clauses. Clause I of BDP is responsible for ensuring that the values of LIST-U and LIST-LU are appropriately setup at the different places in a grammatical representation:

(2) **Binding Domains Principle**, Clause I

i. The LIST-LU value is identical to the concatenation of the LIST-LU values of its daughters in every sign;

ii. the LIST-LU and LIST-U values are token-identical in a sign of sort *discourse*;

iii. i. the LIST-U value is token-identical to each LIST-U value of its daughters in a non-NP sign;

ii. in an NP sign *k*:

- in Spec-daughter, the LIST-U value is the result of removing the elements of the LIST-A value of Head-daughter from the LIST-U value of *k*;
- in Head-daughter, the LIST-U value is the result of removing the value of R-MARK of Spec-daughter from the LIST-U value of *k*.

By virtue of (i.), LIST-LU collects up to the outmost sign in a grammatical representation — which is of sort *discourse* — the markers contributed to the context by each NP. Given (ii.), this list with all the markers is passed to the LIST-U value at this outmost sign. And (iii.) ensures that this list with the reference markers in the context is propagated to every NP.

Subclause (iii.ii) prevents self-reference loops due to anaphoric interpretation, avoiding what is known in the literature as the i-within-i effect — recall that the R-MARK value of non lexical NPs is contributed by the lexical representation of their determiners, in Spec-daughter position, as noted above.

The HPSG top ontology is thus extended with the new subsort *discourse* for signs: $sign \equiv word \vee phrase \vee discourse$. This new type of linguistic object corresponds to sequences of sentential signs. A new Schema 0 is assumed combining a phonologically null object of sort *context(ctx)* and a list of non-head daughters.

As the issue of discourse structure is out of the scope of this chapter, we adopted a very simple approach to the structure of discourses which suffices for the present account of Binding Theory. As discussed in the next Section **??**, this object of sort *ctx* helps representing the contribution of the non linguistic context to the interpretation of anaphors.

As to the other two Clauses of the Binding Domains Principle, Clause II and Clause III, they constrain the lists LIST-A and LIST-Z, respectively, whose values keep a record of o-command relations.

BDP-Clause II is responsible for constraining LIST-A:

(3) **Binding Domains Principle**, Clause II
   i. Head/Arguments: in a phrase, the LIST-A value of its head, and of its nominal (or nominal preceded by preposition) or trace Subject or Complement daughters are token-identical;
   ii. Head/Phrase:
      i. in a non-nominal and non-prepositional sign, the LIST-A values of a sign and its head are token-identical;
      ii. in a prepositional phrase,
         - if it is a complement daughter, the LIST-A values of the phrase and of its nominal complement daughter are token-identical;
         - otherwise, the LIST-A values of the phrase and its head are token-identical;
      iii. in a nominal phrase,
         - in a maximal projection, the LIST-A value of the phrase and its Specifier daughter are token-identical;

- in other projections, the LIST-A values of the phrase and its head are token-identical.

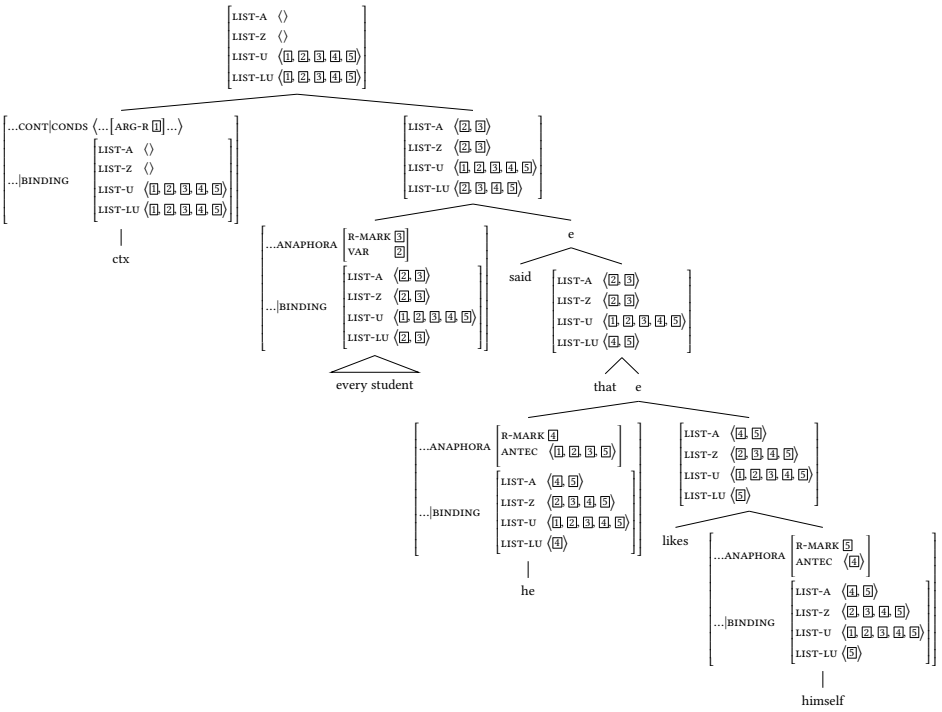

Figure 1: Partial grammatical representation of *Every student said he likes himself.*

2 Conclusion

This chapter discussed several approaches to Binding Theory in HPSG. It is shown that approaches based on an obliqueness order are not sufficient for some languages, that language-specific binding rules are needed and that order (e.g., scrambling in German) plays a role for binding which is not accounted for if obliqueness is made the sole criterion for legitimate bindings.

elaborate, give explicit rules for German

Examples from so-called pragmatic binding show that HPSG's Binding Theory has to be extended to include rules that account for bindings with pronouns with

different number features and different gender features.

It was shown that the right combination of non-configurational aspects (order of elements on a list with respect to a thematic hierarchy, allowing for expletives and raised arguments in the list and accounting for arguments not realized overtly) with configurational aspects (dominance relations including dominance of adjuncts) results in a novel and unique approach to many problems that do not have straightforward alternative analyses.

So, I tried to see who first talked about coindexing. Reinhardt (1983) when she discusses (and argues against) coindexing mentions Langacker's (1966) paper that introduced the notion of command and Ross' (1967) dissertation in this context, but neither uses the term, it seems. So, I remembered Bach and Partee's pioneering (1980) paper and after looking for a while, I found a copy and indeed they argue (as I remembered) against coreference and in favor of coindexing. They seem to talk as if they were the first to make the distinction and why, but maybe they were not.

I thought you might all find it interesting if you didn't know about it (Bach and Partee's paper is from a reprint in Partee's (2004 collection of papers)).

Abbreviations

AV Agentive Voice
OV Objective Voice
PM pivot marker

3 Todo

Bach & Partee (1980); Abeillé et al. (1998); Branco & Marrafa (1999); Pollard (2005); Pollard & Xue (1998); Pollard & Xue (2001); Riezler (1995); Xue & McFetridge (1998); Xue et al. (1994); Büring (2005)

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References

Abeillé, Anne, Danièle Godard & Ivan A. Sag. 1998. Two kinds of composition in French complex predicates. In Erhard W. Hinrichs, Andreas Kathol & Tsuneko Nakazawa (eds.), *Complex predicates in nonderivational syntax* (Syntax and Semantics 30), 1–41. San Diego: Academic Press. DOI: 10.1163/9780585492223_002.

Bach, Emmon & Barbara H. Partee. 1980. Anaphora and semantic structure. In Jody Kreiman (ed.), *Papers from the 16th regional meeting of the Chicago Linguistics Society: Parasession on pronouns and anaphora*. Chicago, IL: Chicago Linguistic Society. Reprint as: Anaphora and Semantic Structure. 2004. In Barbara H. Partee (ed.) (Explorations in Semantics 1), 122–152. Malden, MA: Blackwell Publishers Ltd, 2004. DOI: 10.1002/9780470751305.ch6.

Borsley, Robert D. & Berthold Crysmann. 2020. Unbounded dependencies. In Stefan Müller, Anne Abeillé, Robert D. Borsley & Jean-Pierre Koenig (eds.), *Head-Driven Phrase Structure Grammar: The handbook*, 511–564. Berlin: Language Science Press. DOI: ??.

Branco, António. 2002. Without an index: A lexicalist account of binding theory. In Frank Van Eynde, Lars Hellan & Dorothee Beermann (eds.), *Proceedings of the 8th International Conference on Head-Driven Phrase Structure Grammar, Norwegian University of Science and Technology, Trondheim*, 71–86. Stanford, CA: CSLI Publications. http://csli-publications.stanford.edu/HPSG/2001/ (23 March, 2020).

Branco, António & Palmira Marrafa. 1999. Long-distance reflexives and the binding square of opposition. In Gert Webelhuth, Jean-Pierre Koenig & Andreas Kathol (eds.), *Lexical and Constructional aspects of linguistic explanation* (Studies in Constraint-Based Lexicalism 1), 111–123. Stanford, CA: CSLI Publications.

Büring, Daniel. 2005. *Binding theory* (Cambridge Textbooks in Linguistics 50). Cambridge University Press. DOI: 10.1017/CBO9780511802669.

Copestake, Ann, Dan Flickinger, Carl J. Pollard & Ivan A. Sag. 2005. Minimal Recursion Semantics: An introduction. *Research on Language and Computation* 3(2–3). 281–332. DOI: 10.1007/s11168-006-6327-9.

Frank, Anette & Uwe Reyle. 1995. Principle based semantics for HPSG. In Steven P. Abney & Erhard W. Hinrichs (eds.), *Proceedings of the Seventh Conference of the European Chapter of the Association for Computational Linguistics*, 9–16. Dublin: Association for Computational Linguistics.

Hukari, Thomas E. & Robert D. Levine. 1995. *On SLASH termination and valence-based binding theory*. Paper presented at the LSA Meeting, January 1995, New Orleans.

Koenig, Jean-Pierre & Frank Richter. 2020. Semantics. In Stefan Müller, Anne Abeillé, Robert D. Borsley & Jean-Pierre Koenig (eds.), *Head-Driven Phrase Structure Grammar: The handbook*, 913–953. Berlin: Language Science Press. DOI: ??.

Perlmutter, David. 1984. On the inadequacy of some monostratal theories of passive. In David M. Perlmutter & Carol G. Rosen (eds.), *Studies in Relational Grammar*, vol. 2, 3–37 ?? **check**. Chicago: The University of Chicago Press.

Pollard, Carl. 2005. Remarks on binding theory. In Stefan Müller (ed.), *Proceedings of the 12th International Conference on Head-Driven Phrase Structure Grammar, Department of Informatics, University of Lisbon*, 561–577. Stanford, CA: CSLI Publications. http://csli-publications.stanford.edu/HPSG/2005/ (18 August, 2020).

Pollard, Carl & Ping Xue. 1998. Chinese reflexive ziji: syntactic reflexives vs. non-syntactic reflexives. *Journal of East Asian Linguistics* 7(4). 287–318. DOI: 10.1023/A:1008388024532.

Pollard, Carl J. & Ping Xue. 2001. Syntactic and nonsyntactic constraints on long-distance binding. In Peter Cole, C.T. Huang & Gabriella Hermon (eds.), *Long distance reflexives* (Syntax and Semantics 33), 317–342. New York, San Francisco, London: Academic Press. DOI: 10.1163/9781849508742_011.

Reyle, Uwe. 1993. Dealing with ambiguities by underspecification: Construction, representation and deduction. *Jounal of Semantics* 10(2). 123–179.

Riezler, Stefan. 1995. *Binding without hierarchies*. CLAUS-Report 50. Saarbrücken: Universität des Saarlandes.

van Noord, Gertjan & Gosse Bouma. 1996. Dutch verb clustering without verb clusters. In Patrick Blackburn & Maarten de Rijke (eds.), *Specifying syntactic structures*, 123–153. Stanford, CA: CSLI Publications / Folli.

Xue, Ping & Paul McFetridge. 1998. Verb complementation, null pronominals and binding. In Emily Curtis, James Lyle & Gabriel Webster (eds.), *WCCFL16: The proceedings of the Sixteenth West Coast Conference on Formal Linguistics*. Stanford, CA: CSLI Publications.

Xue, Ping, Carl Pollard & Ivan A. Sag. 1994. A new perspective on Chinese *ziji*. In Raul Aranovich, William Byrne, Susanne Preuss & Martha Senturia (eds.), *Proceedings of the Thirteenth West Coast Conference on Formal Linguistics*. Stanford, CA: CSLI Publications/SLA.

Part III

Other levels of description