Structural Modalities for Binding Domains

In this paper we formalize the complementary distribution between bound pronouns and reflexives in English by imposing structural modalities on the left rule for the pronominal type-constructor $|$ of LLC [3]. We also sever pronominals from reflexives by letting the right rule of LLC to be applied only to the former.

1 Introduction

In the LLC calculus, personal and reflexive pronouns are uniformly assigned the syntactic type $n|n$ with the semantic $\lambda x.x$. Consequently, LLC does not guarantee the complementary distribution between reflexives and bound pronouns predicted by the Principles A and B of the Government and Binding Theory [1]. Roughly, an anaphora must be bound in its governing category (Principle A), whilst a pronoun must be free within it (Principle B). In LLC, contrarily, we may obtain the grammatical and also the ungrammatical readings for him and himself in a sentence like (1).

1. [John’s father]$_2$ loves him$_{1/2}/$himself$_{1/2}$.

LLC extends the Lambek calculus $\mathbf{L}$ [4] by adding the anaphoric type-constructor $|$ and the following (simplified version of) left and right rules:

\[
\begin{align*}
Y \Rightarrow A & \quad X, A, Z, B, W \Rightarrow C \quad \text{[L]} \\
X, Y, Z, B|A, W \Rightarrow C & \quad X, B_1, Y_1, \ldots, B_n, Y_n \Rightarrow C \quad \text{[R]}
\end{align*}
\]

Since the left rule does not impose a locality condition into the antecedent for the anaphor, in LLC not only a pronoun but also a reflexive may be bound from outside its syntactic domain:

2. John$_1$ said he$_1/*$himself$_1$ loves Mary.

Bracket and normal modalities have been applied in Type-Logical Grammar to delimit syntactic domains. The normal modality $\boxdot$ has been used, for example, to prevent a reflexive pronoun within a propositional complement from binding [2]. The bracket modality $\langle \rangle$, in turn, has found a use for formalizing the subject condition (that is, the constraint that bars the extraction from subject nominals) [5].

2 Proposal

We aim to present a more accurate treatment for personal pronouns, taking as a starting point the pronominal connective $|$ from [3] and the intuition behind its logical rules. However, unlike Jaeger’s proposal, our own approach does not intend to be uniform: we assign different
syntactic types for pronouns and reflexives, we restrict the scope for the right rule to be applied
and we propose different left rules for pronouns and reflexives. We identify different syntactic
domains for binding by using the (lexical) structural modality \( [ ] \) of [5] and analogously, for
our \( [ ] \); and we impose structural conditions into the pronominal left rule of LLC by using the
corresponding (syntactic) structural modalities \( [ ] \) and \( \{ \} \). Firstly, we present our treatment
for subject-oriented anaphors.

As an example, consider the following structured rules for subject-oriented anaphors within
a non-propositional complement domain (Fig. 2) and within propositional complement domain
(Fig. 3), with the following side conditions: \( i \neq n \), if \( X_n = Y_n = \epsilon \) or \( X_2 = \epsilon \) in \([][]L_a\); \( Z_3 \neq \epsilon \) in \( \{\}\) \( L_a \). Note that the rule in (Fig. 2) allows us to deal with ECM-verbs as well.

\[
Y \Rightarrow A \quad X, [A], Z_1, [Z_2, B], W \Rightarrow C \quad X, [Y], Z_1, [Z_2, B|A], W \Rightarrow C [][] L_a
\]

\[
[X_1, A_1, Y_1], Z_1, \ldots, [X_n, A_n, Y_n], Z_2, [Z_3, B], W \Rightarrow C \quad [X_1, A_1, Y_1], Z_1, \ldots, [X_n, A_n, Y_n], Z_2, [Z_3, B|A], W \Rightarrow C [][] L_a
\]

**Figure 2**: Rules for (subject-oriented) anaphors within a \( [ ] \) domain

\[
[X_1, A, X_2], Z_1, [Z_2, Z_3, B], W \Rightarrow C \quad [X_1, A, X_2], Z_1, [Z_2, Z_3, B], W \Rightarrow C [][] L_a
\]

\[
[X_1, A, X_2], Z_1, [Z_2, Z_3, B|A], W \Rightarrow C [][] L_a
\]

**Figure 3**: Rules for bound pronouns and reflexives within a \( \{ \} \) domain

Secondly, we deal with object-oriented anaphors in double-object constructions and prepositional
phrases. Since our proposal strongly depends on the syntactic types assigned to the lexical items
into the lexicon, the correctness of our proposal for anaphoric items in these domains mainly rests on
the type assigned to the different classes of verbs. For their treatment we define then a continuous
hierarchical non-commutative \( \odot \) type-constructor and a commutative \( \odot \) one.

\[
[X] \Rightarrow A \quad [Y] \Rightarrow B \quad [X, [Y]] \Rightarrow A \odot B \quad [X] \Rightarrow A \quad [Y] \Rightarrow B \quad [X, [Y]] \Rightarrow A \odot B \quad [X] \Rightarrow B \quad [Y] \Rightarrow A \quad [X, [Y]] \Rightarrow A \odot B
\]

\[
[X] \Rightarrow A \quad [Y] \Rightarrow B \quad [X, [Y]] \Rightarrow A \odot B \quad [X] \Rightarrow B \quad [Y] \Rightarrow A \quad [X, [Y]] \Rightarrow A \odot B
\]

**Figure 4**: Right rules for for non-commutative \( \odot \) and commutative \( \odot \) asymmetrical product

For object-oriented reflexives we propose the rule in (Fig. 5) below:

\[
X_1, [X_2, A, Z_1, [Z_2, B]], W \Rightarrow C \quad X_1, [X_2, A, Z_1, [Z_2, B|A]], W \Rightarrow C [][] L_a
\]

**Figure 5**: Rule for object-oriented reflexives

From the following lexicon, then we may obtain the correct binding relation for pronouns and
reflexives in sentences like (3-10) below, and (1-2) above:

**he/him**: \( n \parallel n \)

**himself**: \( n|n \)
see/love: ((n \ s)/n)
glance: ((n \ s)/pp
show/give/present/send: ((n \ s)/((n) \ (n))
invite/give/send: ((n \ s)/((n) \ (pp))
talk: ((n \ s)/((pp) \ (pp) about))
say/believe: ((n \ s)/[s]
believe/expect: ((n \ s)/s


4. John1 saw *himself1’s mother.

5. [The father of John1]2 loves himself1/himself2.


7. Mary showed/presented John1 himself1.

    b. *John talked about Mary1 to herself1.

9. a. John1 believes himself1 to kiss Mary.
    b. *John1 believes himself1 kisses Mary.
    c. John1 expects Peter2 to like himself1.

10. Max1 said the queen invited both Lucie and himself1/himself1 for tea.

3 Conclusions

Our proposal cover several syntactic domains, such as nominal complements, prepositional complements, prepositional adjunct clauses and double-object constructions. In addition, it preserves the prominence condition on the binder for reflexives: the binder may not be an argument lower in the hierarchy either it may be part of an argument higher in the hierarchy. Further, our rules evidence that free and anaphoric pronouns on the one hand, and bound pronouns on the other, are generally processed in different steps into a proof: if $X_n = X_n = \epsilon$, then free pronouns and reflexives, but not bound pronouns, can be inserted into a derivation. Our proposal also incorporates the previous modal categorial analysis for propositional complements of say/believe in terms of structural modalities, in accordance with our overall proposal, and differentiate two entries for believe: the ECM and also the propositional form.

References


