

Respectively interpretation and Binding Conditions A and B

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1 Introduction

In Yatabe and Tam (2021, Appendix D), a theory of *respectively* interpretation is presented which is capable of assigning appropriate truth conditions not only to a sentence like (1) but also to sentences like (2) and (3), which involve non-constituent coordination.

- (1) Chris and Pat read Austen and Beckett respectively.
- (2) John loves and Mary hates oysters and clams respectively. (from Postal (1998, p. 134))
- (3) I bought and sold a car on Thursday and a bike on Friday, respectively. (from Kubota and Levine (2015))

The theory in question is formulated using HPSG and Minimal Recursion Semantics, and involves a mechanism that rewrites semantic representations. For instance, in the case of sentence (1), the proposed theory initially creates a semantic representation that expresses the proposition that both Chris and Pat read both Austen and Beckett, and that representation is subsequently rewritten to become a representation that expresses the proposition that Chris read Austen and Pat read Beckett.

In this paper, I will first point out that this theory of *respectively* interpretation, which is arguably the best theory of the phenomenon currently available, practically entails that binding conditions A and B need to be reformulated as constraints on the form of semantic representations, and then will propose one way to reformulate the binding conditions in such a manner. The claim that binding condition A is a constraint on the form of semantic representations is a novel one, while the claim that binding condition B is a constraint on the form of semantic representations has a precedent in Reinhart and Reuland (1993).

2 Theories of *respectively* interpretation

Let me start by noting some reasons to believe that the theory described in Yatabe and Tam (2021, Appendix D) is the best theory of *respectively* interpretation currently available.

Goodall (1987) proposes a theory according to which the syntactic representation of a sentence that receives *respectively* interpretation consists of multiple clauses that are conjoined with each other. For instance, the sentence (1) is assumed in this theory to have a syntactic representation resembling that of the sentence *Chris read Austen and Pat read Beckett*. The theory is equipped with a mechanism of linearization that turns that syntactic representation into a phonological representation in which the words are ordered correctly.

There are two good reasons to be skeptical of this theory. First, as pointed out in Dalrymple and Kehler (1995), the theory in question is arguably inapplicable to an example like (4), which is acceptable as a response to a query such as *Where do John and Bill live?*.

- (4) They live in New York and Chicago respectively.

Second, the theory in question is incapable of dealing with a contrast like the following.

- (5) If the cup is too small or too large, then you should go up or down, respectively, in cup size.
(from Eggert (2000))
- (6) *If the cup is too small and too large, then you should go up and down, respectively, in cup size.
(from Yatabe and Tam (2021))

There is nothing in the theory that accounts for the fact that disjunction can yield *respectively* interpretation under some circumstances or for the fact that conjunction can sometimes fail to yield *respectively* interpretation.

Theories presented in works such as Gawron and Kehler (2004) and Chaves (2012) are not purely syntactic but rather semantic, and do not have a problem dealing with sentences like (4). However, like Goodall's theory, these theories fail to provide an explanation as to observations like (5) and (6). Moreover, as pointed out in Kubota and Levine (2015) and Kubota and Levine (2016), these theories cannot deal with instances of *respectively* interpretation that involve non-constituent coordination. Sentence (7) is one such example.

- (7) I bet \$50 and \$100 with John on the football game and (with) Mary on the basketball game (respectively). (from Kubota and Levine (2015))

The theory proposed in Kubota and Levine (2016) can deal with examples like (4) and (7), but predicts incorrectly that *respectively* interpretation is impossible in (5) and possible in (6).

In contrast, the theory proposed in Yatabe and Tam (2021) correctly predicts that *respectively* interpretation is possible in (5) and impossible in (6). The theory likewise has no problem dealing with examples like (7).

In Yatabe and Tam (2021), the authors note the existence of examples like (4), but do not go on to present a concrete analysis of such examples. This shortcoming, however, is easy to fix. All that needs to be done is to add to their theory the assumption that the INDEX value of a plural DP like *they* can be of the form $j +_i k$, where i is a marker that indicates that the semantic conjunction expressed by the symbol $+$ is to be given *respectively* interpretation (see Yatabe and Tam (2021) for the details of this convention and the way it is used in the overall theory).

Thus, Yatabe and Tam's theory is arguably the only descriptively adequate theory of *respectively* interpretation that is currently available.

3 Binding facts and *respectively* interpretation

The theory in question has some immediate consequences for binding theory. Consider first the following sentences, both discussed in Goodall (1987, Subsection 2.4.3).

- (8) *John_i and Mary saw him_i and a cow (respectively).
(9) John_i and Mary love his pet goldfish and him_i (respectively).

When the sentences are given *respectively* interpretation, coreference between *John* and *him* is disallowed in (8) but not in (9). Assuming that the account of *respectively* interpretation presented in Yatabe and Tam (2021) is on the right track (and that theories like that proposed in Goodall (1987)

are not), there is arguably no reasonable way to account for these observations in syntactic terms, and the conclusion that binding condition B is a constraint on the form of semantic representations is inescapable.

Next, consider the following examples, the first of which is discussed in Bošković (2022).

(10) John_{*j*} and Mary_{*k*} hired himself_{*j*} and nominated herself_{*k*} respectively.

(11) *John_{*j*} and Mary_{*k*} hired herself_{*k*} and nominated himself_{*j*} respectively.

Assuming, again, that Yatabe and Tam’s theory is on the right track (and that theories like that proposed in Chaves (2012) are not), it seems difficult to escape the conclusion that binding condition A is a constraint on the form of semantic representations, just like binding condition B.

Analogous examples involving non-constituent coordination can be constructed, as in (12) and (13), and serve to make the same point.

(12) John_{*i*} has compared, and Mary_{*j*} will compare, himself_{*i*} to Picasso and herself_{*j*} to Rembrandt respectively.

(13) *John_{*i*} has compared, and Mary_{*j*} will compare, herself_{*j*} to Picasso and himself_{*i*} to Rembrandt respectively.

Notice that a theory like that presented in Chaves (2012), if correct, would make examples like (10) and (11) unproblematic for the standard, syntactic binding condition A, but not examples like (12) and (13).

4 Reformulating binding conditions A and B

Let us now examine how we could reformulate binding conditions A and B as constraints on the form of semantic representations.

In order to achieve that goal, we need to have a way to distinguish the following three types of variables: variables that have been contributed to a given semantic representation by personal pronouns, variables that have been contributed by reflexive pronouns, and variables that have been contributed by full DPs. I submit that the distinction is made in the following way: a personal pronoun like *her* contributes an elementary predication like (14) to the representation, and a reflexive pronoun like *yourself* contributes an elementary predication like (15). (Reciprocal pronouns will be ignored in this abstract.)

(14) $\left[\begin{array}{ll} \text{RELATION} & \text{equal} \\ \text{PRONOMINAL} & i \\ \text{ANTECEDENT} & j \end{array} \right]$

(15) $\left[\begin{array}{ll} \text{RELATION} & \text{equal} \\ \text{REFLEXIVE} & i \\ \text{ANTECEDENT} & j \end{array} \right]$

The three types of variable can be distinguished from each other if it is further assumed (i) that the PRONOMINAL value of a pronominal and the REFLEXIVE value of a reflexive are both identified with the INDEX value of the respective DP, and (ii) that no two DPs in the same sentence are allowed to have the same INDEX value.

In order to transfer some of the information contained in the syntactic representations into the corresponding semantic representations, I need to assume that an elementary predication contributed by an N, A, or V has features like SUBJECT and OBLIQUE, rather than features like AGENT and LOCATION

and that the `RELATION` value of the elementary predication contributed by a passive verb is different from the `RELATION` value of the elementary predication contributed by the corresponding active verb.

It is also necessary to make a non-standard assumption about the semantic representation of raising predicates. Since a sentence like (16) is possible, it needs to be assumed that a raising predicate like *seem* is not a two-place predicate but a three-place predicate such that one of the three arguments has no semantic effect whatsoever.

- (16) The students seemed to themselves to be geniuses.

Given these assumptions, binding condition A can now be stated as in (19). The term *outranking*, used in (19), is defined in (17). The term *exempt anaphor*, also used in (19), is defined in (18). What is called the *initial semantic representation* of a sentence here is the MRS representation that the grammar initially produces for the sentence. What is called the *final semantic representation*, on the other hand, is the semantic representation that is produced by the rewriting mechanism responsible for *respectively* interpretation and that expresses the correct truth conditions of the sentence. In the case of sentence (1), the initial semantic representation expresses the proposition that both Chris and Pat read both Austen and Beckett, and the final semantic representation expresses the proposition that Chris read Austen and Pat read Beckett.

- (17) Let E be an elementary predication and let X and Y be variables contained in E . We say that X *outranks* Y if and only if (i) X is the `SUBJECT` value of E and Y is not, (ii) X is the `OBJECT` value of E and Y is neither the `SUBJECT` value nor the `OBJECT` value of E , or (iii) X is the `SECONDARY-OBJECT` value of E and Y is not the `SUBJECT` value, the `OBJECT` value, or the `SECONDARY-OBJECT` value of E .
- (18) An elementary predication E of the form shown in (15) is an *exempt anaphor* in a semantic representation M if M does not contain an elementary predication in which the `REFLEXIVE` value of E is outranked by some other variable.
- (19) Binding Condition A:
Suppose that E is an elementary predication of the form shown in (15) that is contained in an initial semantic representation M and that E is not an exempt anaphor in M . Then the final semantic representation that is derived by applying (possibly vacuously) to M the rewriting mechanism responsible for *respectively* interpretation must contain an elementary predication in which the `REFLEXIVE` value of E is outranked by the `ANTECEDENT` value of E .

Note that (19) states that an anaphor is exempted from binding condition A if it is an exempt anaphor in the *initial* semantic representation. The reason the exempt status of an anaphor needs to be determined according to the configuration of the initial semantic representation is that a sentence like (20) is acceptable.

- (20) The artist _{i} says that the characters in her comics are based on her favorite colors, purple and grey, and represent herself _{i} and her boyfriend respectively.
<https://www.demilked.com/adorable-relationship-comics-the-avr-method/>

The reflexive pronoun *herself* in (20) would be incorrectly predicted not to be an exempt anaphor if the exempt status of an anaphor were to be determined according to the configuration of the final semantic representation.

Binding condition B, i.e. the constraint on the interpretation of personal pronouns, can be formulated as follows.

- (21) Binding condition B:
Let E be an elementary predication of the form shown in (14) which is contained in a final semantic representation M . Then the `PRONOMINAL` value j of E must be disjoint in reference from each variable that outranks j in an elementary predication contained in M .

This formulation of binding condition B makes correct predictions not only about examples like (8) and (9) but also about examples like (22) below, which is not correctly ruled out by the version of binding condition B presented in Pollard and Sag (1994).

(22) *We like me. (from Lasnik (1989, Chapter 6))

5 Conclusion

Yatabe and Tam's theory of *respectively* interpretation entails that binding conditions A and B need to be formulated as constraints on the form of semantic representations. It is possible to formulate the two binding conditions as such constraints, although doing so requires some information expressed in syntactic representations to be duplicated in semantic representations.

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