

Expressing numerical uncertainty

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In Russian, numeral expressions can be made approximate through Approximative Inversion (AI), whereby a noun and number appear to invert, as shown in (1b).

- (1) a. Ivan pročital dvadcat' knig.
Ivan read twenty books
'Ivan read twenty books.'
- b. Ivan pročital knig dvadcat'.
Ivan read books twenty
'Ivan read approximately twenty books.'

Approximative Inversion has been analyzed as head movement such that a head containing the noun raises to the left of the numeral. This, however, leads to incorrect semantics, so here I propose that Approximative Inversion involves post-nominal generation of the numeral in a reduced relative structure, where it is associated with a feature marking speaker uncertainty.

Semantics of AI: Despite the name Approximative Inversion, AI does not always pattern with other approximators: an AI construction like *knig dvadcat'* can be felicitous in contexts where *priblizitel'no dvadcat' knig* 'approximately twenty books' and *20-25 knig* '20-25 books' are infelicitous (Pereltsvaig 2006). Instead, AI seems to express the speaker's public uncertainty with respect to the numeral, patterning like the English *maybe* (as in *John read maybe twenty books*). A speaker-uncertainty analysis of AI, however, does not immediately explain why AI generally yields an approximative reading, and furthermore it turns out that AI is not felicitous in all speaker-uncertain situations. Here I propose that AI marks the speaker's uncertainty with respect to the numeral, and information contributed by the numeral is what leads to approximative readings and explains the infelicity of AI in certain speaker-uncertain contexts.

The analysis in a nutshell is that a numeral contributes information which, when used by the hearer to compute alternatives, causes closer numbers to be more likely alternatives to the number expressed and leads to a set of alternatives that looks like approximation. Consider that when a speaker marks some element X as uncertain, a hearer may entertain alternatives to X, using available relevant information to compute these alternatives. For example, consider the case where $X = a \text{ newspaper}$, as in *What John read was maybe a newspaper*. Here, *maybe a newspaper* may lead to a set of alternatives like {a newspaper, a magazine, a book}. The case we are interested in, however, is where X is a scalar numeral, like 20. A scalar X is defined with respect to a scale, and this scale has information about what's similar to X, i.e. what is scalarly close to it (e.g. $X+1$ is more like X than $X+2$). If this information is used in computing alternatives, this can tell the hearer that the closer numbers are more probable alternatives. And it appears that this information IS used for computing alternatives in AI: since the speaker used a numeral (which is defined with respect to a scale), the hearer faces pragmatic pressure to use this information in computing alternatives. Using this closeness information leads to a set of alternatives like $\{X-2,$

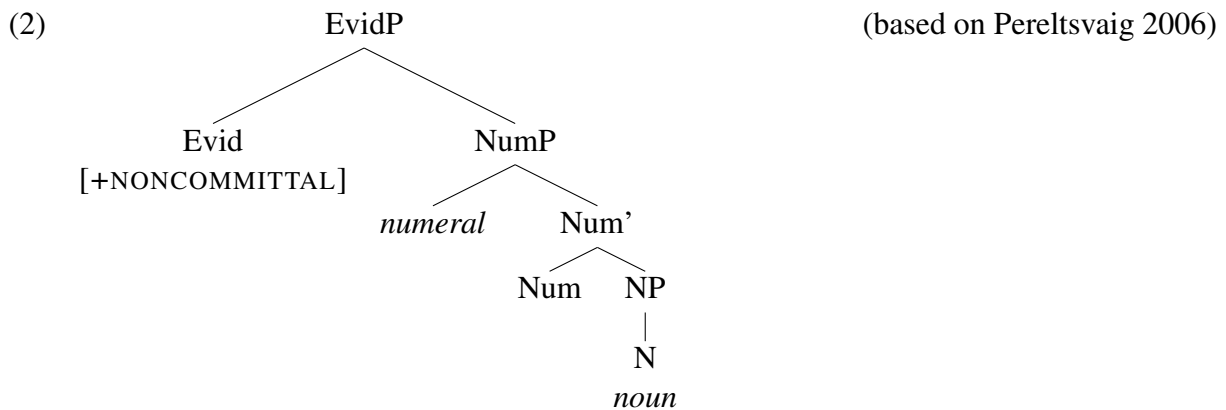
X-1, X, X+1, X+2}, demonstrating how a scalar numeral marked with speaker uncertainty can lead to an approximative reading.

To see this analysis on a more concrete example, consider again the sentence in (1b). Here, the speaker has used the scalar *dvadcat* ‘twenty’ and has marked his uncertainty with respect to it. Since it has been marked as uncertain, the hearer may wish to entertain alternative numbers of books that Ivan may have read. Since the speaker has gone to the trouble of using a scalar, the hearer faces pragmatic pressure to use the information associated with the scalar in computing alternatives, and since this information says that numbers closer to 20 are more similar to 20 and therefore more likely, the hearer will entertain alternatives close to 20, coming up with a set like {18, 19, 20, 21, 22}, which resembles approximation.

An additional piece of information is needed to account for the semantic distribution and interpretation of AI: scalars are associated with information not just about what is close to them (e.g. X+1 is closer to X than X+2) but also about what is close ENOUGH to them. You can get a sense for this by considering round numbers (see Krifka (2009) for a worked-out analysis). For example, in the right context you can use the numeral *twenty* to express the quantity 22, but you are unlikely to be in a context where you can use the numeral *twenty* to express the quantity 36 (i.e. 36 would not be close enough to 20). So, in my discussion of the derivation of (1b) I assumed that e.g. 22 was close enough to 20 to be a likely alternative, but 23 was not. This information is relevant to the speaker-uncertain situation I referred to above where AI is infelicitous: there the information contributed by the scalar is inconsistent with other relevant information used in computing alternatives (i.e. the two pieces of information overlap only on the expressed numeral, which is inconsistent with speaker uncertainty), leading to AI’s infelicity.

Syntax of AI: AI has generally been viewed as head movement of the noun to check some approximation-related feature, and while this analysis has certain advantages, we will see that it is ultimately problematic semantically.

At first glance, head movement provides a rather tidy account of AI. Consider the structure in (2), proposed by Pereltsvaig (2006). Here the noun moves to the left of the numeral, resulting in the correct word order. This movement is motivated by feature checking, and the relevant feature, [+NONCOMMITTAL], is one which marks the speaker’s public uncertainty. Thus, head movement seems to provide a rather parsimonious explanation for the meaning and form of AI (though see Yadroff and Billings (1998) among others, which use approximation, not uncertainty, features).



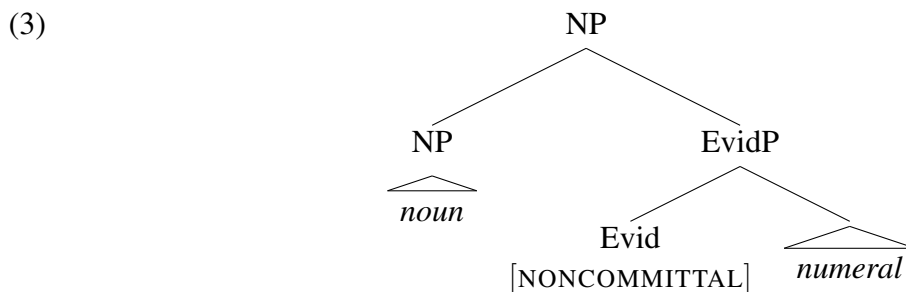
There is further evidence pointing toward a head movement analysis. For one, it seems that AI cannot move anything larger than the noun. This is predicted by a head movement analysis, where only the head, without its complement, moves. Another piece of evidence involves the head movement constraint, which states that a head may not skip an intervening head. It appears that when an adjective is involved, AI is impossible. If the adjective occupies an intervening head, this pattern is expected under a head movement account, since the noun would be required to skip an intervening head, violating the head movement constraint.

Ultimately, however, AI is not as clean cut as a head movement analysis suggests. First, it is not clear that adjectives should be considered intervening heads (cf. analyses which place the AP in specifier position such that A does not intervene). Additionally, it appears that the noun can skip an intervening head containing the preposition, which should violate the head movement constraint.

The most formidable problem facing a head movement analysis, however, is semantic. Consider again the structure in (2). Here, the noun head-moves to check a feature to the left of the numeral marking the speaker's uncertainty. The problem here is that it is the noun that is checking this feature. Consider the interpretation that would be expected from (2). A compositional account predicts $[[N [+NONCOMMITTAL]]] = \text{noncommittal}(N)$, which for a sentence like (1b) should mean that Ivan read 20 things which were maybe books. This, however, is not what the sentence means. Rather, the sentence means that Ivan read some number of books which was maybe 20, i.e. the uncertainty is with respect to the numeral, not the noun.

Yadroff and Billings (1998) recognized this problem and, instead of head-moving N, they head-moved Meas. Meas is the head of a functional projection where [COUNT] is checked, and it is where units or measure words appear. However, when we consider the interpretation expected from this analysis, a compositional account predicts $[[Meas [+NONCOMMITTAL]]] = \text{noncommittal}(\text{Meas})$, which, for a sentence like (1b), should indicate that you're unsure about the unit of book measurement. This, again, is not what the sentence means.

Given these problems associated with the head movement analysis, a different type of syntactic structure seems in order. The semantics of AI suggests a structure like that in (3), where instead of relying on approximative-feature checking to move the noun to a pre-numeral position, the numeral in AI is generated in a post-nominal relative structure. This achieves the correct word order while associating the numeral, not the noun, with [NONCOMMITTAL].



This type of structure resembles Cinque (2005)'s analysis of post-nominal modification, which involves a post-nominal (reduced) relative clause. This structure also makes AI parallel to similar Russian post-nominal modification constructions, shown in (4), which are less suggestive of head movement and more suggestive of post-nominal modification (especially (4b)).

