Approximative Inversion Revisited[*]

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Approximative Inversion (AI) is a rather puzzling construction in Russian and other East Slavic languages. In this construction the noun and the numeral appear in an inverted order, yielding an approximative reading, as demonstrated 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[1] twenty books.'

This construction has received some attention, notably in Yadroff & Billings (1998) and Pereltsvaig (2006), and these analyses have had some success, but are limited in scope. In this paper I support the semantic findings of Pereltsvaig but suggest a different syntactic view. I argue, counter to previous analyses, that in AI the numeral is located in a post-nominal relative structure where it is associated with an epistemic modal operator which gives rise to an approximative reading.

1. The Semantics of AI

The goal of this section is to explain when AI is felicitous, as well as what AI means when felicitous. In the past AI has been assumed to be

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[1] I will use the term *approximately* in AI translations, though this is not quite accurate.

roughly equivalent to one of two options: an approximator (English paraphrase *approximately #*, indicating that the number is imprecise and falls within some range; Billings 1995; Billings & Yadroff 1996; Yadroff & Billings 1998) or an uncertainty marker (English paraphrase *maybe #*, indicating speaker uncertainty with respect to the numeral; Pereltsvaig 2006, following Mel'čuk 1985). I will argue that AI acts as an uncertainty marker, but to do this, I will be forced to resolve two problems. First, on the surface AI patterns like neither an approximator nor an uncertainty marker, and second, it is not clear how uncertainty itself would lead to an approximative reading.

1.1 AI in context

On the surface, AI does not look like an approximator or an uncertainty marker, as we can see by examining two examples of AI in context. As demonstrated in (2a), AI is felicitous in a speaker-uncertain context, unlike other approximators in (2b) and (2c), suggesting that AI functions as an uncertainty marker, not an approximator.

(2) Birthday example: (Pereltsvaig 2006:284)
Masha is going to a colleague's birthday party and is asked how old that colleague is. Since she doesn't know him very well, she is guessing his age from his looks, etc. In this situation, Masha's reply can use the approximative inversion in [(2a)], but not any other approximative strategy, such as using *priblizitel'no* 'approximately' or an interval:

a. let tridcat'
years thirty

b. #priblizitel'no tridcat' (let)
approximately thirty years

c. #30-35 let
30-35 years
'approximately thirty years'

Now consider (3). If AI were an uncertainty marker, as suggested in (2), it should be felicitous in the uncertain context in (3), but it is not.[2]

(3) Zodiac example:
You're talking to an acquaintance, and she tells you her brother was born in the year of the ox, which for present purposes means he's 11, 23, 35, 47, 59, 71, or 83 years old. This acquaintance is in her thirties, so your best guess would be that her brother is 35 (as opposed to 11, 23, etc.).
let tridcat' pjat'
years thirty five
'approximately thirty-five years'

So while in (2) AI patterns with uncertainty markers and with not approximators, in (3) AI does not pattern with uncertainty markers. To reconcile this, in the following section I propose that AI marks the speaker's uncertainty with respect to the numeral. The numeral itself leads to an approximative reading and the contrast in felicity between (2) and (3).

1.2 Deriving approximation from uncertainty

The present question is how AI results in an approximative reading if it is a marker of speaker uncertainty. First, we can consider the English exchange below. In (4) Bill marks his uncertainty with respect to the numeral using *maybe*. Ann ultimately does not know how many books are in Bill's office, but he is likely to consider quantities close to 30 more likely, much as if Bill had responded *Approximately thirty*.

(4) Ann: How many books are in your office?
Bill: Maybe thirty.

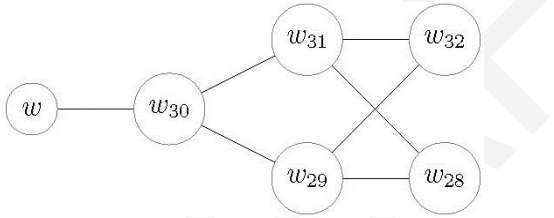
So, uncertain numerals like *maybe thirty* do seem to lead to approximative readings in the right context, namely ones in which the

[2] The response in (3) is felicitous if it indicates that the brother is very close to 35 years old, give or take a few days. It cannot, however, mean that he is exactly 35 or exactly 47 or exactly 23, etc.

numeral has a scalar interpretation. Now that we see approximation arising from uncertainty, we must determine how this happens.

I propose that *maybe* is a modal with a certain type of modal base and ordering source that can lead to an approximate interpretation of numerals. I assume a possible world semantics (Kratzer 1981, 1991) where the modal base determines which worlds are accessible from a given world *w* (accessible worlds are the ones in which all the propositions in the modal base are true), and the ordering source determines how close the accessible worlds are (w_a is as least as close to *w* as w_b iff all the propositions in the modal base that are true in w_b are also true in w_a). We want the modal base and ordering source to be such that (4) results in (5), where only worlds where the number of books is close to 30 are possible, and worlds where the numbers closer to 30 are more likely[3].

(5)



To arrange this, we must make explicit the relevant information about the probability of different alternatives, as well as and how to have this probability information appropriately entered into the epistemic modal base and ordering source.

It has been suggested (e.g. in Krifka 2009) that numerals are associated with information about how close other values are to that numeral, as well as which values are 'close enough' to them. This information shows up in round numbers. For example, in the right context you can say *This book cost* \$*30* even if it cost \$29.50. You might also be able to say this if the book cost \$28 or maybe even \$27, but not \$20, which is not 'close enough'. This range information is

[3] In (5) the circles represent sets of worlds where the subscripted numeral is the number of books in Bill's office in that world. Lines represent accessibility.

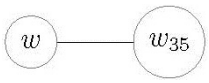
psychologically real[4], and I propose that using numerals makes it salient such that it can enter possible-word computations.

Given that this information is associated with numerals, I propose that when used in a modal context the modal base contains information about what values are close enough to be plausible and the ordering source contains information that orders more closely the worlds with values closer to the actual numeral (see Zaroukian 2010 for details). AI can then be analyzed as involving a modal operator, just like *maybe*, which explains why it can be interpreted as marking uncertainty as well as approximation.

Applying this analysis to the birthday example in (2), the epistemic modal base contains worlds where the value is close enough to 30 to be plausible, which in this context we will say is [28 − 32]. However, it also contains the belief that it is this colleague's birthday, excluding intermediate ages, like 28 years and three months. The resulting arrangement of worlds is the same as (5), where the only possible worlds are ones where the value is close (in this context, between 28 and 32) to 30.

Note that true approximators like (2b) *priblizitel'no* 'approximately' are infelicitous in this context. This follows from their status as range-denoting expressions, blind to non-range-related contextual information. In (2), this means that *priblizitel'no* 'approximately' is oblivious to the fact that is it this colleague's birthday and will therefore suggest that intermediate ages like 28 years and three months are possible. This conflicts with the hearer's knowledge, leading to infelicity.

In the zodiac example in (3) the modal base contains worlds where the value is close enough to 35 to be plausible, say [32 − 38], but it also contains the belief that this person is 11 or 23 or 35 etc. This leaves only one possible value, 35, which is inconsistent with uncertainty and leads to infelicity. The result is sketched in (6).

(6) 

[4] This is seen, for example, in our ability to perceive quantities. Our likelihood of perceiving a quantity as corresponding to a particular value is reflected by a normal distribution around the actual quantity with the standard distribution depending on that actual quantity (see Dehaene 1997, among others).

So, AI is not mere approximation. Rather, it marks speaker uncertainty in a way that only allows close alternatives to the numeral expressed, which results from information contributed by the numeral (the same kind of information we see in number roundness). AI can accommodate contextual information, though if this information conflicts with the information contributed by the numeral, it can lead to infelicity, as seen in the zodiac example in (3).

2. Syntax of AI

Given the uniqueness of AI as an approximation structure, it is not surprising that previous analyses have focused on its syntax. The goal of this section is to show some challenges facing a satisfactory syntactic account and argue for a new way to surmount them. Specifically, I argue for a structure where the numeral combines directly with an epistemic modal operator, as suggested by the semantic analysis above, but in a post-nominal reduced relative structure.

2.1 Head movement analysis

Most analyses have claimed that AI is head movement of the noun to check some approximation-related feature (Billings & Yadroff 1996; Yadroff & Billings 1998; Pereltsvaig 2006), and indeed much data on AI seems to support a head movement analysis. For one, it appears that nothing bigger than the noun can move, as shown in (7).

(7) PP stranding (Pereltsvaig 2006:278)

a. desjat' [pobed [$_{PP}$ nad vragom]]
   ten victories over enemy$_{INST}$
   'ten victories over the enemy'
b. pobed desjat' [[$_{PP}$ nad vragom]]
   victories ten over enemy$_{INST}$
   'approximately ten victories over the enemy'
c. * [pobed [$_{PP}$ nad vragom]] desjat'
   victories over enemy$_{INST}$ ten

This is expected if AI is head, not phrasal, movement of the noun. Additionally, it appears that other heads can block movement, as in (8).

(8) Adjectives (adapted from Pereltsvaig 2006:279)
a. desjat' dovol'nyx lingvistov
ten satisfied linguists
'ten satisfied linguists'
b. (*dovol'nyx) lingvistov (*dovol'nyx) desjat' (*dovol'nyx)
(satisfied) linguists (satisfied) ten (satisfied)
'approximately ten satisfied linguists'

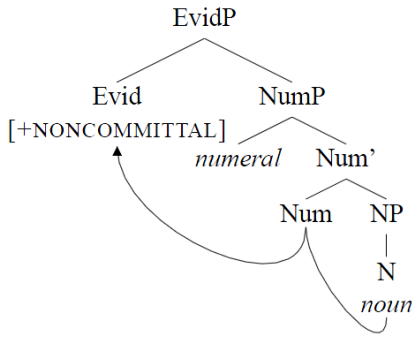
Again this is expected if AI is head movement of the noun, since head movement is blocked by an intervening head, which the adjective *dovol'nyx* 'satisfied' is here assumed to be.

However, there are several problems with this analysis. First, note that (8) only supports a head movement account if a structure like [$_{AP}$ A [$_{NP}$ N]], not [$_{NP}$[$_{AP}$ A] N] (cf. Cinque 2010), is assumed, where the head A is in an intervening position. Second, the word order *noun P numeral* is often possible as in (9), where P should be an intervening head blocking head movement.

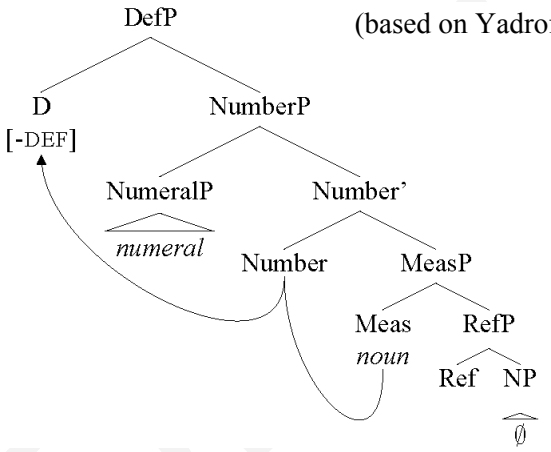
(9) knig za pjat' (Billings & Yadroff 1996:46)
books$_{GEN.PL}$ for five
'for approximately five books'

These objections aside, (10)-(11) provide head movement structures which may derive the right word order. In (10) the noun in N moves to Evid(ential) to check a feature marking speaker uncertainty. In (11), the noun is phonologically null in N while a phonological realization of the noun in Meas(sure) moves to D to check a non-definite feature.

(10) (based on Pereltsvaig 2006)



(11) (based on Yadroff & Billings 1998)



However, an even greater problem emerges upon considering the semantic effect of this feature checking. If AI is N-movement as in (10), AI should compose as in (12), according to which the example in (1b) would incorrectly mean *Ivan read 20 [maybe books]*, where it is what Ivan read that the speaker is not sure about, not its quantity.

(12) ⟦N [+NONCOMMITTAL]⟧= noncommittal(N)

If AI is Meas-movement as in (11), AI should compose as in (13), according to which the example in (1b) would mean *Ivan read an*

indefinite measure of 20 books, where checking a formal [-DEF] feature on Meas leads to an indefinite quantity (i.e. approximative) reading.[5]

(13) ⟦Meas [-DEF]⟧ = indef(Meas)

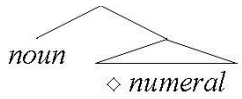
It far from obvious, however, why approximation should result from a formal [-DEF] feature, and if it did, it is not clear that this is the desired reading. Recall from section 1.1 that AI is not simply approximation and seems to mark speaker uncertainty. To solve this, some other feature like [+NONCOMMITTAL] could be added to D. But if this feature combines with Meas and Meas combines with the noun, then this feature should have ramifications for the interpretation of the noun as well, such that (1b) would incorrectly mean *Ivan read [maybe [20 units]] of books*. Additionally, it is not clear that having the noun null in N and pronounced in Meas is ideal, especially if its motivation is an analysis that yields the wrong semantics for AI.

Head movement may be salvageable if we drop compositionality and allow the feature [+NONCOMMITTAL] checked on the noun to have a semantic effect on the numeral, but this would be a costly departure from standard assumptions about the mapping between syntax and semantics. It appears that a semantically satisfying head movement analysis of AI is far from obvious.

2.2 A different kind of analysis

Given these problems with a head movement account, we might consider a different approach, treating the numeral like a post-nominal modifier with a structure like (14).

[5] As rightly pointed out by an anonymous reviewer, this argument depends on assumptions about feature interpretation. For instance, a negative feature in Neg° does not negate a negative particle that it houses; rather it negates the elements in its scope. In the case of negation, however, the feature and the particle, in a sense, share a denotation, and the feature is not used to motivate movement of the negative particle to Neg°. The relationship between a noun and [+NONCOMMITTAL] is much different, so we do not expect it to behave like negation. Conceivably, [+NONCOMMITTAL] could act on elements in its scope with the noun appearing outside of this domain. I know, however, of no motivation for movement to an arrangement of this sort.

(14) 

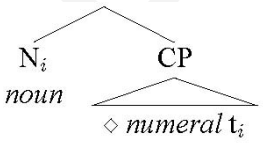
This way, the semantics work out as desired. An epistemic modal possibility operator ◊ combines with the numeral, not the noun. This achieves uncertainty by combining the numeral directly with ◊ and approximation is achieved as described in section 1.2, by incorporating information about which numerals are likely (i.e. the 'close enough' ones) into the modal base and ordering source.

This structure, however, brings up a new problem: how could a structure like (14) match the success of the head movement analyses in dealing with the PP-stranding and adjective data in (7) and (8)? The solution may fall out from a raising analysis of relative clauses.

Under a raising analysis of relative clauses, the head of a relative clause begins within the relative clause and raises to its surface position, where raising is triggered by a strong selectional feature on the external D for a [+N] category (Kayne 1994; Bianchi 1999; Bianchi 2000). This is demonstrated in (15), where the NP *picture* originates as the complement of *liked* and moves out to its surface position.

(15) $[_{DP}$ the $[_{CP}[_{NP}$ picture $]][C^0[_{XP}[_{DP}$ which $t_{NP}\,]_i[X^0[_{IP}$ Bill liked $t_i\,]]]]]]$ (Bianchi 2000:130).

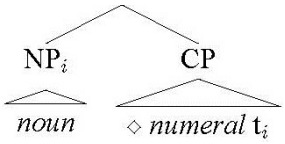
If the post-nominal modifier in AI were a relative clause that the noun moved out of, this could account for the PP-stranding and adjective data is two different ways. For one, instead of raising an NP as in (15), in AI perhaps only N head-moves, as in (16).

(16) 

This works for PP stranding data in (7), where only the N, not the whole NP, moves out of the relative clause, stranding the PP. This works as well for the adjective data in (8) if A blocks head movement of N.[6]

Alternatively, AI may be standard NP-movement as in (15) and (17), but with prosodic constraints at play, as proposed by Billings (1995). For example, it could be stipulated that the moved NP must be a single prosodic word (i.e. a constituent with single word stress, with certain exceptions, Billings 1995). This works for PP stranding data in (7), where the NP moves leaving a PP adjunct behind. It likewise accounts for the adjective data in (8) using an analysis of adjectives which places them within the NP ($[_{NP}[_{AP}$ A] N]), since adjectives would make the NP more than one prosodic word.

(17)



In other words, under a prosodic account adjectives block AI since they occur within the to-be raised NP, making it more than one prosodic word. Prepositional phrases, on the other hand, do not block movement and are instead stranded, since the raised NP does not contain the adjoined PP ($[_{NP}[_{NP}$ N] PP]).

A raising analysis of relative clauses solves another problem associated with the type of structure in (16): noun declension. In (1), repeated below in (19), the quantified noun appears in genitive case regardless of inversion (cf. non-quantified noun in (19c) appears in the accusative case). Number marking on the noun similarly depends on the numeral, also shown in (19). With the structure in (16), it is not obvious the number and case marking in AI can be accounted for.

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[6] Other arguments for a head movement analysis follow under this analysis as well, including case asymmetries. Pereltsvaig (following Baylin 2004) argues that oblique case is associated with the number in head, which blocks head movement of the noun and explains the impossibility of AI with oblique-case numerals. In (17), this same explanation holds, since a numeral in an intervening head position would block N from raising out of the relative clause. The NP-movement analysis below, however, cannot as straightforwardly account for this contrast.

(18) a. Ivan pročital {dvadcat' knig /četyre knigi}.
Ivan read {twenty books$_{GEN.PL}$/four books$_{GEN.SG}$}
'Ivan read twenty/four books.'

b. Ivan pročital {knig dvadcat'/knigi četyre}.
Ivan read {books$_{GEN.PL}$ twenty/ books$_{GEN.SG}$ four}
'Ivan read approximately twenty/four books.'

c. Ivan pročital knigi.
Ivan read books$_{ACC.PL}$
'Ivan read books.'

A solution is suggested by inverse case attraction, where a relative clause head appears with internal case (Bianchi 1999). For example, in the Latin example in (20) 'city' is expected to be nominative ('The city ... is yours'), but it seems to be receiving accusative case through its relation within the relative clause.

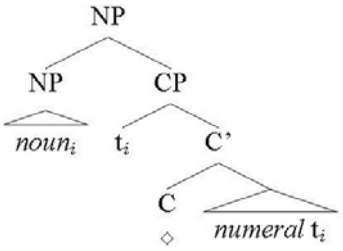
(19) Urbem quam statuo vestra est. (Bianchi 1999:93)
city$_{ACC}$ which$_{ACC}$ found yours is
'The city that I found is yours.'

Inverse case attraction has been taken as evidence for a raising analysis of relative clauses. The head of a relative clause begins within the relative clause and retains case and number agreement as it moves out to its surface position. So, whatever mechanism causes this to occur for inverse case attraction may also be operative in AI.

There is a variety of additional evidence in support of a structure like (16). For one, analyzing post-nominal modifiers as relative clauses is well precedented (see Cinque 2010 and references therein). Additionally, others have proposed covert-modal-containing relative clauses, notably Bhatt (1999), who analyzed non-finite modifiers as modal-containing relative clauses.[7] Following Bhatt, the structure in (16) may then be drawn more precisely as (21), with a covert modal in C.

[7] Unlike in Bhatt's analysis, the modal in AI would be epistemic (not bouletic) and reconstruction of the NP within the relative clause would be prohibited (not obligatory). If a modal analysis turns out to be untenable, we could rely again on feature checking with a structure like [$_{NP}$[$_{NP}$ noun] [$_{EVIDP}$ Evid+[+NONCOMMITTAL]+numeral] t$_{numeral}$]

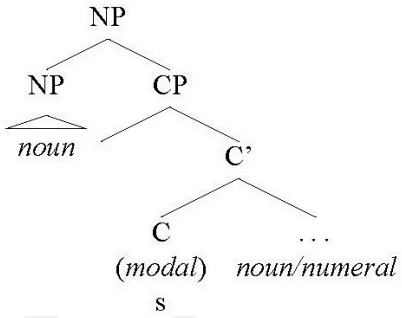
(20) (Based on Bhatt 1999)



Furthermore, this analysis of AI suggests parallels between AI and similar constructions. In the approximative phrases in (22), *s* could be an overt realization of a modal in C, using a similar structure like (23).

(21) a. osetrof s sorok (Billings 1995:12)
sturgeons$_{GEN.PL}$ S forty$_{ACC}$
'about forty sturgeons (archaic)'
b. mal'čik s pal'čik
boy S thumb$_{ACC}$
'boy (about) the size of a thumb, Tom Thumb'

(22)



3. Conclusion

Here it has been proposed that AI marks uncertainty on the numeral, which leads to an approximative interpretation of that numeral. More specifically, the numeral is associated with information about the closeness of different values and about which values are 'close enough', and AI involves a modal such that the information contributed to the modal base and ordering source by the numeral only allows close values as alternatives to the numeral expressed. Head movement of the noun

alone, which has been the dominant syntactic analysis of AI, has difficulty explaining the semantics, but base-generating the noun in a post-nominal relative structure like (16)/(21) can provide a coherent semantic, as well as syntactic, analysis.

A number of complications in AI have gone unaddressed in this paper and stand as a challenge for any comprehensive analysis, including the head movement analyses discussed above. Among these are case asymmetries, variability and restriction on preposition placement, the impossibility of AI with head nouns like 'one' and 'billion' (Franks 1995), AI's preference for non-agreeing verbs when in subject position, and AI's inability to serve as antecedent for *drug druga* 'one another' (Franks 1995). While the analysis presented here attempts to correct some inadequacies of previous analyses, much work remains to be done on this unique and puzzling structure.

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