An Alternative Account of Imprecision

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Introduction: Round numbers are known to allow imprecise or approximate interpretations: for example, (1a) might be used felicitously if a couple more or fewer than 100 people attended, (1b) to describe a rope whose true length diverged slightly from 50 meters, and (1c) for an arrival time of 3:00 plus/minus a few minutes. (Im)precision can also be regulated overtly with approximators such as *roughly, about* and *exactly* (2).

(1) a. There were 100 people at the rally.
b. The rope is 50 meters long
c. Mary arrived at 3:00.

(2) a. There were about 100 people at the rally.
c. The rope is roughly 50 meters long.
b. Mary arrived at exactly 3:00.

Based in part on facts relating to the comparative, we defend a novel analysis of imprecision based on the notion of granularity, construed here in terms of sets of alternatives.

Two Theories: There are two leading approaches to imprecision. Lasersohn '99 considers it to be loose talk, and models it via **pragmatic halos (PH)**, sets of entities which differ from an expression's denotation in only pragmatically ignorable ways. The halo of *3:00*, for instance, would consist of times 'close enough' to 3:00. Approximators like *about/exactly* operate on halos. In the **scale granularity (SG)** approach (Krifka '07, Sauerland & Stateva '07), measurement results can be reported w.r.t. scales that differ in their granularity level, conceptualized as density of scale points. The approximate interpretation of *3:00* might involve a scale measuring time in 15-minute increments. Imprecision involves interpretation relative to a coarse-grained scale; approximators work by determining scale choice.

Data: Some initial facts support SG over PH. In particular, not all values pattern the same w.r.t. approximation: While the round numbers in (1) can be interpreted approximately, non-round numbers (e.g. *97, 3:01, 49 meters*) must be interpreted (more) precisely. This is problematic for PH. If the difference between 3:00 and 3:01 is pragmatically ignorable, such that 3:01 is in the halo of 3:00, then we would expect 3:00 also to be in the halo of 3:01 (i.e. 'different only in ignorable ways' should be symmetric). But 3:01 cannot be felicitously used for a time closer to 3:00. Under SG, this is accounted for in that 3:00 occurs on a coarser-grained scale than 3:01.

However, other data are not explained by either PH or current theories of SG.

i) Comparatives are precise. While the values in (1) can be read approximately, the same values in comparatives cannot. (3) does not have a reading on which it is true if 99 attended (though 99 is greater than 98, a value that could count as roughly 100), nor one where it is false if 101 attended (though 101 also falls within the approximate interpretation of 100).

(3) There were more than 100 people at the rally.

To account for this via PH, we would need to stipulate that the comparative has the function of reducing the halo of a measure expression to the trivial one. SG would require a similar stipulation that the comparative necessarily selects for fine scale granularity.

ii) Approximators are NPIs. A previously unnoticed pattern is that in positive sentences, overt approximators are disallowed in comparatives (4a) (with the exception of echo contexts). But oddly, they are grammatical in the corresponding negative sentences (4b) and other NPI-licensing contexts, e.g. (4c):

(4) a. *There were more than about/roughly/approximately 100 people at the rally.
b. There weren't more than about/roughly/approximately 100 people at the rally.
c. If there were more than about/roughly/approximately 100 people at the rally…

For PH there is first of all an interpretive challenge: in examples like (2), approximators might be analyzed in terms of existential quantification over halo elements, such that (2a) would be true iff $\exists n \in$ *Halo(100)* s.t. *n* attended. But (4b) does not mean that there does not exist an *n* close to 100 s.t. more than *n* attended; this would entail that no more than the minimum number describable as *about 100* attended, when intuitively (4b) means that no more than the maximum in that range attended. To solve this, it would be necessary to replace existential with universal quantification, or stipulate that the existential quantifier always scopes over negation and other operators. Here SG has an advantage, in that *about 100* denotes an interval of the scale as a single unit, with (4b) asserting that this interval is not exceeded. But current SG approaches, in common with PH, do not explain the contrast between (4a) and (4b,c).

Proposal: We propose a novel granularity-based analysis of imprecision in which distinct granularity levels are modeled as sets of alternatives to the mentioned expression. For example, two possible sets of alternatives to *50 meters* (5 meter and 1 meter levels) are:

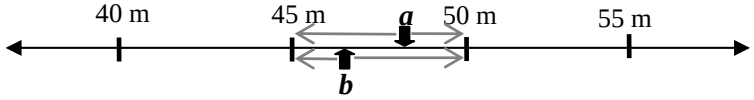
(5) a. $ALT_{5\ meters}$*(50 meters)* = {…40 m, 45 m, 50 m, 55 m, …}
b. $ALT_{1\ meter}$*(50 meters)* = {…48 m, 49 m, 50 m, 51 m, …}

The choice of granularity level *gran* is contextually determined via an assignment function *g*. Truth relative to a granularity level assignment is then defined as follows:

(6) For a measure expression *n*, $[[\varphi(n)]]^g = 1$ iff for all $m \neq n \in ALT_{gran}(n)$,
$[[\varphi(n)]]^{g[gran=0]}$ is 'closer to true' than $[[\varphi(m)]]^{g[gran=0]}$;
$[[\varphi(n)]]^g = 0$ otherwise

'Closeness to truth' in turn is defined in terms of the scalar distance that the actual measure would need to be displaced to reach a value that would yield truth under a maximally precise (*gran=0*) interpretation. For example, if the actual length of the rope were *a*, (1b) would be true at *gran=5 meters*, because *a* is closer to 50 meters than to the next value, 45 meters. However, if the true length were *b*, (1b) would be false, as 45 meters is closer than 50 meters:

(7)



Values that occur in coarser-grained alternative sets (typically powers of 10 and the results of halving/doubling these) thus allow more imprecise interpretations.

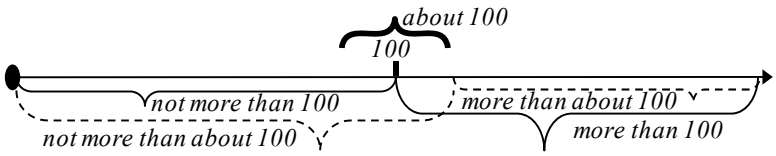
Comparatives: The picture is different for comparatives such as *more than 100* or *more than 50 meters*. No matter how *gran* is set, the definition in (6) ensures that (3) is true if 101 attended, since it is true at *gran=0* with no displacement of the actual value. Likewise, (3) is false if 99 attended, since in that case there is some alternative within $ALT_{gran}(100)$ for which it is true at *gran=0*; for example, if *gran=10*, *more than 90* is such an alternative. Thus (6) derives the necessarily precise interpretation of measure expressions in comparatives without stipulation. The choice of ALT_{gran} turns out not to have a truth-conditional effect; but we show it nonetheless plays a role, specifically in implicature calculation (Cummins et al. '12).

Approximators: The truth definition in (6) has the effect of associating each measure expression with a range of values for which it is true (relative to the assigned granularity level). We propose that this is lexicalized by approximators, which map values to intervals based on some possible granularity level:

(8) $[[APPROXIMATOR\ n]]^g = [n - gran'/2,\ n + gran'/2]$, for some granularity level *gran'*

In the case of expressions such as *roughly* and *about*, *gran'* is set to the coarsest granularity level that is a possible candidate for *gran*; *exactly*, by contrast, selects for the finest possible level. An immediate advantage of (8) relative to previous approaches is that it explains the infelicity of approximators with 0 and other scalar endpoints *(??about/exactly 0 people;* though cf. *about/exactly 0°C)*: if *n* equals 0, $n - gran'/2$ is undefined. Like other versions of SG, (8) derives the correct interpretation for negated approximators in comparatives (4b), in that the modified expression denotes an interval as a single unit. The restriction of such expressions to NPI contexts can then be accounted for in terms of competition with structurally defined alternatives in the sense of Katzir '07. Specifically, the range encompassed by *more than about 100* is contained within that covered by *more than 100*; a speaker in a position to utter the former is thus also in the position to utter the latter, which is favored in that it is briefer and (we will argue) not less informative. But in negative contexts the inclusion relation is reversed: a speaker may be in a position to utter *not more than about 100* without being knowledgeable as to whether *not more than 100* obtains.

(9)



Summary: The present analysis provides further support for a granularity-based approach to imprecision, while also accounting for facts not explained by existing theories of granularity.