Granularity and weak disjunctions

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Data. Considerable attention has been paid recently to the semantics of approximators such as *about*, *exactly*, *more or less*, *some* and their cross-linguistic counterparts (Sauerland and Stateva 2007; Greenberg and Ronen 2013; Anderson 2014). One form of approximating expression that has not to date received a formal semantic analysis is the **Weak Disjunction (WD)** exemplified in (1):

(1) a. There were 40 or 50 people at the party. b. John bought 10 or 15 CDs.

The WD construction has several interesting properties. First, while it has the form of a disjunction, it in fact communicates an (approximate) range: (1a) is not only true if exactly 40 or exactly 50 obtains, but also for values in between. Second, it has a very different communicative effect as an apparently similar range-denoting expression formed with *between* (2): while the examples in (1) express approximations, and impliy speaker uncertainty, (2) suggests precise knowledge of a range. Relatedly, (2) is undoubtedly false in the case where the actual number is 39, whereas (1a) is at least moderately acceptable.

(2) There were between 40 and 50 people at the party.

Finally, and most importantly, not all number pairs produce well-formed WDs. In contrast to the examples in (1), the examples in (3) are at best marginal, and crucially cannot be interpreted as approximations, but only have an 'actual disjunction' reading.

(3) #There were 50 or 40 / 10 or 13 / 18 or 21 / 15 or 25 people at the party.

Pollmann and Jansen (1996) and Eriksson et al. (2010) identify the following 'rules' for the WD construction: i) the two numbers must be in ascending order (thus *#50 or 40 people*, etc.); ii) the gap between them must be a divisor of both values (*#10 or 13*, etc.); iii) the gap must be a so-called favored number, being of the form $\{1/2/2.5/5\} * 10^n$, such as 1, 2, 5, or 10 (*#18 or 21 people*, etc.). These restrictions do not apply to the *between* construction (e.g. *between 10 and 13 people*).

I show that the interpretation of both WD and *between* constructions and the constraints on the former, can be accounted for via **scale granularity**.

Granularity as alternatives. I adopt an analysis of of numerical imprecision based on scale granularity (Krifka 2007)), construed here in terms of **sets of alternatives** to a measure expression. The components of the analysis are as follows: i) Number words have an underlying precise denotation; for simplicity, I follow Kennedy (2015) in taking them to denote quantifiers over degrees (type $\langle dt, t\rangle$) as in (4), which can be lowered to a term meaning (type d). ii) To model granularity, we start with some standard unit *gran*, which yields a standard sequence S_{gran} (e.g. (5)). iii) For a measure expression α and granularity level *gran*, a set of alternatives to α can then be defined as in (6). iv) Finally, truth or falsity of a sentence containing a measure expression is relativized to the granularity level at which that expression is interpreted. More specifically, *gran* is set via an assignment function g; truth relative to *gran* is defined in terms of the scalar distance that the actual exact measure would need to be displaced in order to achieve truth under a perfectly precise ($gran = 0$) interpretation, per (7). In simple terms, a proposition containing a measure expression is thus evaluated as true iff there is no better choice of expression at the relevant granularity level.

(4) $[\![\text{fifty}]\!] = \lambda I_{\langle dt,t\rangle}.\text{max(I)} = 50$

(5) $gran = 10$; $S_{10} = \{10, 20, 30, \ldots\}$

(6) $ALT_{gran}(\alpha) = \{\alpha' : [\![\alpha']\!] \in S_{gran}\}$ e.g. $ALT_{10}(\text{fifty}) = \{\ldots, \text{forty, fifty, sixty}, \ldots\}$

(7) **Truth wrt. granularity level:** For a sentence ϕ containing a measure expression α, $[\![\phi]\!]^g = 1$ iff there is no $\alpha' \in ALT_{gran}(\alpha)$ such that $[\![\phi[\alpha'/\alpha]]\!]^{g[gran=0]} = 1$ would require a smaller scalar displacement of the actual measure than $[\![\phi]\!]^{g[gran=0]} = 1$.

This analysis correctly derives the approximate interpretation of round numbers. For example, (8a) has the semantic interpretation in (8b). But if *gran* is set to a value coarser than 1, (8a) can be evaluated as true even if the actual value deviates somewhat from 50, as long as there is no better alternative to *fifty* at level *gran*; for example, with $gran = 10$, (8a) could be truthfully uttered for values between 45 and 55.

(8) a. There were 50 people at the party.
b. $max(\{n$: there was a group of n people at the party$\}) = 50$

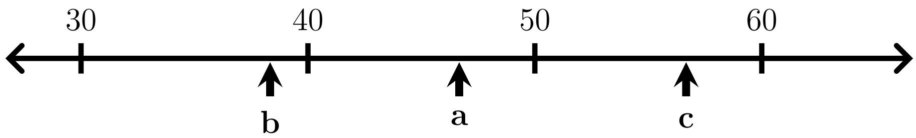
Analysis of WD and *between*. The account given to the simple numerical construction in (8) can readily be extended to weak disjunctions. I first propose that such disjunctions involve two sequential values at some allowable granularity level *gran*. This immediately accounts for the rules governing which number pairs that can occur in WDs, once we make the independently motivated assumption (Krifka 2007) that available choices for *gran* are based on powers of ten and the results of halving and doubling these.

An example such as (9a) then receives the analysis in (9b):

(9) a. There were 40 or 50 people at the party.
b. $max(\{n$: there was a group of n people at the party$\}) = 40$ or 50

Given the definition in (7), (9a) can be truthfully asserted for all values for which *forty* or *fifty* is at least as good a description as any other member of ALT_{10}(forty) (=ALT_{10}(fifty)). This holds in particular for all values in between 40 and 50 (as in **a** in (10)), but also for values outside of this range, as long as they are closer to 40 or 50 than any other value at $gran = 10$ (true for **b** in (10) but not **c**, which is better described by *sixty*). The result is that *40 or 50* effectively conveys an approximate range.

(10)



In contrast to this, *between* constructions directly denote ranges (see (11)), and thus do not require that the two numerals correspond to sequential members of some S_{gran}. Regardless of how *gran* is set, (11a) will be evaluated as true for any value between 40 and 50, since it is already true for such values at $gran = 0$. Conversely, it will be evaluated as false for any value outside of this range, since in that case there will be some other choice of numerals that would make the sentence true at $gran = 0$ (in the case of **b** in (10), one such choice would be *between 30 and 40*). Thus *between* constructions convey ranges with sharp boundaries.

(11) a. There were between 40 and 50 people at the party.
b. $40 \leq max(\{n$: there was a group of n people at the party$\}) \leq 50$

Conclusions and extensions. An analysis of numerical imprecision based on granularity construed as alternatives yields a straightforward semantic analysis of weak disjunctions, and of their differences from range expressions formed with *between.* This represents an advantage over an alternate approach based on Pragmatic Halos (Lasersohn 1999), which does not account for restrictions on which numerals can be used approximately. We discuss further applications of the present approach to approximators such as *about*, both alone (*about 50*) and used in conjunction with WD (*about 40 or 50*).

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