Uncertain numerals

Erin Zaroukian, Johns Hopkins University

We often use words like *maybe* to mark uncertainty in our utterances. When we mark our uncertainty on numerals, however, strange things happen. Below we will see these somewhat unexpected effects of marking uncertainty on a numeral, as well as a for explanation for them using possible world semantics. This analysis will ultimately apply to all uncertain scalars, not just numerals, and it will inform our view on other scalar modifiers like *approximately*.

You can use words like *maybe* to mark your uncertainty with respect to an item as in (1a), and as a result your interlocutor might entertain alternatives to this uncertain item, as sketched in (1b). When the uncertain item is a numeral, there is a strong tendency for the set of alternatives to resemble approximation, as in (2).

(1) a. A: Who won the race?
B: Maybe John.
b. {John, Ann, Pete}

(2) a. A: How many people competed?
B: Maybe twenty.
b. {18, 19, 20, 21, 22}

However, this does not occur for all uncertain numerals (e.g. *Which bus? Maybe the 20*). Furthermore, when this approximation effect occurs, the range of alternatives depends on the numeral (e.g. if you replace *twenty* in (2) with *twenty-seven*, the range tends to be smaller).

These phenomena can be given a formal explanation using Krifka (2009)'s conception of numerals, along with a possible world semantics as described in Kratzer (1991). To begin, we can consider alternatives to be possible worlds (i.e. worlds consistent with the epistemic modal base), and these worlds will be ordered in terms of their plausibility by an ordering source. Following Krifka we can assume that numerals represent a range which can be characterized as the values which fall within one standard deviation of the expressed numeral on a normal distribution over the number line. For example, if we have a context where the standard deviation for *twenty* would be 2, then *twenty* can represent values in the range [18-22]. We can then phrase this in terms of propositions using p_σ, which says that the value represented by *twenty* falls within one standard deviation (σ) of 20, and a family of functions p_x, which says that the value represented by *twenty* falls within $\sigma - x$ of 20 for $0 < x < \sigma$. Now, if p_σ is in modal base and p_x is in the ordering source, we have an explanation for the approximation that arises: only worlds where values close to 20 are true will be accessible, so only these values will be plausible alternatives. We also have an explanation for why approximation does not always occur with uncertain numerals: it only happens with *scalar* numerals, like in (2), not with numerals acting in a non-scalar labeling capacity such that they do not represent normal distributions. And finally if we consider Krifka's pragmatic preference for simple expressions, we have an explanation for why the range of alternatives depends on the numeral: this preference leads more complex numerals like *twenty-seven* to represent smaller ranges (i.e. induce smaller σs) than simpler numerals like *twenty*, and since *twenty-seven* has a smaller σ, its p_σ allows a smaller range of possible worlds, leading to its narrower interpretation as an uncertain numeral.

It turns out that this analysis for the approximative effect of uncertain numeral extends naturally to other scalars, which seem to display the same effect (e.g. colors), suggesting that all scalars behave alike in representing a range characterized by a normal distribution. This analysis can also inform the way we think of other means of approximation. For example, *approximately* gives rise to a similar though not identical meaning (e.g. it shows the same range effects but does not incorporate external information in the same way), and it turns out that this too can be captured by associating scalars with normal distributions.

References: Kratzer, A. (1991). Modality. In A. von Stechow and D. Wunderlich (Eds.), *Handbuch Semantik*, Berlin: Walter de Gruyter. pp. 639–650. • Krifka, M. (2009). *Approximate Interpretations of Number Words: A Case for Strategic Communication*, CSLI Publications. pp. 109–132.