A Vagueness Approach to the Mass/Count Distinction

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Outline Although the grammatical mass/count distinction ultimately depends on lexical selection and is subject to cross-linguistic variation, the perceptual mass/count distinction is determined by the intuitive availability of atomic objects. An illuminating definition of *atomic object* is proposed under the framework built by Chierchia (2010). This analysis facilitates a sensible solution to the problem about counting and it also contributes toward a better understanding of situated interpretation of nouns and the notion of *exemplification* which are central to situation semantics.

Symbolic primitives *Part-of*: $\leq$; *proper-part-of*: $d < d' =_{\text{def}} d \leq d' \wedge d \neq d'$; *sum of* d' *and* d'': $d' \cup d'' =_{\text{def}}$ the minimal object d such that $d', d'' \leq d$.

Mass/count distinction For each noun stem $\mathbf{P}$, $[\![\mathbf{P}]\!]$ is a number-neutral property P. The interpretation P_c of $\mathbf{P}$ relative to a context c is threefold: a positive extension P_c^+ consisting of objects being P, a negative extension P_c^- of those which are not P and a vagueness band P_c^* being the gap characterizing the inherently vague boundary between P-objects and non-P-objects (Chierchia 2010). Generally, an individual d is an *atomic* P*-object* (or P*-atom*, notation: $d \in P_c^{\text{AT}}$) in context c iff it is such a P-object that any division will produce non-P-objects, formally, (1). Differently, the atomic objects falling under some certain nouns, e.g., *rope* and *rock*, which normally have both mass usage and count usage, are defined by connectedness (Moltmann 1998).

Then the perceptual mass/count distinction can be characterized by the lack/existence of atoms defined by (1). Plural objects consist of multiple atoms, while mass objects' lack of atoms follows from the observation that half of a mass object falls under P_c^* (if it is too small to count as $\mathbf{P}$) or P_c^+ (otherwise). Moreover, (1) is compatible with the fact that an atomic object can still be atomic even if some tiny piece is chipped off which is a problem with Bale and Barner (2009) and Chierchia (2010).

Counting principle Since a teapot and its residue after losing a tiny fragment both fall under $\text{TEAPOT}_c^{\text{AT}}$, it poses a problem about counting: there can be many overlapping teapots within a single teapot (Kratzer 2011). The solution is to divide each P-object into disjoint P-atoms, i.e., for each $d \in P_c^+$, pick an $S_d \subseteq P_c^+$ consisting of disjoint P-atom(s) whose sum is d, formally, (2). The number $|d|_{P,c} =_{\text{def}} |S_d|$. Furthermore, in each well-defined structure, no matter which S_d is picked out, $|S_d|$ is expected to be the same for the d at issue as long as (2) holds.

Situation semantics Without explicit modifiers, people can refer to no P-atom that is a proper part of a P-atom within the same situation by $\mathbf{P}$. Therefore, the interpretation of a count noun $\mathbf{P}$ relative to a situation s and a context c (before being associated with determiners) contains the sums of maximal P-atoms within s, formally, (3). In contrast, the situated interpretation of a mass noun $\mathbf{P}$ is (4), as the maximality constraint on count nouns doesn't apply to mass nouns.

A situation s *exemplifies* a proposition p iff (5) is satisfied (Kratzer 2002, 2011). Nonetheless, a situation exemplifying the proposition expressed by (6) remains its exemplification even if the apple loses or gains some water molecules. More generally, the minimality (5) requires should be defined in terms of the discrete *part-of* relation $\prec$ relative to the set C of nouns involved in the proposition at issue, e.g., $C_{(6)} = \{\mathbf{apple}\}$ for (6). Specifically, the minimal situations should be such that (a) none of them can still exemplify the proposition if any atom mentioned in the proposition is removed from it, and (b) no irrelevant object is contained. Formally, $s' \prec_{C,c} s$ iff (7) is satisfied where $s \setminus s'$ is the complement of s' with respect to s, i.e., the maximal part of s that is disjoint with s'.

Conclusion The intuitive definition of atomic object sheds new light on the perceptual mass/count distinction and it also grounds the sensible analyses of intimately related issues.

(1) $d \in P_c^+$ and for all non-overlapping d', d'' (i.e., there is no object x satisfying both $x \leq d'$ and $x \leq d''$) such that $d', d'' < d$, it holds that $d' \in P_c^-$ or $d'' \in P_c^-$.

(2) $\forall x \in S_d[x \in P_c^{\text{AT}}] \wedge \neg \exists y, y' \in S_d \exists z[y \neq y' \wedge z \leq y \wedge z \leq y'] \wedge \bigcup S_d = d$

(3) $[\![\mathbf{P}]\!]_{s,c} =_{\text{def}} \{d \in P_c^+ \mid d \leq s \wedge \forall d' \in P_c^+[d \leq d' \leq s \wedge |d'|_{P,c} = |d|_{P,c} \rightarrow d' = d]\}$

(4) $[\![\mathbf{P}]\!]_{s,c} =_{\text{def}} \{d \in P_c^+ \mid d \leq s\}$

(5) if p is not true in a sub-situation of s, s is a minimal situation where p is true.

(6) There is an apple.

(7) (i) $s' < s$; and (ii) there is a $\mathbf{P} \in C$ such that $|\bigcup[\![\mathbf{P}]\!]_{s',c}|_{[\![\mathbf{P}]\!],c} < |\bigcup[\![\mathbf{P}]\!]_{s,c}|_{[\![\mathbf{P}]\!],c}$, or for some $d \leq s \setminus s'$, $d \not\leq \bigcup_{\mathbf{P'} \in C} \bigcup[\![\mathbf{P'}]\!]_{s,c}$.

Selected References

[1] A. Bale and D. Barner. The interpretation of functional heads: Using comparatives to explore the mass/count distinction. *Journal of Semantics*, 26:217–252, 2009.

[2] G. Chierchia. Plurality of mass nouns and the notion of “semantic parameter”. In *Events and Grammar*. Kluwer Academic Publishers, 1998.

[3] G. Chierchia. Mass nouns, vagueness and semantic variation. *Synthese*, 174:99–149, 2010.

[4] A. Kratzer. Facts: particulars or information units? *Linguistics and Philosophy*, 25:655–670, 2002.

[5] A. Kratzer. Situations in natural language semantics. In *The Stanford Encyclopedia of Philosophy*. <http://plato.stanford.edu/archives/fall2011/entries/situations-semantics/>, 2011.

[6] M. Krifka. Conjunctions, plurals, mass terms, and kinds. <http://amor.cms.hu-berlin.de/~h2816i3x/Lehre/2000_Semantics/SemanticsI-07.pdf>, 2000.

[7] F. Moltmann. Part structures, integrity, and the mass-count distinction. *Synthese*, 116(1):75–111, 1998.

[8] S. Rothstein. Counting and the mass/count distinction. *Journal of Semantics*, 27:343–397, 2010.