

Modifiers of Modal Auxiliaries: New Sources for Ordering Sources

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LSA 2013 Annual Meeting
Boston, MA
Jan. 5, 2013

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Modifying Modals

- Modifiers of modal auxiliaries (MMAs) have not yet been given a formal compositional account.

(1) The vase could easily fall.

- The effect of the MMA in (1) is to strengthen or intensify a modal.

(2) a. The vase could easily fall. → The vase could fall.
b. The vase could fall. → The vase could easily fall.

- Note that this is not the same *easily* as in (3), which could be paraphrased as “with ease”; this use of *easily* requires an agentive verb, which is not present in (2)

(3) a. He could easily lift it over his head. ↔ He could lift it over his head with ease.
b. The vase could easily fall. ↔ #The vase could fall with ease.

- Recent work has shown that at least some modals, like *likely*, are gradable (Yalcin 2007, 2010; Lassiter 2011; Klecha 2012), requiring a modal semantics which is compatible with a Kennedy-style semantics for gradability (Kennedy 1999, 2007; Kennedy and McNally 2005), which allows for the combination of gradable modals with degree modifiers like *more*, *too*, *very*, etc.

- Lassiter (2011) argues in light of this that all modals, even modal auxiliaries, are inherently scalar; so maybe *easily* is like a degree modifier?

(4) a. $\llbracket \text{likely} \rrbracket_{Lassiter} = \lambda p[Pr(p)]$
b. $\llbracket \text{could} \rrbracket_{Lassiter} = \lambda p[Pr(p) \succ 0]$

- But *could* cannot combine with degree modifiers more generally, and *easily* does not combine with anything other than modal auxiliaries.

- Yalcin (2007) argues for a mixed account where some modals are gradable and some have a traditional quantificational semantics; moreover, Klecha (2012a, in progress) specifically rebuts Lassiter, arguing that modal auxiliaries may have a Kratzerian quantificational semantics.

- I propose a semantics for *easily* which allows for it to act as a “possibility intensifier” but without abandoning a Kratzerian quantificational semantics for possibility modals, as Lassiter (2011) does.

- Rather, *easily* restricts the domain of the modal, giving a stronger interpretation

Gradability

- A first cut analysis might be that *easily* is an overt ordering source, which provides a more restrictive ordering

- The modal *could* then takes the best of the worlds in the modal base as determined by this ordering to return a more exclusive modal domain (say, only highly probable or stereotypical worlds)

(5) $\llbracket \text{could} \rrbracket = \lambda \phi[\lambda m[\lambda g[\lambda w[\exists v \in \text{BEST}_{g(w)}(\cap m(w))][\phi(v)]]]]$

- However, *easily* is itself gradable:

(6) a. The vase very easily could have fallen.
b. The piggy bank fell, but the vase just as easily could have fallen.

- An ordering source is a set of propositions from which the modal determines an ordering and narrows its domain

- Klecha (2012a, in progress) argues that degree modification is the primary diagnostic for gradability, i.e., type $\langle \alpha, \langle s, d \rangle \rangle$; given that *easily* combines with degree modifiers, *easily* must denote a measure function

- I argue that *easily* denotes a stereotypical ordering over worlds given an evaluation world

- Thus it is of type $\langle s, \langle s, d \rangle \rangle$

(7) $\llbracket \text{easily} \rrbracket = \lambda v[\lambda w[\text{STEREOTYPICALITY}(v)(w)]]$

Degree Modification

- I take degree modifiers to have the type $\langle \langle \alpha, \langle s, d \rangle \rangle, \langle \alpha, \langle s, t \rangle \rangle \rangle$
- Already needed to account for adjective type variability

(8) $\llbracket \text{tall} \rrbracket^g = \lambda x_e[\lambda w[\text{height}(x)(w)]]$
 $\llbracket \text{just as}_7 \rrbracket^g = \lambda G_{\langle \alpha, \langle s, d \rangle \rangle}[\lambda x_\alpha[\lambda w[G(x)(w) = g(7)]]]$
 $\llbracket \text{just as}_7 \text{ tall} \rrbracket^g = \lambda x_e[\lambda w[\text{height}(x)(w) = g(7)]]$

$\llbracket \text{early} \rrbracket^g = \lambda x_e[\lambda w[\text{earliness}(x)(w)]]$
 $\llbracket \text{just as}_7 \rrbracket^g = \lambda G_{\langle \alpha, \langle s, d \rangle \rangle}[\lambda x_\alpha[\lambda w[G(x)(w) = g(7)]]]$
 $\llbracket \text{just as}_7 \text{ early} \rrbracket^g = \lambda x_e[\lambda w[\text{earliness}(x)(w) = g(7)]]$

- This means that *easily* can also combine with degree modifiers

(9) $\llbracket \text{easily} \rrbracket^g = \lambda v[\lambda w[\text{STEREOTYPICALITY}(v)(w)]]$
 $\llbracket \text{just as}_7 \rrbracket^g = \lambda G_{\langle \alpha, \langle s, d \rangle \rangle}[\lambda x_\alpha[\lambda w[G(x)(w) = g(7)]]]$
 $\llbracket \text{just as}_7 \text{ easily} \rrbracket^g = \lambda v[\lambda w[\text{ST}(v)(w) = g(7)]]$

- And with the **positive morpheme**, which relates the target to a standard relative to an anaphorically introduced **comparison class** (Kennedy 2007)

(10) $\llbracket \text{easily} \rrbracket^g = \lambda v[\lambda w[\text{ST}(v)(w)]]$
 $\llbracket \text{pos}_8 \rrbracket^g = \lambda G_{\langle \alpha, \langle s, d \rangle \rangle}[\lambda x_\alpha[\lambda w[G(x)(w) \succeq s(G)(g(8))(w)]]]$
 $\llbracket \text{pos}_8 \text{ easily} \rrbracket^g = \lambda v[\lambda w[\text{ST}(v)(w) \succeq s(\text{ST})(g(8))(w)]]$

Compositional Analysis of MMAs

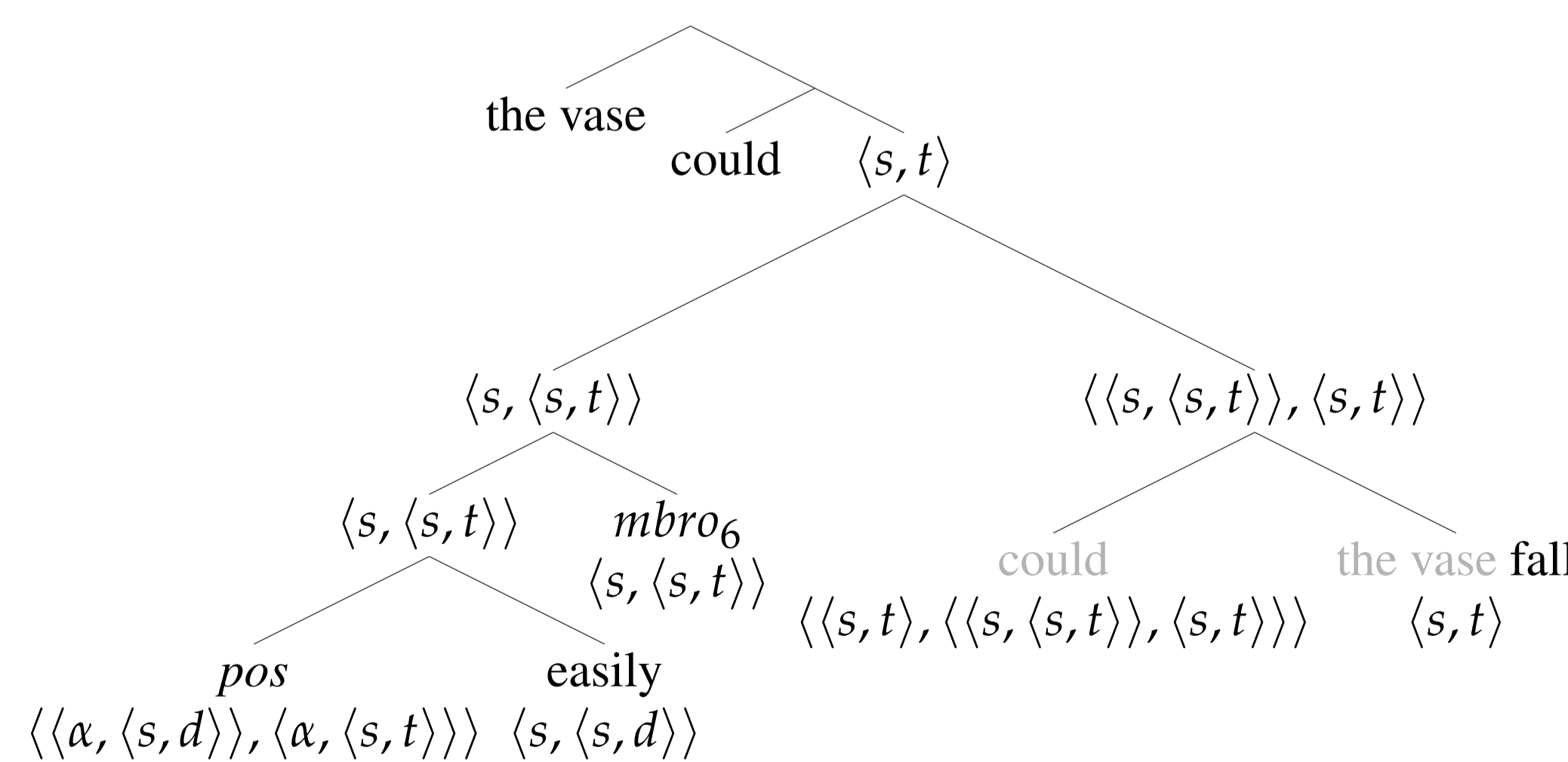
- The MMA *easily* attaches as the sister of *mbro*₆; both are of type $\langle s, \langle s, t \rangle \rangle$

- I assume they combine via a generalized Predicate Modification rule:

Generalized Predicate Modification If a node α has two daughters, β and γ , both of type $\langle \tau, \langle s, t \rangle \rangle$, then let $\llbracket \alpha \rrbracket = \lambda x_\tau[\lambda w[\llbracket \beta \rrbracket(x)(w) \ \& \ \llbracket \gamma \rrbracket(x)(w)]]$

- Giving the following derivation:

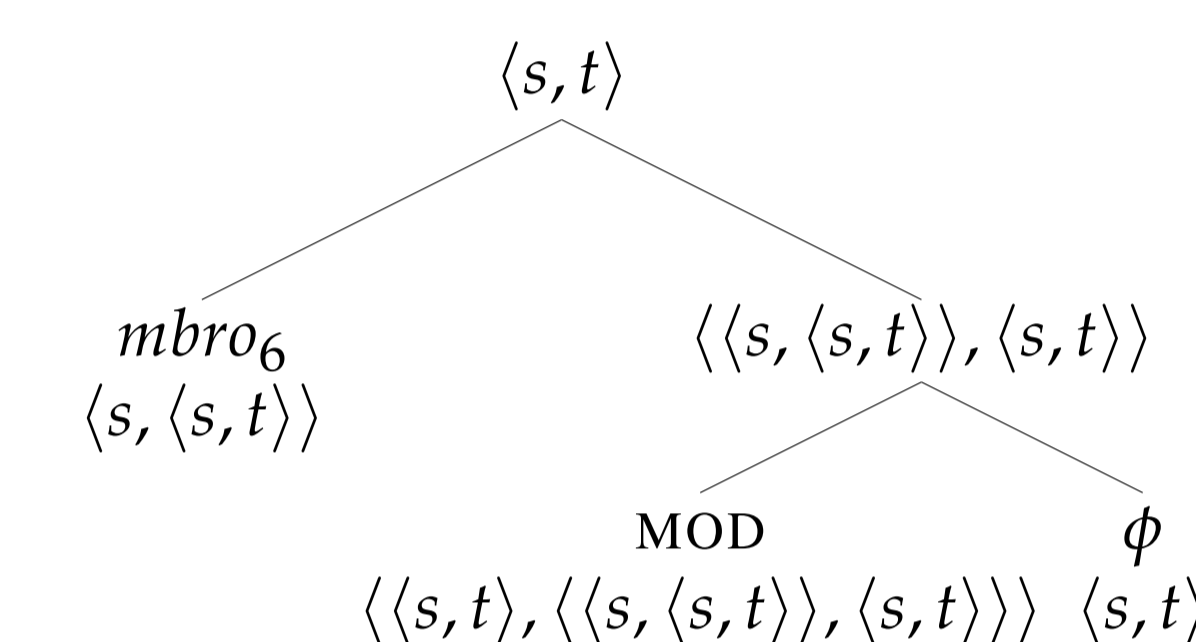
$\llbracket \text{the vase fall} \rrbracket^g = \lambda w[\text{tvf}(w)]$	LEX
$\llbracket \text{could} \rrbracket^g = \lambda \phi_{\langle s, t \rangle}[\lambda m_{\langle s, \langle s, t \rangle \rangle}[\lambda w[\exists v \in m(w)][\phi(v)]]]$	LEX
$\llbracket \text{the vase could fall} \rrbracket^g = \lambda m_{\langle s, \langle s, t \rangle \rangle}[\lambda w[\exists v \in m(w)][\text{tvf}(v)]]]$	FA
$\llbracket \text{mbro}_6 \rrbracket^g = \lambda v[\lambda w[v \in \cap g(6)(w)]]$	LEX
$\llbracket \text{pos}_8 \text{ easily} \rrbracket^g = \lambda v[\lambda w[\text{ST}(v)(w) \succeq s(\text{ST})(g(8))(w)]]$	(10)
$\llbracket \text{pos}_8 \text{ easily } \text{mbro}_6 \rrbracket^g = \lambda v[\lambda w[\text{ST}(v)(w) \succeq s(\text{ST})(g(8))(w) \ \& \ v \in \cap g(6)(w)]]$	GPM
$\llbracket \text{the vase could } \text{pos}_8 \text{ easily } \text{mbro}_6 \text{ fall} \rrbracket^g = \lambda w[\exists v[\text{ST}(v)(w) \succeq s(\text{ST})(g(8))(w) \ \& \ v \in \cap g(6)(w) \ \& \ \text{tvf}(v)]]]$	FA



Compositionality: Basics

- Some assumptions about modal compositionality:
- The modal base is represented in the syntax
- I also assume the modal does *not* take a modal base argument directly (i.e., a set of propositions); rather it takes an accessibility relation
- The intersection of the modal base is accomplished by the modal base *pro* (*mbro*); this expression bears an index which is mapped by the assignment function to a function from a world to a set of propositions, i.e., a modal base
- Also contrary to much literature, I argue that *could* does not have an ordering source (more on this below)

$\llbracket \text{mbro}_6 \rrbracket^g = \lambda v[\lambda w[v \in \cap g(6)(w)]]$
 $\llbracket \text{could} \rrbracket^g = \lambda \phi_{\langle s, t \rangle}[\lambda m_{\langle s, \langle s, t \rangle \rangle}[\lambda w[\exists v \in m(w)][\phi(v)]]]$
 $\llbracket \text{mbro}_6 \text{ could } \phi \rrbracket^g = \lambda w[\exists v \in \cap g(6)(w)[\phi(v)]]$



Context Sensitivity

- Consider a conditional in conjunction with *easily*:

(13) If a strong gust of wind had come along, you could easily have fallen.

- Suppose that the antecedent unlikely; i.e., there are no stereotypical worlds with a strong gust
- It looks like this gives us an empty modal base and fails to derive the right meaning
- The original lexicalized superlative semantics for ordering sources was formulated to get around this very problem (Kratzer 1981, 2012)
- But recall that *pos* crucially determines a standard of comparison contextually (Kennedy 2007)
- As with attributive adjectives, the comparison class may come from its sister:

(14) That is a tall {boy/man/skyscraper}.

- Likewise, the standard of stereotypicality is relativized to which worlds are in the modal base
- This provides an intriguing alternate strategy for dealing with various problems that the original formulation of the ordering source was meant to solve

Bonus: Can MMAs tell us about syntax of modals?

- Note that *easily*'s position is highly variable:

(15) It (easily) could (easily) have (easily) fallen.

- Can this tell us anything about the syntactic position of *could* a la quantifier float?
- This might suggest that *could* starts below *have* in (15), which is consistent with the analysis in Condoravdi (2002)

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