

PART IV: The Spatiotemporal Domain

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Semantic Properties of the Perfect: Reichenbach (1947)

Simple past: ———E,R—————S—————

Present perfect: ———E—————R,S—————

Past perfect: ———E—————R—————S—————

The Klein-ian Decomposition

The Reichenbachian view has been generalized by Klein (1994) and others to conceive of the Aspect node as being something that can be used to impose viewpoint on the event time by selecting portions of it as the reference/topic time. Some examples of the use of the Asp node to characterize perfective vs. imperfective more generally are given in Demirdache and Uribe-Etxebarria (2008) and Giorgi and Pianesi (1997) to name a few. For example, Giorgi and Pianesi (1997) hypothesise that various tenses are the result of the composition of a relation between E and R (relation 2 in their table) and a relation between S and R (relation 1).

(1)

Relation 1:	S_R	future	Relation 2:	E_R	perfect
	R_S	past		R_E	prospective
	(S,R)	present		(E,R)	neutral

The Asp Node in the Current Proposal

In the present proposal, in binding the eventuality argument of EvtP, the Asp node introduces a variable of spatiotemporal properties of events anchored in d . To this extent the Asp node must always be present in any phrase structure building a proposition, and is the locus where temporal viewpoint or orientation properties for the event can be expressed for the first time.

$$(2) \quad [[\text{AspP}]] = \lambda f_{\langle v, v, t \rangle} \lambda d \exists e [\text{Utterance}(d) \wedge f(d)(e) \wedge \perp u \neg(e)]$$

To anticipate, however, I will depart from the Kleinian intuition in arguing that an intermediate reference situation, or topic situation (with a distinct situational variable) is only actually introduced in the context of auxiliary constructions. This will make a clearer distinction between constructions involving modals and perfect auxiliaries (which involve intermediate reference situations) and those like perfective and imperfective aspectual constructions

Previous Semantic Analyses of the Perfect

(3) (a) *The Resultant State Analysis:*

The (present) perfect is a present tense assertion of a situation that carries with it an entailment of a past event (Parsons 1990, Smith 1991, Kamp and Reyle 1993).

(b) *The Indefinite Past Analysis:*

The (present) perfect is an assertion of a past event, with a pragmatic component/presupposition requiring present relevance (Reichenbach 1947, Klein 1992, Inoue 1979).

(c) *The Extended Now Analysis:*

In the (present) perfect, a temporally complex situation is being asserted starting from the past and extending to overlap with the utterance time (McCoard 1978, Pancheva and von Stechow 2004)

Target State Perfect

- (4)
 - (a) John has thrown the ball on the roof. (and it's still there)
 - (b) John has pushed over the chair. (and it's still there.)
 - (c) John has broken his glasses. (and they're still broken)

Resultant State Perfect

- (5)
 - (a) John has driven a truck (before).
 - (b) John has reached the top of that mountain (before).
 - (c) John has broken his glasses (before)

Universal Perfect

- (6) (a) John has lived in Paris for 3 years (i.e. from three years ago up until now).
(b) John has lived in Paris since 2012.

Aktionsart Sensitivity of the Perfect

- Target State Perfect: Only those that form Target state stative passives (i.e. those with Res in their specification)
- Resultant State Perfect: All verbs (including states)
- Universal Perfect: Only states

None of the analyses of the perfect (except for Portner 2003) capture the aktionsart sensitivity of the perfect.

Semantic Puzzles with the Perfect

- A. The different ‘readings’ of the perfect are aktionsart sensitive. The target state perfect and the resultant state perfect seem to track the possibility of the stative passive and eventive passive respectively. The universal perfect is only possible with states.
- B. Compared to the simple past, the present perfect appears to have a flavour of ‘current relevance’, and shows what have been called ‘lifetime effects’.
- C. Temporal modification of the present perfect is restricted in interesting ways— one such restriction is that the embedded event time does not appear to be accessible for modification, in contrast to the past perfect or modal perfect (the present perfect puzzle).

Current Relevance and Lifetime Effects

In the following dialogues, although the English past tense and the English perfect are often both possible, to my ear this dialogue is odd in the perfect as an out of the blue description of my day, and I would prefer the simple past.

- (7) A: How was your day?
B: ??I have swum a whole kilometer today in the pool/
swam a whole kilometer today in the pool.

Current Relevance and Lifetime Effects

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B: ??I have swum a whole kilometer today in the pool/
I swam a whole kilometer today in the pool. But the following dialogue is fine if I am telling my partner that I have done some exercise and am now ready for a hearty dinner.

(8) A: Are you hungry?

B: I have swum a whole kilometer today, so yes.

Current Relevance and Lifetime Effects

In the case of verbs that have target states built into their meaning, the state in question can always be the target state. But here, we seem to get a kind of evidential constraint on felicity (see also Pancheva 2003). In (9), the perfect is infelicitous if A is interrogating B back at the cabin, even though the tracks are still in the snow, and even though that state is clearly 'relevant'.

(9) BACK AT THE CABIN

A: How did you find the wounded deer?

B: The poor animal left bloody tracks in the snow.

B: ??The poor animal has left bloody tracks in the snow.

Current Relevance and Lifetime Effects

On the other hand (10) is perfect if A and B are together in the forest and contemplating the tracks as they speak.

(10) OUT IN THE WOODS

A: How will we find the deer?

B: No problem. Fortunately, it has left tracks in the snow.

Current Relevance and Lifetime Effects

There is also a sensitivity to the nature of the subject or HOLDER of the present state, which may or may not be the same as this idea of 'current relevance'. It has been noticed in the literature that if the subject of the perfect is a historical person, then the perfect is very odd. As noted by Chomsky (1970), (11-a) is rather odd out of the blue, while (11-b) is perfectly fine. (11-c) is an old classic sentence from McCoard (1978), cited also in Portner (2003).

- (11) (a) ??Einstein has visited Princeton.
(b) Princeton has been visited by Einstein.
(c) ??Gutenberg has discovered the printing press.

Building the Perfect out of the -ED Participle and 'Have'

I follow the syntax and morphology of the perfect directly and build it around the present tense assertion of a situation s' which is necessarily a consequence of the situation denoted by the participle s_0 .

Thus, the analysis involves two distinct situations, an embedded one, and another one related to it which will be the essential equivalent of what people have called the reference, or topic situation. The two situations are thus respectively:

- (i) *The Dependent Situation* s_0 (the situation existentially closed at Asp)
- (ii) *The Asserted Situational State* s' : the situation introduced by *have* that is in relationship with the dependent situation

The crucial question now is what the 'Have' predicate that relates s' to s_0 actually means. The meaning of the perfect needs to include the idea that s' *entails* s_0 , that its existence necessarily entails the existence of s_0 .

I have assumed, as I think is natural, that the *-en/ed* participle is the component that directly contributes the embedded situation s_0 , and it is the auxiliary *have* that introduces the secondary stative situation s' . *Have* must now attach to this constituent to build the perfect, raising the highest argument to its own specifier position. Recall again the proposal for the AspP head given earlier:

$$(12) \quad [[\text{AspP}]] = \lambda f_{\langle v, \langle v, t \rangle \rangle} \lambda d \exists e [\text{Utterance}(d) \wedge f(e)(d) \wedge \perp_u \lrcorner(e)]$$

So the participle spells out AspP and that event has conceptual/perceptual properties as characterized by u . At this point we must allow *have* to combine with this constituent to build a derived state that will have a particular relationship to e , but which will itself be the actual eventuality that is explicitly anchored to the utterance by means of tense.

Denotation for Auxiliary *Have* in the Spatiotemporal Domain

$$[[\text{ have }]] = \lambda Q \lambda x \lambda f' \lambda d \exists s' \exists f [Q(f)(d) \wedge \wedge \text{State}(s') \wedge \text{HOLDER}(s') = x \wedge f = \lambda s \lambda d [s' \text{ gives evidence for the spatiotemporal relation between } s \text{ and } d \text{ in the same world as } s'] \wedge f'(s')(d)]$$

The key to the semantics is the definition of the notion of inference licencing state, or evidential state (what I will called the *EVID-STATE*).

- (13) For all s' , s , s' is an *EVID-STATE* for s iff s' is a state which gives evidence for s in the same world as s' .

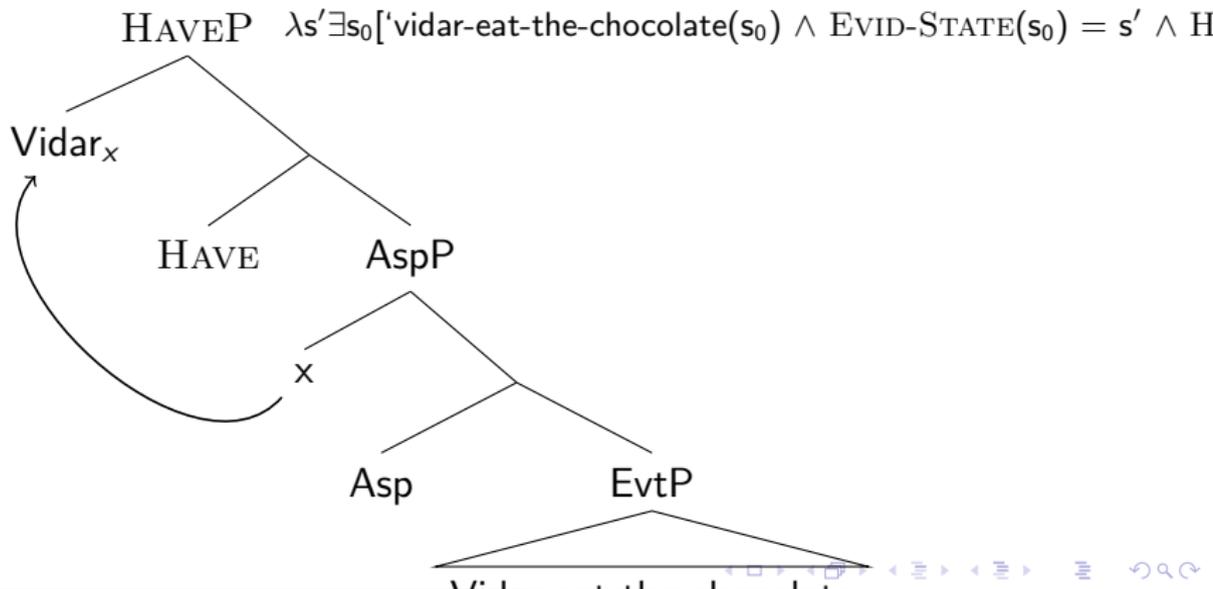
Denotation of AspP headed by *Have*

$$(14) \quad [[\text{haveP}]] = \lambda x \lambda f' \lambda d \exists s' \exists f \exists s_0 [\text{Utterance}(d) \wedge f(s_0)(d) \sqsubseteq u \sqcup (s_0) \wedge \text{HOLDER}(s') = x \wedge \text{EVID-STATE}(s_0) = s' \wedge f(s')(d)]$$

The EVID-STATE s' will have a HOLDER in the domain of real instantiated individuals, and its position will be filled by internal merge from the AspP, raising the highest argument there to that role.

Tree for the Perfect

In simple terms (abstracting away from the quantificational event semantics formulas) we get the tree below, with the simplified denotation given. At this point, it is the EVID-STATE situational variable s' that will be input to modification and tense modulation (anchoring to the utterance).



The Perfect has Event Implications!

The denotation above says that *have* combines with a situational description and creates a *derived stative* situational description, such that the derived stative situation is an EVIDENTIAL STATE for that situational description. In the progressive chapter, *-ing* built an ID-STATE, which was a relationship between Event properties, where the identifying state property did not entail the existence of the whole event. Here we are in the situational domain after the existential closure of the event variable. Here, if one situation is inferrable from another another then the existence of the one entails the actual existence of the other.

Aktionsart Sensitivity of the Perfect

Inferring the existence of a situational particular s_0 from s' requires that whole situation to exist *at or prior to* the onset of s' . (This is because, according to Werner (2006) and others, only the present and the past are 'determined' in this sense.)

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As we have already assumed, a situation instantiating a dynamic eventuality has a temporal parameter which must be an interval larger than a moment, while a situation instantiating a state only requires that the state have the temporal parameter of a moment. A stative situation can therefore overlap with the stative s' and still be consistent with s' giving evidence for s_0 (because all that is required is a moment).

So precisely in the case of dependent states, the s' can in fact perfectly overlap with dependent stative situation (and potentially continue on from there), as in the case of the universal perfect.

In the case of dependent dynamic situations, the evidential situation can at best overlap with its final moment or result state, and so the dependent dynamic situation must end up preceding it

Corollaries for Aktionsart Sensitivity in Evidential States (CASES)

Thus, for the assertion of s' an EVID-STATE based on the dependent situation s_0 , we have the following corollaries.

If f (relating s_0 and d) is inferrable from s' , then we call s' an EVIDENTIAL STATE for s_0 , and then s_0 must be *determined* by the onset of s' .

If s_0 is a state, then $s_0 \odot s'$, OR $s_0 < s'$

If s_0 is dynamic, then $s_0 < s'$

Lifetime Effects

There are two features of this derived situation that give rise to very particular pragmatic effects and felicity conditions. One is that the subject of the property must be an instantiated individual at the time the situation is asserted to exist. Events and relations to participants do not require instantiation of either Event description or participant nominal description, but once a relationship is established at the level of situations (Events with temporal and worldly instantiation), then actuality entailments follow the application of existential closure both for nominal and verbal extended projections.

- (15) (a) ??Gutenberg has discovered the printing press.
- (b) ??Shakespeare has written Hamlet.

Evidential State gives better results than a Current Relevance Condition

The second feature that is crucial is the fact that the derived situation *gives evidence* for the truth of e. This is different from current relevance, as proposed in the literature, where the perfect provides the 'answer' to a salient at-issue question raised by the discourse, as in the analysis of Portner (2003), Inoue (1979) and many others.

- (16) A: Where is the ball?
B: John has thrown it on the roof.
B': John threw it on the roof.
B'': It's on the roof.
B''': ??John hurt his arm throwing the ball on the roof.

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The Perfect and Simple Past are equally good here.

Evidential State gives better results than a Current Relevance Condition

Similarly, when A asks a question about 'John', my intuition is that both the B and B' versions are mildly deviant to the same extent. The best answer is of course B''', and B'' is completely strange because it doesn't mention John at all.

- (17) A: What's up with John?
B: ?He has just thrown the ball on the roof.
B': ?He just threw the ball on the roof.
B'': ??The ball is on the roof.
B'''': He hurt his arm throwing the ball on the roof.

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 B': ?He just threw the ball on the roof.
 B'': ??The ball is on the roof.
 B'''': He hurt his arm throwing the ball on the roof. Once again, the Perfect and Simple Past are equally good here. The perfect doesn't seem to contribute anything extra here compared to the simple past here, over and above general Gricean considerations.

Perfect as Evidential State

The thing we need to capture is the *difference* between the use of the perfect and the corresponding use of the simple past. In the case of accomplishments, the s' that is asserted seems often to be the same as the result state of the corresponding verb. In such cases, the difference between the perfect and the simple past is that in the latter, the result state might no longer hold (18-b). But in the perfect (18-a) the result state is precisely the state that is asserted to exist at the speech time. The result state is in fact a prototype example of an EVID-STATE since its existence entails the existence of the dynamic event portion that leads to it.

- (18) (a) John has thrown the ball on the roof.
(b) John threw the ball on the roof.

Perfect as Evidential State

However, the result state of an eventuality is not the only kind of *EVID-STATE* that could be asserted. In cases where the event description has no result state described within it, as in activities, the *EVID-STATE* needs to be more contextually constructed/inferred.

- (19) (a) John has driven a truck.
(b) Mary has read *Middlemarch*.

So there *is* an important contextual component to the meaning of the perfect here. The interlocutor must infer the relevant *EVID-STATE* on the basis of real world knowledge, common ground, and the particular issues under discussion. This is what people call the *Experiential perfect*, which is a cover term for the kind of situation-based *EVID-STATE* that needs to be inferred from context.

I assume therefore that the Event internal result state, when it exists always counts as giving rise to a potential EVID-STATE, but is only possible for resP verbs. On the other hand the experiential perfect is constructed via situations directly, and is available for all types of verbs (including states), as long as the dependent situation in question is now over and has had *contextual consequences*.

- (20) (a) John has driven a truck.
(b) Mary has eaten sushi.
(c) The deer has left tracks in the snow.
(d) John has lived in Paris for 3 years.

Because only states allow complete overlap for the evidential state, only these can additionally give rise to the universal perfect.

The Evidential flavour of the Perfect

(See also Pancheva 2003)

- (21) A: How did you find the wounded deer?
 (a) B: The poor animal left bloody tracks in the snow.
 (b) B': ??The poor animal has left bloody tracks in the snow.

Notice that the B' utterance is clearly *relevant* to answering the question in some sense, but the present tense ascription of a stative property to the reindeer, that of having left tracks in the snow, does not seem felicitous. This is because the perfect above reports a criterial state as *evidence* of the event. The perfect is only felicitous when it is precisely only that state that is present and apparent to the interlocutors.

The Evidential Flavour of the Perfect

Thus, if the deer has not been found yet and all we see is the snow before us, then the following discourse is perfectly felicitous.

- (22) A: How will we find the deer?
B: No problem. Fortunately, it has left tracks in the snow.

The fact that a downstream *EVID-STATE* is what is being directly asserted, rather than the event itself, is what is directly responsible for the evidential flavour of the perfect that is very salient in certain contexts (see also Pancheva 2003).

Identifying State vs. Evidential State

(23) **Identifying State (Id-State)** (Definition)

For all event descriptions P , an *Identifying-State* for P , is a stative eventuality that manifests sufficient cognitive/perceptual identifiers of the event property P .

Evidential State (Evid-State) (Definition)

$\text{EVID-STATE FOR } s_0 =_{\text{def}} s'$ iff s' is a stative situation (i.e. which can have a moment as its temporal parameter) which is a salient situation that provides *critical evidence for the existence of s_0* in the same world as s' . The existence of s' always entails the existence of s_0 .

Modality in English (Brennan 1993)

The different modals in English and in particular the epistemic - deontic split have been described and analysed carefully in many works going back to the sixties and seventies (Perlmutter 1971, Jackendoff 1972, Groenendijk and Stokhof 1975, Palmer 1986, Iatridou 1990, Brennan 1993, Portner 2009).

Root

<i>may</i>	permission
<i>must</i>	obligation
<i>can</i>	(a) ability (b) permission
<i>will</i>	disposition to behave in a certain way future prediction

Epistemic

	possibility rel. to speaker knowledge
	necessity rel. to speaker knowledge
	possibility rel. to speaker knowledge
	necessity rel. to speaker knowledge

Modals in English (Addendum)

Root

<i>might</i>	(permission in the past) ¹
<i>should</i>	obligation
<i>could</i>	(a) ability in the past
<i>would</i>	disposition in the past to behave in a certain way

Epistemic

possibility rel. to speaker knowledge
necessity rel. to speaker knowledge
possibility rel. to speaker knowledge
hypothetical prediction rel. to speaker knowledge

¹Archaic

Dynamic Modality

This type of modality has to do with the inherent abilities and dispositions of the agent.

- (24) (a) John can swim.
- (b) John eats anything you put in front of him.

Syntactic Diagnostics (Brennan 1993)

- Whether the subject of the modal necessarily has a theta role independent of that given to it from the main verb (raising vs. control)
- Whether the modal can scope over a quantifier in subject position
- Whether symmetric predicates continue to be symmetric when modalized or not.

Syntactic Diagnostics

	Θ -Role for Subject	Modal Scope wrt Subject	Symmetry
DYN	YES	Modal Low	\neg Persistent
CIRC.	YES/NO	Ambiguous	\pm Persistent
EP.	NO	Ambiguous	+ Persistent

Hierarchical Ordering/Functional Sequence

Quite generally, Nauze (2008) finds broad support for the following hierarchy proposed also in Cinque (1999).

- (25) Epistemic modality < Circumstantial Modality < Dynamic Modality

HAVE > Dynamic Modal

English modals are special in that they only exist in finite form, and always raise to the highest inflectional node. However, we can illustrate the crosslinguistic patterns with Swedish, a minimally more permissive language. Important to us is also the position of the modals with respect to the auxiliary *have*.

- (26) Han har kunnat skriva klart sin
 He has can-PAST PART. write finished/ready his
 uppsats.
 article
 'He was able to finish his article'

*Dynamic Modal > HAVE

- (27) Han kan ha skrivit klart sin uppsats.
He can have written finished/done his article.
'*it is capable that he has finished his article '

Epistemic Modal > HAVE

Turning now to epistemic versions of 'can', we see the opposite ordering with respect to the 'have' auxiliary. It is perfectly possible to embed 'have' under the Epistemic modal, as shown in the grammatical interpretation for the above sentence (repeated here as (28)).

- (28) Han kan ha skrivit klart sin uppsats.
 He can have written finished/done his article.
 'It is possible that he has finished his article'

Deontic Modal > HAVE Turning finally to deontic modality, the modal auxiliary 'must' can get a deontic reading of obligation, and under this reading it is possible for it to embed the perfect auxiliary 'have' as in (29).²

- (29) Han måste ha gjort leksan innan
 He must-PRES have done the homework within
 Fredag.
 Friday
 'He must have the homework done by Friday.'

²Note that here, the reading is that the perfect eventuality is obliged to hold some time in the future. This is consistent with deontic modality in general, which is obligatorily forward shifting with respect to the evaluation time. These sentences are tricky to construct felicitous versions of because it requires some context to construct a situation where a perfect state is going to be relevant in the future.

So we can see from this data that 'have' is higher than Dynamic modality and lower than Epistemic modality, but that it seems to be in principle interleavable with Deontic modality.

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I will assume that this is true in English also, and place the base position for deontic meanings within the same sortal zone as the perfect auxiliary discussed earlier.

An Implicational Hierarchy?

(31)

Dynamic	Circumstantial	Epistemic
<i>can/could</i>	<i>can/could</i>	<i>can't/could</i>
<i>will/would</i>	<i>will/would</i>	<i>will/would</i>
	<i>may</i>	<i>may</i>
	<i>must</i>	<i>must</i>
	<i>should</i>	<i>should</i>
		<i>might</i>

Derivational Morphology I

In terms of closeness to the root, it should also be noted that the suffix *-able* which creates adjectives with a 'modal' flavour from verbal roots in English, is confined to dynamic meanings, the lowest of the three possibilities, where the internal properties of the subject are what are at stake.

- (32) (a) The book can be read (circumstantial or dynamic).
(b) The book is readable (dynamic: inherent property).

Derivational Morphology II

The same seems to be true of the suffix *-er*, which creates Nouns with a generic/type sense with the flavour of dynamic dispositional modality.

- (33) (a) John will cheat at Monopoly. (dispositional or futurate)
(b) John is a cheater. (dispositional only)

Distinguishing Dynamic Modality

Dynamic (Participant Internal)

Expletive subjects impossible
 Modalizing affects the symmetry of the predicate
 Occurs lowest in a sequence of modals crosslinguistically
 Scopes low wrt to (polar) negation
 Scopes low wrt to Subject position
 Can be expressed by derivational suffixation in English

Circ./Epistemic (Participant External)

Expletive subjects possible
 Variable
 Variable
 Variable
 Variable
 No

Distinguishing Circumstantial from Epistemic

Circumstantial Modality

lower than epistemics under cooccurrence
 Morphological PAST can shift modal state in some lgs
 can take scope under the subject
 No interaction with Speaker oriented meanings

Epistemic Modality

higher than circumstantials
 modal state cannot be shifted
 never take scope under the subject
 Speaker oriented

Alethic Modality

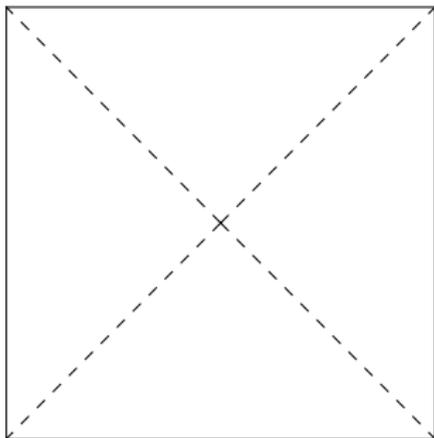
The formal tradition for thinking about these things comes from the philosophers and the logicians. They were concerned with logical relations among propositions first and foremost and not with the inner workings of natural language, but in the realm of epistemic modality there are clear natural language expressions that map nicely to these notions. Possibility and necessity (conventionally notated as \diamond and \square respectively) can be thought of as a set of notions that can partition the domain of propositions into jointly exhaustive and mutually exclusive subclasses.

Possible		
Necessary	Contingent	Impossible
	Non-Necessary	

Alethic Square of Oppositions

Necessary

Impossible



Possible

Non-necessary

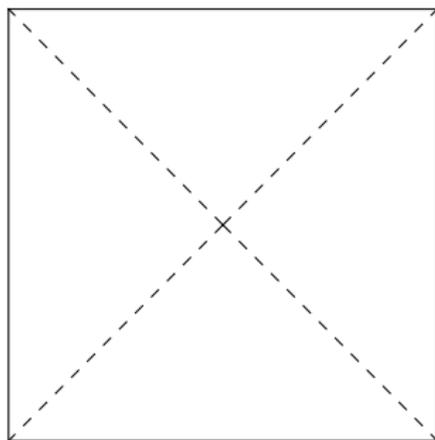
Quantification

	Some $xP(x)$	
All $xP(x)$	Some $xP(x) \wedge$ Some $x\neg P(x)$	No $xP(x)$
	Some $x\neg P(x)$	

Quantificational Square of Oppositions

All $xP(x)$

No $xP(x)$



Some $xP(x)$

Some $x\neg P(x)$

Quantification and Possible Worlds

“These deep quantificational analogies reflect much of the inspiration behind ‘possible world semantics’ for such logics. Once the analogies are noticed, this sort of semantics seems all but inevitable.” McNamara (2014), pg

The Classical Model (Kratzer 77, 81)

Formally, therefore, we can translate the notion of necessity into universal quantification in the following way, with definitions taken from Portner (2009). Skipping the standard axioms relating to the general propositional calculus, we cut right to the chase and give the definitions for necessity modals and possibility modals in (34-a) and (34-b) respectively.

- (34) (a) α is of the form $\Box\beta$ and for all v such that $R(w,v)$, $[[\beta]]^{v,M} = 1$.
 ($\Box\beta$ is true iff β is true in *all* members of W accessible from w).
- (b) α is of the form $\Diamond\beta$ and for some v such that $R(w,v)$, $[[\beta]]^{v,M} = 1$.
 ($\Diamond\beta$ is true iff β is true in *some* member of W accessible from w).

The Classical Model (Kratzer 77, 81)

The beauty and elegance of the 'Simple Modal Logic Hypothesis' as Portner calls it, is that "the meaning of every modal expression in natural language can be expressed in terms of only two properties: (a) whether it is a necessity or possibility modal, and (b) Its accessibility relation R." (Portner 2009, pg 31).

(35) **Epistemic Frame:**

$F = \langle W, R \rangle$ is an epistemic frame iff for some individual i :

- W = the set of possible worlds conceivable by humans.
- R = the relation which holds between two worlds w and w' iff everything which i knows in w is also true in w' .

The Classical Model (Kratzer 77, 81)

We can further extend the analogy to the deontic frame, and posit a domain of quantification defined by the accessibility relation corresponding to the 'rules' established by a certain context. This is given in (36).

(36) **Deontic Frame:**

$F = \langle W, R \rangle$ is a deontic frame iff for some system of rules r :

- W = the set of possible worlds conceivable by humans.
- R = the relation which holds between two worlds w and w' iff all of the rules which r establishes in w are followed in w' .

Generalizability via the Accessibility Relation R

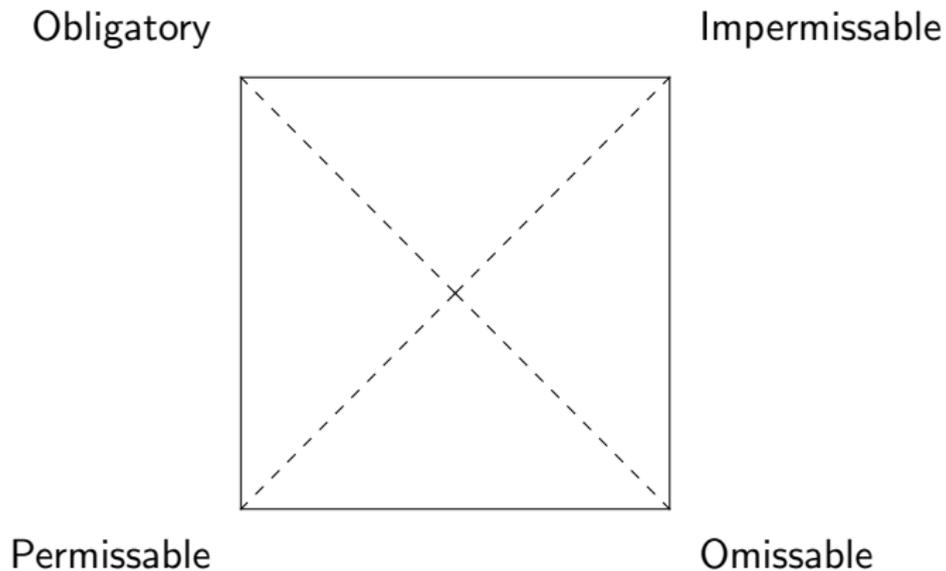
In fact, there is no limit to the contextual specificity of the modal bases one could imagine. There could be subvarieties of deontic modal bases according to what kinds of laws or desiderata are involved and these could be filled in by context. We could also imagine other modal bases such as *buletic* conversational backgrounds related to wishes and *teleological* conversational backgrounds related to aims.

- (37) (a) In view of the laws of Massachusetts, drivers must yield to pedestrians.
(b) In view of the traditions of our family, you, as the youngest child, must read the story on Christmas eve.

Analogizing to the Deontic Frame

Permissable		
Obligatory	Optional	Impermissible
	Omissable	

The Deontic 'Square of Oppositions'



BUT for Deontic Modality the Analogy Does NOT Carry Over

This seems all very well and good except for the fact that unlike in the other two cases, the simple entailments in (37) do not seem to go through.

- (38) (i) $OB(p)$ does not entail p
(ii) p does not entail $PE(p)$.

In other words, just because there is an obligation on someone to do something, it does not mean that it gets done. And if p is the case, it does not mean that it was permitted.

Hacquard (2006): Relating Modal Interpretation to Height

Hacquard is at pains to reconcile the elegance of the Kratzerian system where a single underspecified meaning can handle both epistemic and root interpretations, with the results of linguistic typology (cartography) which suggest the generalization that epistemic readings attach higher in the clause, *outside* tense, and root meanings attach *inside* tense. Her idea is to replace the base world from which the modal base is calculated with an event instead, and relate the semantic differences to differences in how that event is anchored. This in turn is sensitive to the height of the modal in question.

- (i) when the modal is speaker-oriented, it is keyed to the speech time and receives an epistemic interpretation;
- (ii) when the modal is attitude holder-oriented, it is keyed to the attitude time and receives an epistemic interpretation;
- (iii) when the modal is subject-oriented, it is keyed to the time provided by tense and receives a root interpretation.

The Proposal in Ramchand (2018)

Hacquard keeps intact the core structure of the Kratzerian solution:

- modals are still quantificational (\exists vs. \forall) over possible worlds.
- The modal base itself is still contextually/pragmatically controlled; it is only the perspectival base that is sensitive to syntactic height.

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Ramchand (2018):

- (i) The semantic type of a constituent varies systematically according to height in the functional sequence.
- (ii) The different heights of modals must correspond to a different semantic type of complement.
- (iii) The (underspecified) meaning of the modal combined with the semantic type of the prejacent should derive the difference between dynamic, circumstantial and epistemic.
- (iv) The circumstantial modal should be the same kind of semantic type as the perfect auxiliary (with which it interleaves in the functional sequence).

To preserve the insights of the classical model within the present system, we need to find a way of representing the flexibility of the modal base and tying it to height of attachment. We have assumed so far that the inflectional domain, the second phase, is characterized by the fact that it builds properties of anchored event properties. I repeat the denotation for something of the AspP type in (39).

$$(39) \quad [[\text{AspP}]] = \lambda f \lambda d \exists e [\text{Utterance}(d) \wedge f(d,e) \wedge \perp u \lrcorner(e)]$$

The Reference Situation and the Perfect

In the case of the perfect, the merge of an auxiliary introduced a new situational variable which constituted an intermediate reference situation for the ultimate anchoring relationship for the first phase event. Specifically, *have* introduced a reference situation s' which was related to e and which was then an intermediary in the anchoring of e to the utterance situation d .

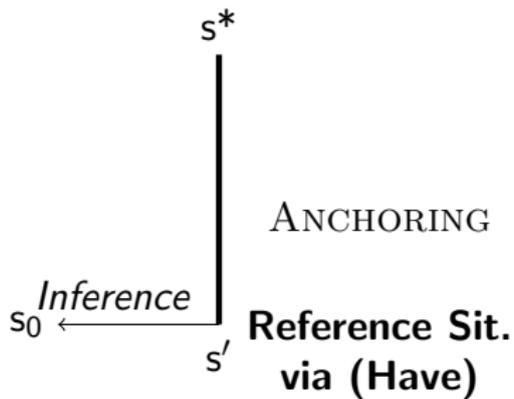
$$(40) \quad [[\text{have}]] = \lambda Q \lambda x \lambda f' \exists s' \lambda d \exists f [Q(f)(d) \wedge \text{State}(s') \wedge \text{HOLDER}(s') = x \wedge f = \lambda s \lambda d [s' \text{ gives evidence for a spatio-temporal relation between } s \text{ and } d \text{ in the same world as } s'] \wedge f'(s')(d)]$$

The Reference Situation and the Circumstantial Modal

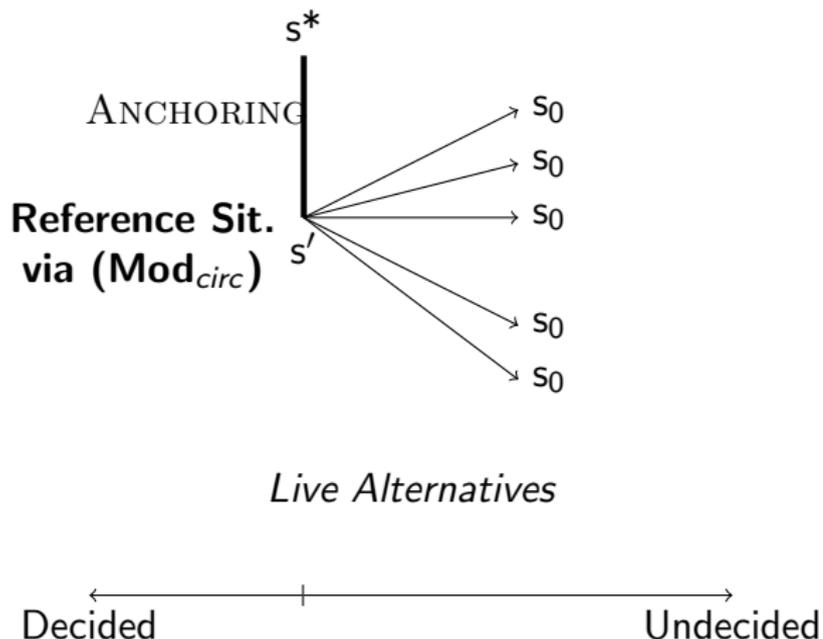
For the circumstantial modal auxiliary, we will assume something similar.

- The modal will introduce a perspectival situational variable s' with respect to which the situation denoted by the first phase s_0 is oriented.
- While the **perfect** expresses an **inferential relation between the reference situation and the prejacent situation**, the **circumstantial modal** will express a **projective, predictive relation between the reference situation and the prejacent**.

Schema for The Perfect



Schema for the Circumstantial Modal



Circumstantial Modals as Modifiers of Spatiotemporal Properties (Just Like the Perfect)

The modal combines with the constituent expressing properties of spatiotemporal properties of s_0 anchored at d , and states that an f exists expressing s_0 as a **live alternative** from s' .

$$(41) \quad [[\text{Mod}_{\text{circ-may}}]] = \lambda Q \lambda x \lambda f' \exists s' \lambda d \exists f [Q(f)(d) \wedge \wedge \text{State}(s') \wedge \text{HOLDER}(s') = x \wedge f = \lambda s \lambda d [s \text{ is located at a world-time pair that is a CHOICE for the perspectival topic in } s'] \wedge f'(s')(d)]$$

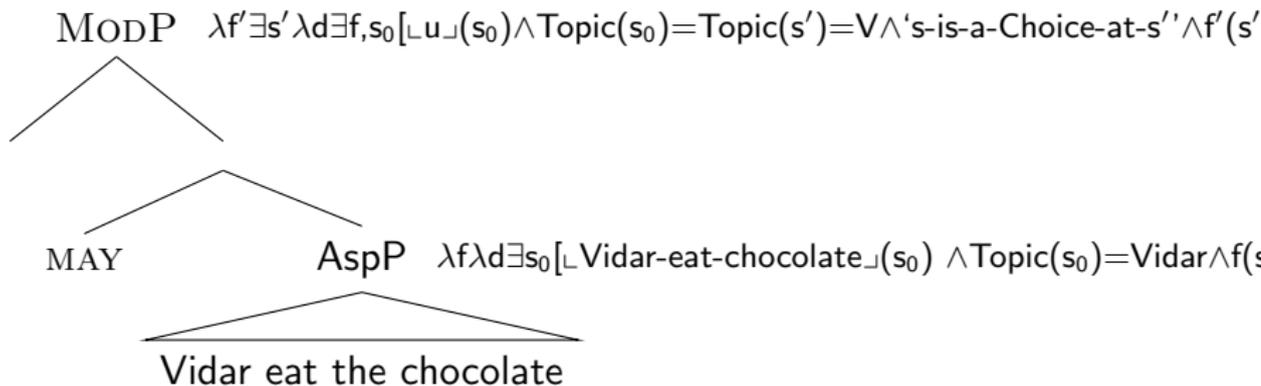
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Circumstantial **live alternatives** are simply different ways in which the future could turn out. A circumstantial live alternative, is a situation with particular time and world parameters that is still 'up for grabs'. By definition, it therefore has a time specification that is projected forward with respect to the perspectival situation.

In words, this says that there is a perspectival stative situation s' for which s_0 (the one characterized by the event property described in the first phase) is a live alternative for the topic argument. It is this perspectival stative situation that will eventually be anchored by the tense predicate.



Replacing Possible Worlds Quantification with CHOICE

The spatio-temporal relationship between the perspectival situation and the preadjacent situation performs intuitively the same role as the Kratzerian accessibility relation in terms of possible worlds.

Replacing Possible Worlds Quantification with CHOICE

The spatio-temporal relationship between the perspectival situation and the preajacent situation performs intuitively the same role as the Kratzerian accessibility relation in terms of possible worlds. However, the relationship that *unifies the usage of various different modals*, and is thus a better choice of ontological primitive, is the abstract notion of CHOICE among live alternatives.

Informal Schema for Modal Denotations

A modal meaning involves the assertion of a CHOICE within a set of 'live alternatives' *for* a Topic individual x *in* a perspectival situation s' . These alternatives are directly constructed from the constituent that the modal attaches to.

Rethinking \exists and \forall in the Context of a CHOICE Semantics

The existential binding of the f property relating s' to the prejacent as a valid live alternative is tantamount to existential assertion of possibility. The innovation we need here is not to introduce universal quantification over f for so-called universal modals, but think of the circumstantial necessity modals *non*-quantificationally in terms of *exclusive* choice.

(42) (a) Jane must_{[PoIP [AspP < Jane > sing]]}.

(b) $[[\text{Mod}_{\text{circ-must}}]]$ = $\lambda Q \lambda x \lambda f' \lambda s' \lambda d \exists f [Q(f)(d) \wedge \wedge \text{State}(s') \wedge \text{HOLDER}(s') = x \wedge f = \lambda s \lambda d [s \text{ is located at a world-time pair that is the ONLY CHOICE for the perspectival topic in } s'] \wedge f'(s')(d)]$

Here once again, the Set of Alternatives is: all the different possible values of world time vectors projected from s' .

The Form of the Modal Complement

Finally, we observe that modal verbs in English combine with the bare 'uninflected' form of the verb. We have already seen that the bare uninflected root in English can lexicalize the full complement of verbal heads, and thus, by hypothesis lacks T, or Asp information. Furthermore, it is the form that is morphologically eligible for suffixation. I will assume that the form the combines with modal verbs is this very same item, suffixed with an irrealis Asp head, which represents the infinitival ending, which is null in English.³

³The information of this null morpheme is to provide the presupposition that the verbal eventuality in question is located in a different world than the world of the perspective situation.

A Natural Language Based Ontology for Expressing Hypotheticality

The only difference between the above system and the classical treatments lies in *where* the primitive corresponding to possibility or hypotheticality is located in the axiomatization of the logic that modal meanings builds on. In this particular treatment, the quantificational analogy is rejected and the system is built from an analogy to CHOICE, generalizing from the deontic core cases instead.

The primitive CHOICE relation asserts the freedom of the 'pivot' within the space of hypothetical alternatives, from a particular situational vantage point.

A Natural Language Based Ontology for Expressing Hypotheticality

The 'pivot' for the CHOICE is a crucial argument of the CHOICE relation, and is the topic (either explicitly or implicitly) of the perspectival situation. Something can be a choice for a pivot x if it is part of the things x is able to do, is allowed to do, or is logically possible for x to do.

Another important thing is that the choices are inherently relativized to the involvement of x , unlike in classical treatments where it has to be built in with difficulty. In circumstantial modals, this x argument is usually the highest or external argument of the event in the situational description, but it can also be other arguments or even filled in contextually.

A Natural Language Based Ontology for Expressing Hypotheticality

There is still an important role in these definitions for different presupposed information or pragmatic contextual information about the `GROUNDS` for why the pivot has the `CHOICE` he/she/it does. This framework is not intended to replace the contextual input to modal semantics. the 'Grounds' for a `CHOICE` are in part contributed by the lexical presupposition of the modal itself and in part by linguistic context and other contextual factors.

- (43) Grounds for `CHOICE` coming from discourse context:
A: Oh no, I have a meeting at 9 a.m. tomorrow morning!
B. Then, you must get up before 8 for once.
- (44) Grounds for `CHOICE` coming from adverbial modification:
If you want to make that meeting, you must get up before 8.

The Classical Model vs. The CHOICE Semantics Model

	CLASSICAL MODEL	CHOICE Semantics for Modality
Quantificational force	\exists \forall	CHOICE EXCLUSIVE CHOICE
Modal Base (Primary effects)	Dynamic Circumstantial Epistemic	Prejacent: Zone 1 (EvtP) Prejacent: Zone 2 (AspP) Prejacent: Zone 2 (above TP)
Modal Base (Secondary) + Ordering Source	deontic, buletic teleological etc.	lexical presuppositions of modal concerning nature of GROUNDS for CHOICE
Modal Base (Secondary)	contextual and linguistic factors constraining modal base	contextual and linguistic factors on GROUNDS for CHOICE

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