M

Temporal constraints on the meaning of modalized sentences

Jungmee Lee

Seoul National University

SICOGG 22

Modality and temporality

Hockett's design features of human languages

- Arbitrariness
- Learnability
- Creativity (prodinduceuctivity)
- ....
- **Displacement**: "All human languages allow their speakers to talk about situations that are **not in the actual here and now** (including situations that are in the past or future, as well as hypothetical situations)."

Modality and **temporality** are at the heart of "displacement"!

(von Fintel 2006).

Modal meanings, which are concerned with the possibility or necessity of a proposition, are expressible in all languages:

(1) a. John **must/might/may** be home. [modal auxiliaries]
b. **Perhaps**, Sandy is home. [adverbs]
c. There is a slight **possibility** that Sandy is home. [nouns]
d. It is far from **necessary** that Sandy is home. [adjectives]
e. **If the light is on**, Sandy is home. [conditionals]

(von Fintel 2006, p.1)

Temporal meanings are also expressible across languages, typically by means of tense and aspect.

(2) a. John **was singing**. [past tense, progressive aspect]
b. John sang **yesterday**. [adverbs]
c. **Before/after/when** John arrived, Mary left. [connectives]

Outline of the talk

1. Meaning of Modals
2. Modal-Temporal Interaction:

   Epistemic vs. Root Modals in Interactions with Tense and Aspect
3. Modal Sentences in Korean:

   A Modal Sentence with the Bound Noun *Swu*

Meaning of Modals

Subcategories of modality: Epistemics vs. Roots

1. **Epistemic modals**: pertaining to the speaker's knowledge (from Greek *episteme* 'knowledge')

   (3) a. A typhoon **may** hit the island.

   b. Mary **must** have a good reason for being late.

2. **Root modals**: Circumstances (such as rules, desires, goals, ability) serve to identify some possibility as better than others, or affect the actions available to an individual.

   (4) a. The rich **must** give money to the poor.
   [deontic (from Greek *deon* 'obligation')]

   b. You **should** try this chocolate.
   [bouletic (from Greek *boule* 'wish')]

   c. You **could** add some more salt to the soup.
   [teleological (from Greek *telos* 'goal')]

   d. John **can** swim. [ability]

Modal vs. non-modal sentences

(5) John has the flu.

=‘John has the flu in the actual world.’

(6) John **might** have the flu.

= ‘In view of what is known, it is possibly true that John has the flu.’

=‘**In some epistemically accessible worlds**, John has the flu.’

(7) John **must** have the flu.

= ‘In view of what is known, it is necessarily true that John has the flu.’

=‘**In all the epistemically accessible worlds**, John has the flu.’

Quantificational force of modals

Modals have been analyzed as quantifications over accessible worlds in traditional modal logic.

1. **Necessity modals** (e.g. *must* in English) are analyzed as **universal** quantification over accessible worlds.
2. **Possibility modals** (e.g. *may* in English) are analyzed as **existential** quantification over accessible worlds.

Accessible worlds of a modal sentence

Kratzer (1981, 1991) proposes that the accessible worlds of a modal sentence (i.e. the possible worlds at which a modal sentence is true) are determined by **conversational backgrounds**.

1. **Modal Base** (**MB**) gives a set of accessible worlds to a modal sentence.
2. **Ordering Source** (**OS**) imposes a particular ordering among the accessible worlds determined by a Modal Base.

(8) John **must** have the flu.

a. **Epistemic** Modal Base (**MB**$_{epis}$)

= { John has a fever, John has a cough, John did not get a flu shot, ...}

b. **Doxastic/Streotypical** Ordering Source (**OS**$_{dx/st}$)

= {Flu leads to a fever, Many people in town are suffering from flu right now, People suffering from the same symptoms in the same town all have the same disease, ... }

(Portner 2009, pp.64-65)

With **MB**$_{epis}$ and **OS**$_{dx/st}$, (8) says that among the worlds in which all of the facts that the speaker knows hold, his expectations rank most highly those worlds in which John has the flu.

Lexically ambiguous?

Crosslinguistically, the same modal words (e.g. *must* in English) can be used to express a wide range of interpretations. Then, are they lexically ambiguous?

(9) a. John **must** have the flu. [Epistemic interpretation]

b. John **must** go to jail. [Root interpretation]

In Kratzer's theory, each modal is **not lexically ambiguous**, but the difference between an epistemic and a root interpretation is **contextually determined** by means of conversational backgrounds:

(10) a. John **must** have the flu.
[Epistemic interpretation: due to $\mathbf{MB}_{epis}$ and $\mathbf{OS}_{dx/st}$]

b. John **must** go to jail.
[Root interpretation: due to $\mathbf{MB}_{circ}$ and $\mathbf{OS}_{deontic}$]

(11) John **must** go to jail.

a. **Circumstantial** Modal Base (**MB**$_{circ}$)

= { John robbed Mary, John is an adult, John is mentally competent, ...}

b. **Deontic** Ordering Source (**OS**$_{deontic}$)

= { Robbery by competent adults is to be punished by time in jail, ... }

(Portner 2007, p.11)

With **MB**$_{circ}$ and **OS**$_{deontic}$, (11) says that among the worlds in which all of the circumstantial facts hold, the relevant rules rank most highly those worlds in which John goes to jail.

Formalization of modal meanings

(12) John has the flu.

j-have-flu′(NOW, $\mathbf{w}^*$)

(13) John **might** have the flu.

$\exists w'[w' \in \mathbf{MB}_{epis}/\mathbf{OS}_{dx/st}(\text{NOW}, w^*) \wedge \text{j-have-flu}'(\text{NOW}, \mathbf{w}')]$

(14) John **must** have the flu.

$\forall w'[w' \in \mathbf{MB}_{epis}/\mathbf{OS}_{dx/st}(\text{NOW}, w^*) \rightarrow \text{j-have-flu}'(\text{NOW}, \mathbf{w}')]$

(15) John **must** go to jail.

$\forall w'[w' \in \mathbf{MB}_{circ}/\mathbf{OS}_{deontic}(\text{NOW}, w^*) \rightarrow \text{j-go-jail}'(\text{NOW}, \mathbf{w}')]$

NOW (speech time), w^* (actual world)

MB_{epis} (epistemic modal base), MB_{circ} (circumstantial modal base)

$\text{OS}_{dx/st}$ (stereotypical/doxastic ordering source), $\text{OS}_{deontic}$ (deontic ordering source)

Epistemic vs. Root Modals

in Interactions with Tense and Aspect

Cinque's (1999) hierarchy

Cinque (1999, p.106) argues for a universal hierarchy of functional heads on the basis of the linear ordering of adverbs in languages like Italian and French.

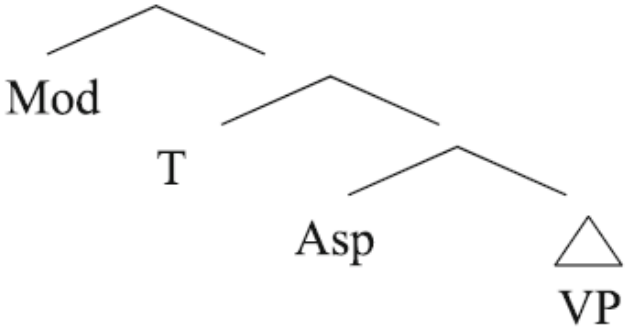
(16) $[_{mood_{speech act}}$ *frankly* $[_{mood_{evaluative}}$ *fortunately* $[_{mood_{evidential}}$ *allegedly* $[_{mod_{epistemic}}$ *probably* $[_{T_{past}}$ *once* $[_{T_{future}}$ *then* $[_{mod_{irrealis}}$ *perhaps* $[_{mod_{necessity}}$ *necessarily* $[_{mod_{possibility}}$ *possibly* $[_{asp_{habitual}}$ *usually* $[_{asp_{repetetive}}$ *again* $[_{asp_{freq(I)}}$ *often* $[_{mod_{volitional}}$ *intentionally* $[_{asp_{celerative(I)}}$ *quickly* $[_{T_{anterior}}$ *already* $[_{asp_{terminaitive}}$ *no longer* $[_{asp_{continuative}}$ *still* $[_{asp_{perfect(?)}}$ *always* $[_{asp_{retrospective}}$ *just* $[_{asp_{proximative}}$ *soon* $[_{asp_{durative}}$ *briefly* $[_{asp_{generic/progressive}}$ *characteristically(?)* $[_{asp_{prospective}}$ *almost* $[_{asp_{sg.completive(I)}}$ *completely* $[_{asp_{pl.completive}}$ *tutto* $[_{voice}$ *well* $[_{asp_{celerative(II)}}$ *fast/early* $[_{asp_{repetetive(II)}}$ *again* $[_{asp_{freq(II)}}$ *often* $[_{asp_{sg.completive(II)}}$ *completely*]]]]]]]]]]]]]]]]]]]]]]]]]]]]]]

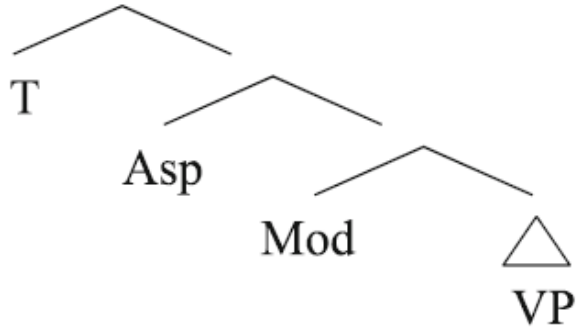
Subsequent work has supported Cinque's findings concerning adverb ordering in other languages (e.g. Nilsen (1997) for Norwegian, Beijer (2005) for Swedish, Alexiadou (1997) for Greek, Rackowski & Travis (2000) for Malagasy, etc.).

Note that roots and epistemics occupy different syntactic positions in Cinque's hierarchy:

(17) **Mod**$_{epis}$ $\succ$ **Tense** $\succ$ **Aspect** $\succ$ **Mod**$_{root}$

Some previous authors (Jackendoff 1972; Zubizaretta 1982; Picallo 1990; Butler 2003, inter alia) propose a syntactic analysis, according to which epistemics take TP complements, and roots take VP complements.





The literature on modality (Iatridou 1990, Abusch 1997, Stowell 2004, inter alia) has also noted that epistemics scope over tense, and roots occur within the scope of tense.

Condoravdi's (2002) TP and TO

Condoravdi (2002) notes that (18) are available with two different modal readings (epistemic vs. root), but they differ in their temporal profiles.

(18) a. John **might have won** the game (but I am not sure if he did).
[Epistemic interpretation]

='It is possible that John won the game.'

= Given what is known to me now, it is possible that John won the game.

b. John **might have won** the game (if he hadn't been feeling sick that day).
[Root interpretation]

'It was possible that John would win the game.'

=Given John's circumstances then, it was (metaphysically) possible for the world to develop in such a way that John would win the game.'

Condoravdi (2002) introduces two temporal references for a modal sentence (TP vs. TO), and analyzes the modal reading of (18) in terms of its interaction with the temporal meaning:

1. **Temporal Perspective (TP)**: the time at which a modal's conversational background is evaluated
2. **Temporal Orientation (TO)**: the relation between a modal's TP and the time of the prejacent event

Example	Modal Base	Temporal Perspective (TP)	Temporal Orientation (TO)
(18a)	epistemic	present	past
(18b)	circumstantial	past	future

Rullmann & Matthewson's (2018) crosslinguistic study

Rullmann & Matthewson (2018) argue that all the following combinations of TPs and TOs are possible in natural language sentences,
cf. Condoravdi's (2002) restricted set of the possible readings of (18).

	Past TP	Present TP
Past TO	epistemic	epistemic
Present TO	epistemic	epistemic
Future TO	epistemic circumstantial	epistemic circumstantial

Rullmann & Matthewson (2018) support their claim from other languages like Dutch, English, Gitksan (Tsimshianic) and St'át'imcets (Lillooet Salish).

Modal sentences in Korean

Periphrastic modal expressions in Korean

	Epistemic	Priority	Dynamic
Possibility	*-un/l moyang-i-* (conjecture) *-ul swu iss-* (conjecture) *-un/l kes kath-* (conjecture) *-un/l tus-ha-* (conjecture) *-un/l seng-siph-* (conjecture) *-un/l tus-siph-* (conjecture)	*-eto toy-* (permission) *-eto coh-* (permission) *-eto kwaynchanh-* (permission) *-ul swu iss-* (permission)	
Necessity	*-ul li eps-* (certainty) *-ul/n kes-i-* (certainty)	*-eya ha-* (obligation) *-eya toy-* (obligation) *-un kes-i coh-* (desire/goal) *-umyen ha/siph-* (desire)	*-ul swu iss-* (ability) *-ul cwul al-* (ability) *-ul kes-i-* (volition) *-koca ha-* (volition) *-ulyeko ha-* (volition)

Mun (2016, p.177)

The modal readings of Korean *swu* sentences

Korean sentences with the bound noun *swu* receive both epistemic and root interpretations.

(19) Jon-i ku thakca-lul olmki-∅-l swu iss-∅-ta.
Jon-NOM that table-ACC move-PRES-ADN SWU exist-PRES-DECL
'It is possible that Jon will move the table.' [**Epistemic**]
'Jon is able to move the table.' [**Dynamic (ability)**]
'Jon is allowed to move the table.' [**Priority (permission)**]

The effect of temporal elements on the modal readings

The modal readings of the *swu*-construction is affected by temporal elements.

(20) **with stative predicates**

Jon-i **pappu**-∅-l swu iss-∅-ta.
Jon-NOM busy-PRES-ADN SWU exist-PRES-DECL

'It is possible that Jon is busy.' **[Epistemic]**
#'Jon is able to be busy.' **[Dynamic (ability)]**
#'Jon is allowed to be busy.' **[Priority (permission)]**

(Mun, 2016, 78)

(21) **with progressive aspect**

Jon-i ku thakca-lul olmki-**koiss**-∅-ul swu iss-∅-ta.
Jon-NOM that table-ACC move-PROG-PRES-ADN SWU exist-PRES-DECL

'It is possible that Jon is moving the table.' **[Epistemic]**
#'Jon is able to be moving the table.' **[Dynamic (ability)]**
#'Jon is allowed to be moving the table.' **[Priority (permission)]**

(22) **with past tense**

Jon-i ku thakca-lul olmki-**ess**-ul swu iss-∅-ta.
Jon-NOM that table-ACC move-PAST-ADN SWU exist-PRES-DECL

'It is possible that Jon moved the table.' **[Epistemic]**
#'Jon was able to move the table.' **[Dynamic (ability)]**
#'Jon was allowed to move the table.' **[Priority (permission)]**

Previous analyses

The modal readings of a *swu*-sentence have been accounted for in terms of (i) **structural ambiguity** (Ha 2007, Chung 2007, Kim 2010, Kim 2014) and (ii) **lexical ambiguity** (Mun 2016, Lee 2017).

- In the former approach, a *swu*-construction is analyzed as having two separate syntactic structures, each of which gives rise to an epistemic or a non-epistemic modal reading.
- In the latter approach, a *swu*-construction is analyzed as containing a modal element that lexically specifies distinct modal meanings.

Structural ambiguity analysis

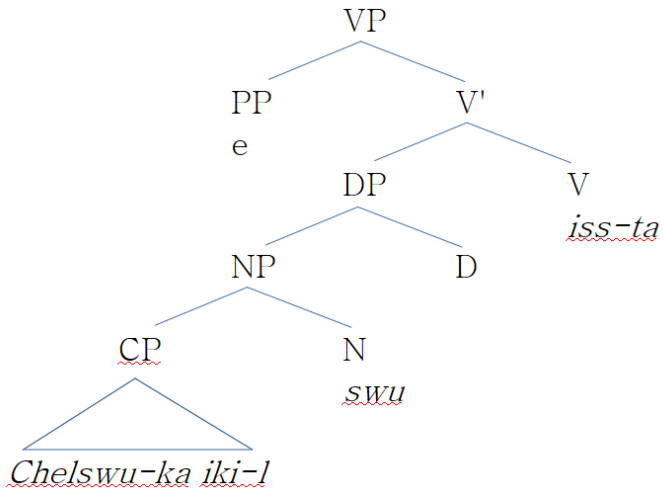
Ha (2007), Chung (2007), Kim (2010), and Kim (2014) argue that the availability of different modal readings in a *swu*-construction is due to its two possible syntactic structures.

For example, Ha (2007) postulates two separate structures for *swu*-sentences in terms of Tsujioka's (1996) analysis of Japanese existential constructions: epistemic modals in absolute existential constructions in (23a) vs. root modals in possessive existential constructions in (23b)

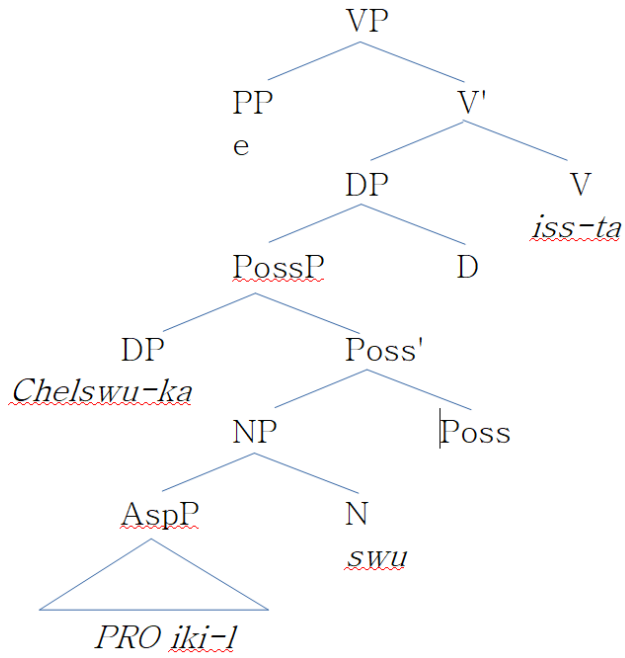
- The precopular DP in (23a) is analyzed as a gapless nominal complement, and the CP that contains all the arguments of the embedded predicate is taken as a complement by *swu*.
- In contrast, *swu* in (23b) combines with AspP which has the adnominal suffix *-(u)l* as its head. This AspP contains PRO whose controller occurs in the PossP-Spec.

(23) Ha's (2007) structures for *swu*-sentences

a. Epistemic modals



b. Root modals



These syntactic analyses cannot account for why non-epistemic readings are not available with a *swu*-construction containing past tense, a stative predicate, or progressive aspect while its corresponding *swu*-construction with present tense, an eventive predicate, or non-progressive aspect can receive non-epistemic readings.

Lexical ambiguity analysis

From a formal semantic perspective, Mun (2016) proposes **three separate lexical entries** of *-ul swu iss-*. The heart of her analysis lies in the **choosing function** which is encoded in (24b-c) and defined as in (25):

(24) a. $[\![$ *-ul swu iss-*$_{epistemic}$ $]\!]^{f,g}$= $\lambda P \lambda t \lambda t' \lambda w \exists w' [w' \in Best_{g^{stereotypical}(w,t)}(\cap f_{epis}(w,t)) \& P(w',t') = 1]$

b. $[\![$ *-ul swu iss-*$_{ability}$ $]\!]^{f,g}$ = $\lambda P \lambda x \lambda t \lambda t' \lambda w \forall w' [w' \in Best_{g^{stereotypical}(w,t)}(\cap f_{circ}(w,t)) \& x$ **chooses** $P(t')$ in w' at $t \rightarrow P(x,w',t') = 1]$

c. $[\![$ *-ul swu iss-*$_{permission}$ $]\!]^{f,g}$ = $\lambda P \lambda x \lambda t \lambda t' \lambda w \exists w' [w' \in Best_{g^{stereotypical}(w,t)}(\cap f_{circ}(w,t)) \& x$ **chooses** $P(t')$ in w' at $t \& P(x,w',t') = 1]$

(Mun, 2016, 104)

(25) Definition of **chooses**: x chooses P in w at t iff

a. **The diversity requirement**: P and not-P are in the set of x's options in w at t.

b. **The agentivity requirement**: P goes onto x's *private To-Do List* in w at t.

(Mun, 2016, 104)

- Mun (2016) accounts for the *swu*-examples with past tense in terms of the diversity requirement, and those with stative predicates in terms of the agentivity requirement.
- According to Mun (2016), the *swu*-sentences with a stative predicate are unavailable with non-epistemic reaings because they cannot occur with an agentive subject. The case with progressive aspect remains unaddressed in her work, but it should be noted that the agentivity condition is inapplicable to it: this is because the progressive must occur with an eventive predicate which allows for an agentive subject as in (21).
- I argue that the fact that the lexically-encoded or the grammatically-modified statives are unavailable with non-epistemic readings in a *swu*-sentence should be taken to indicate that the non-epistemic readings are **temporally constrained**, rather than it is restricted by another constraint such as the agentivity condition.

Proposed analysis

- I extend the empirical coverage of the *swu*-constructions to those containing the progressive such as (21), and provide a **uniform** analysis of the *swu*-examples with past tense, a stative predicate, and progressive aspect.
- I illustrate how a *swu*-construction is temporally interpreted in terms of Condoravdi's (2002) notions of TP and TO.
- I **compositionally** analyze the meaning contributions of tense and (lexical and grammatical) aspect in Korean, and show how the temporal interpretations of the *swu*-sentences with past tense, a stative predicate, and progressive aspect are derived.
- On the basis of the proposed compositional analysis, I argue that their non-epistemic readings are **pragmatically** ruled out due to the independently-motivated temporal constraints on the modal bases (Condoravdi 2002, Rullmann & Matthewson 2018, inter alia).

Temporal interpretation of a *swu*-construction

TPs are determined by the matrix clause tense.

(26) **Present TP**

Cikum po-ni, [Jon-i ku thakca-lul olmki-∅]-l swu iss-**∅/#ess**-ta.
now see-as, Jon-NOM that table-ACC move-PRES-ADN SWU exist-PRES/PAST-DECL

'In view of what I know now, it is possible that Jon will move the table.'
'In view of the present circumstances, Jon is able to move the table.'
'In view of the present circumstances, Jon is allowed to move the table.'

(27) **Past TP**

Ecey po-ni, [Jon-i ku thakca-lul olmki-∅]-l swu iss-**#∅/ess**-ta.
yesterday see-as, Jon-NOM that table-ACC move-PRES-ADN SWU exist-PRES/PAST-DECL

'In view of what I knew yesterday, it was possible that Jon would move the table.'
'In view of the previous circumstances (yesterday), Jon was able to move the table.'
'In view of the previous circumstances (yesterday), Jon was allowed to move the table.'

TOs are constrained by the tense and aspect in the adnominal clause. Particularly, the stativity of a predicate affects the TO-interpretation by means of its interactions with tense.

If the *swu*-construction embeds an **eventive predicate**,

1. its cooccurring **past** tense induces a **past-TO interpretation**, as illustrated in (28) and (29).
2. its cooccurring **present** tense induces a **future-TO interpretation**, as illustrated in (30) and (31).
3. The occurrence of the **progressive** with present tense results in both the **present-TO interpretation** and the **future-TO interpretation**, as illustrated in (32) and (33).

*with eventive predicates

(28) **Present TP, Past TO**

(Cikum po-ni,) [Jon-i **ecey**/#cikum/#nayil ku thakca-lul olmki-**ess**]-ul swu iss-∅-ta.
now see-as, Jon-NOM yesterday/now/tomorrow that table-ACC move-PAST-ADN SWU exist-PRES-DE

'(In view of what I know now,) it is possible that Jon moved the table yesterday/#now/#tomorrow.'
#'(In view of the present circumstances,) Jon is able to have moved the table yesterday/now/tomorrow.'
#'(In view of the present circumstances,) Jon is allowed to have moved the table yesterday/now/tomorrow.'

(29) **Past TP, Past TO**

(Ecey po-ni,) [Jon-i **kucekkey**/#ecey/#nayil ku thakca-lul
yesterday see-as, Jon-NOM the.day.before.yesterday/yesterday/tomorrow that table-ACC
olmki-**ess**]-ul swu iss-ess-ta.
move–PAST-ADN SWU exist-PAST-DECL

'(In view of what I knew yesterday,) it was possible that Jon had moved the table the day before yesterday/#yesterday/#tomorrow.'
#'(In view of the previous circumstances (yesterday),) Jon was able to have moved the table the day before yesterday/yesterday/tomorrow.'
#'(In view of the previous circumstances (yesterday),) Jon was allowed to have moved the table the day before yesterday/yesterday/tomorrow.'

(30) **Present TP, Future TO**

(Cikum po-ni,) [Jon-i **nayil**/#cikum/#ecey ku thakca-lul olmki-Ø]-l swu
now see-as, Jon-NOM tomorrow/now/yesterday that table-ACC move-PRES-ADN SWU
iss-Ø-ta.
exist-PRES-DECL

'(In view of what I know now,) it is possible that Jon will move the table tomorrow/#now/#yesterday.'
'(In view of the present circumstances,) Jon is able to move the table tomorrow/#now/#yesterday.'
'(In view of the present circumstances,) Jon is allowed to move the table tomorrow/#now/#yesterday.'

(31) **Past TP, Future TO**

(Kucekkey po-ni,) [Jon-i **ecey**/#kucekkey/#han.tal.cen.ey ku
the.day.before.yesterday see-as, Jon-NOM yesterday/the.day.before.yesterday/a.month.ago that
thakca-lul olmki-Ø]-l swu iss-ess-ta.
table-ACC move-PRES-ADN SWU exist-PAST-DECL

'(In view of what I knew the day before yesterday,) it was possible that Jon would move the table yesterday/#the.day.before.yesterday/#a.month.ago.'
'(In view of the previous circumstances (the day before yesterday),) Jon was able to move the table yesterday/#the.day.before.yesterday/#a.month.ago.'
'(In view of the previous circumstances (the day before yesterday),) Jon was allowed to move the table yesterday/#the.day.before.yesterday/#a.month.ago.'

(32) **Present TP, Present/FutureTO**

(Cikum po-ni,) [Jon-i **cikum/nayil**/#ecey ku thakca-lul olmki-**koiss-∅**]-l swu
now see-as, Jon-NOM now/tomorrow/yesterday that table-ACC move-PROG-PRES-ADN SWU
iss-∅-ta.
exist-PRES-DECL

'(In view of what I know now,) it is possible that Jon is moving the table now/tomorrow/#yesterday.'
#'(In view of the present circumstances,) Jon is able to be moving the table now/tomorrow/yesterday.'
#'(In view of the present circumstances,) Jon is allowed to be moving the table now/tomorrow/yesterday.'

(33) **Past TP, Present/Future TO**

(Ecey po-ni,) [Jon-i **ecey/nayil**/#kucekkey ku thakca-lul
yesterday see-as, Jon-NOM yesterday/tomorrow/the.day.before.yesterday that table-ACC
olmki-**koiss-∅**]-l swu iss-ess-ta.
move-PROG-PRES-ADN SWU exist-PAST-DECL

'(In view of what I knew yesterday,) it was possible that Jon was moving the table yesterday/tomorrow/#the.day.before.yesterday.'
#'(In view of the previous circumstances (yesterday),) Jon was able to be moving the table yesterday/tomorrow/the.day.before.yesterday.'
#'(In view of the previous circumstances (yesterday),) Jon was allowed to be moving the table yesterday/tomorrow/the.day.before.yesterday.'

If the *swu*-construction embeds a **stative predicate**,

1. its cooccurring **past** tense induces a **past-TO interpretation**, as illustrated in (34) and (35).
2. its cooccurring **present** tense constrains **the TO to the nonpast time of the TP**, as illustrated in (36) and (37).

*with stative predicates

(34) **Present TP, Past TO**

(Cikum po-ni,) [Jon-i **ecey**/#cikum/#nayil pappu-**ass**]-ul swu iss-∅-ta.
now see-as, Jon-NOM yesterday/now/tomorrow busy-PAST-ADN SWU exist-PRES-DECL

'(In view of what I know now,) it is possible that Jon was busy yesterday/#now/#tomorrow.'
#'(In view of the present circumstances,) Jon is able to have been busy yesterday/now/tomorrow.'
#'(In view of the present circumstances,) Jon is allowed to have been busy yesterday/now/tomorrow.'

(35) **Past TP, Past TO**

(Ecey po-ni,) [Jon-i **kucekkey**/#ecey/#nayil pappu-**ass**]-ul swu
yesterday see-as, Jon-NOM the.day.before.yesterday/yesterday/tomorrow busy-PAST-ADN SWU
iss-ess-ta.
exist-PAST-DECL

'(In view of what I knew yesterday,) it was possible that Jon had been busy the day before yesterday/#yesterday/#tomorrow.'
#'(In view of the previous circumstances (yesterday),) Jon was able to have been busy the day before yesterday/yesterday/tomorrow.'
#'(In view of the previous circumstances (yesterday),) Jon was allowed to have been busy the day before yesterday/yesterday/tomorrow.'

(36) **Present TP, Present/Future TO**

(Cikum po-ni,) [Jon-i **cikum/nayil**/#ecey pappu-Ø]-l swu iss-Ø-ta.
now see-as, Jon-NOM now/tomorrow/yesterday busy-PRES-ADN SWU exist-PRES-DECL

'(In view of what I know now,) it is possible that Jon is busy now/tomorrow/#yesterday.'
#'(In view of the present circumstances,) Jon is able to be busy now/tomorrow/yesterday.'
#'(In view of the present circumstances,) Jon is allowed to be busy now/tomorrow/yesterday.'

(37) **Past TP, Present/Future TO**

(Ecey po-ni,) [Jon-i **ecey/nayil**/#kucekkey pappu-Ø]-l swu
yesterday see-as, Jon-NOM yesterday/tomorrow/the.day.before.yesterday busy-PRES-ADN SWU
iss-ess-ta.
exist-PAST-DECL

'(In view of what I knew yesterday,) it was possible that Jon was busy yesterday/tomorrow/#the.day.before.yesterday.'
#'(In view of the previous circumstances (yesterday),) Jon was able to be busy yesterday/tomorrow/the.day.before.yesterday.'
#'(In view of the previous circumstances (yesterday),) Jon was allowed to be busy yesterday/tomorrow/the.day.before.yesterday.'

Interim summary

Crucially, dynamic (ability) and priority (permission) modal readings are available with a *swu*-sentence if and only if the TO is restricted to future. This contrasts with epistemic modal readings that are available with all combinations of TPs and TOs.

Aspect		Tense		Temporal interpretation		Modal reading			e.g.
Lexical aspect	Grammatical aspect	Matrix clause	Embedded clause	TP	TO	Epistemic	Dynamic (ability)	Priority (permission)	
Eventive	without progressive	past	past	Past	Past	✓	*	*	(29)
		past	present	Past	**Future**	✓	✓	✓	(31)
		present	past	Present	Past	✓	*	*	(28)
		present	present	Present	**Future**	✓	✓	✓	(30)
	with progressive	past	past	Past	Past	✓	*	*	(48)
		past	present	Past	Nonpast	✓	*	*	(33)
		present	past	Present	Past	✓	*	*	(49)
		present	present	Present	Nonpast	✓	*	*	(32)
Stative	without progressive	past	past	Past	Past	✓	*	*	(35)
		past	present	Past	Nonpast	✓	*	*	(37)
		present	past	Present	Past	✓	*	*	(34)
		present	present	Present	Nonpast	✓	*	*	(36)
	with progressive	N/A							(39b)

Compositional meaning of tense and aspect in Korean

I compositionally analyze the meaning contributions of the elements that affect the temporal interpretation of a *swu*-construction, i.e. stative/eventive predicates, progressive/non-progressive aspect, and present/past tense, utilizing Reichenbach's (1947) terms for temporal reference.

1. **Utterance time (UT)**

   the time at which a given sentence is uttered

2. **Event time (ET)**

   the time at which a described eventuality occurs

3. **Reference time (RT)**

   the time that an utterance is *about*

Meaning of lexical and grammatical aspect in Korean

Aspect constrains the temporal location of **ET** with respect to **RT**
(e.g. Dowty 1986, Hinrichs 1986, Kamp & Rohrer 1983, Partee 1984, Klein 1994).

(38) Context: The speaker met Jon in the library yesterday. Now, she says:

a. Jon-i (ecey) ku thakca-lul olmki-ess-ta.
Jon-NOM yesterday that table-ACC move-PAST-DECL
'Jon moved the table (yesterday).' [**RT** ⊆ **yesterday**′], [**ET** ⊂ **RT**]

b. Jon-i (ecey) ku thakca-lul olmki-koiss-ess-ta.
Jon-NOM yesterday that table-ACC move-PROG-PAST-DECL
'Jon was moving the table (yesterday).' [**RT** ⊆ **yesterday**′], [**RT** ⊆ **ET**]

(39) Context: the same as (38)

a. Jon-i (ecey) pappu-ass-ta.
Jon-NOM yesterday busy-PAST-DECL
'Jon was busy (yesterday).' [**RT** ⊆ **yesterday**′], [**RT** ⊆ **ET**]

b. *Jon-i (ecey) pappu-koiss-ess-ta.
Jon-NOM yesterday busy-PROG-PAST-DECL
intended: 'Jon was busy (yesterday).'

- **RT** is constrained by the time adverb *ecey* 'yesterday', but its exact temporal location is contextually determined, e.g. the time at which the speaker met Jon in the library yesterday.
  (Partee 1984, Hinrichs 1986, Dowty 1986, Kamp & Reyle 1993, inter alia),
- (38a) has a perfective interpretation, according to which the event of Jon's moving the table has a culmination point within the **RT**. By contrast, (39a) receives an imperfective interpretation, i.e. the described state has no change within the **RT**, but it holds at the larger interval including the **RT**.
- The imperfective interpretation is available with eventive predicates as well, if they occur with the progressive *-koiss* as in (38b). Similarly, I assume that the perfective meaning of examples like (38a) arises from a perfective aspect, which is phonologically null.

- Stative predicates cannot occur with the progressive *-koiss*, but they have an imperfective meaning by themselves, as shown in (39). I analyze the imperfective meaning as being lexically encoded in the meaning of stative predicates.

(40) **Eventive vs. Stative predicate**

a. *ku thakca-lul olmki-* 'move that table'
$\Rightarrow S'_{[-t,-s]} \setminus N_{[nom]} : \lambda x \lambda w \lambda t [move.table'(x, w, t)]$

b. *pappu-* 'busy'
$\Rightarrow S'_{[-t,+s]} \setminus N_{[nom]} : \lambda x \lambda w \lambda t \exists t' [t \subset t' \wedge busy'(x, w, t')]$

(41) **Progressive vs. Perfective aspect**

a. *-koiss-* 'PROG' $\Rightarrow S'_{[-t,+s]} \setminus S'_{[-t,-s]} : \lambda p \lambda w \lambda t \exists t' [t \subset t' \wedge p(w, t')]$

b. $\emptyset_{perf}$ 'PERF' $\Rightarrow S'_{[-t,-s]} \setminus S'_{[-t,-s]} : \lambda p \lambda w \lambda t \exists t' [t' \subset t \wedge p(w, t')]$

Meaning of Korean tenses

Tense is responsible for the temporal location of the **RT** with respect to

1. the **UT** (in a matrix clause), or
2. the **RT** of a matrix clause (in an embedded clause).

Following dynamic semantic theories of temporal interpretation (Partee 1984, Hinrichs 1986, Dowty 1986, Kamp & Reyle 1993, inter alia),
I assume that **RT** is not existentially bound (cf. Prior 1967), but its exact temporal location is contextually determined: recall the relevant discussion with (38) and (39).

(42) **Past vs. Present tense**

a. *-ess* 'PAST'
$\Rightarrow S'_{[+t,\alpha s]} \setminus S'_{[-t,\alpha s]} : \lambda p \lambda w \lambda t[t' \prec t \wedge p(w,t')]$

b. $-\emptyset_{pres}$ 'PRES'
$\Rightarrow S'_{[+t,+s]} \setminus S'_{[-t,+s]} : \lambda p \lambda w \lambda t[t \leq t' \wedge p(w,t')]$ if p is stative.
$\Rightarrow S'_{[+t,-s]} \setminus S'_{[-t,-s]} : \lambda p \lambda w \lambda t[t \prec t' \wedge p(w,t')]$ if p is eventive.

- In (42a), past tense *-ess* locates t' (denoting **RT**) prior to t (denoting **UT** in a matrix clause, or **RT** of a matrix clause in an embedded clause).
- Korean present tense has a different temporal meaning depending on the stativity of the prejacent, as we have seen in the preceding section. This is translated in (42b): it has a nonpast temporal reference with a stative untensed sentence radical, and a futurate temporal reference with an eventive untensed sentence radical.

Modal meaning of *swu*

I analyze *swu* as encoding a modal meaning, but I do not postulate separate lexical entries for its possible modal flavors (cf. Mun 2016; Lee 2017): Recall the basic assumption in Kratzer's modal theory, according to which the conversational backgrounds are *contextually* determined and thus no lexical ambiguity is assumed.

(43) *swu*
$\Rightarrow N_{[nom]} \setminus S'_{[+t]} : \lambda p \lambda w \lambda t \exists w' [w' \in \textbf{BEST}(\textbf{MB}, \textbf{OS}, w, t) \wedge p(w', t)]$

- (43) says that among the worlds in which all of the facts given by the MB hold, the worlds most highly ranked by the OS are the ones in which the prejacent proposition *p* is true.

Compositional derivations of the temporal interpretation

Consider a syntactic and semantic derivation of a *swu*-sentence, particularly how the TPs and the TOs of the *swu*-sentences in (19)-(22) are compositionally computed by the interaction of tense and aspect.

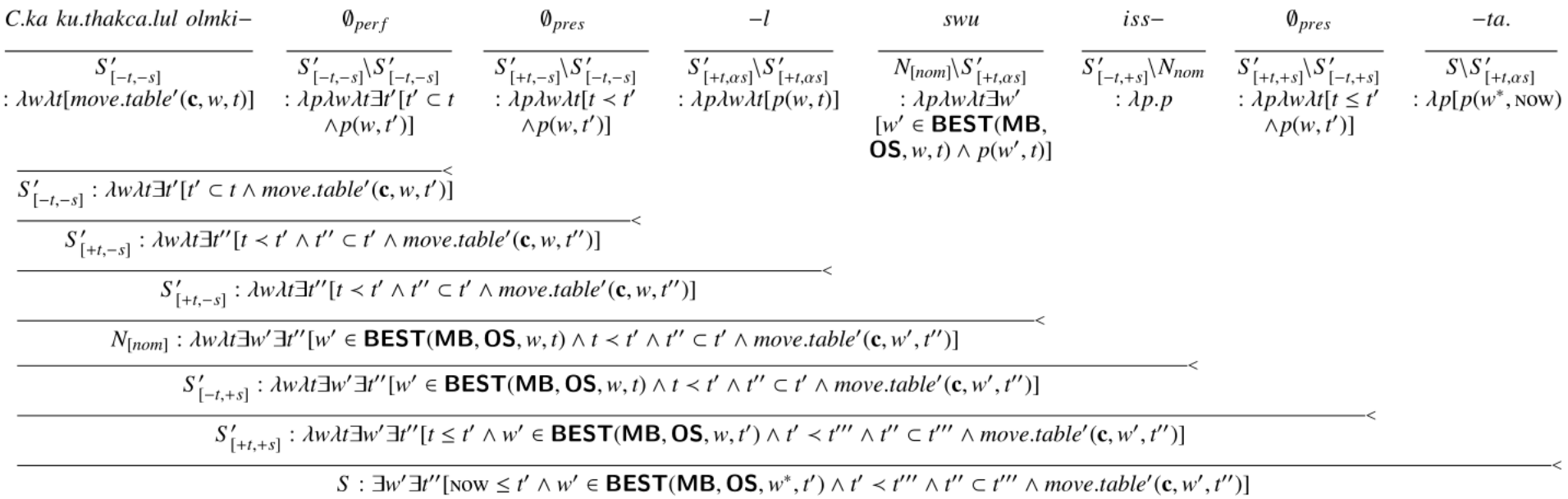


Figure 1. Derivation of a *swu*-sentence in (19)

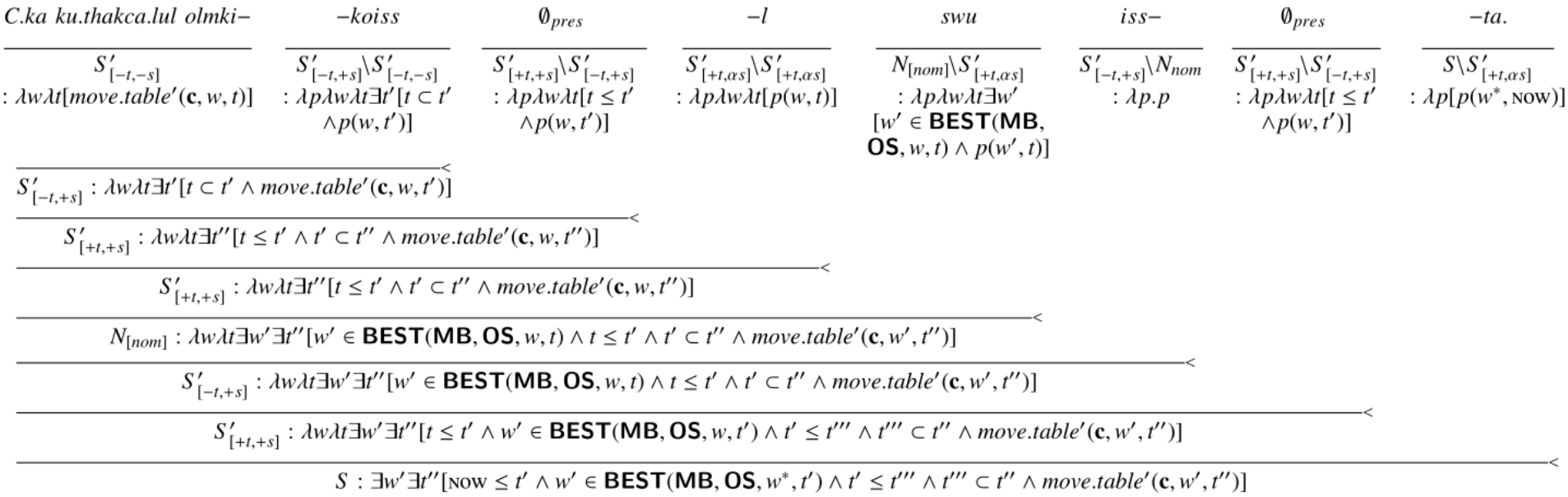


Figure 2. Derivation of a *swu*-sentence with the progressive in (21)

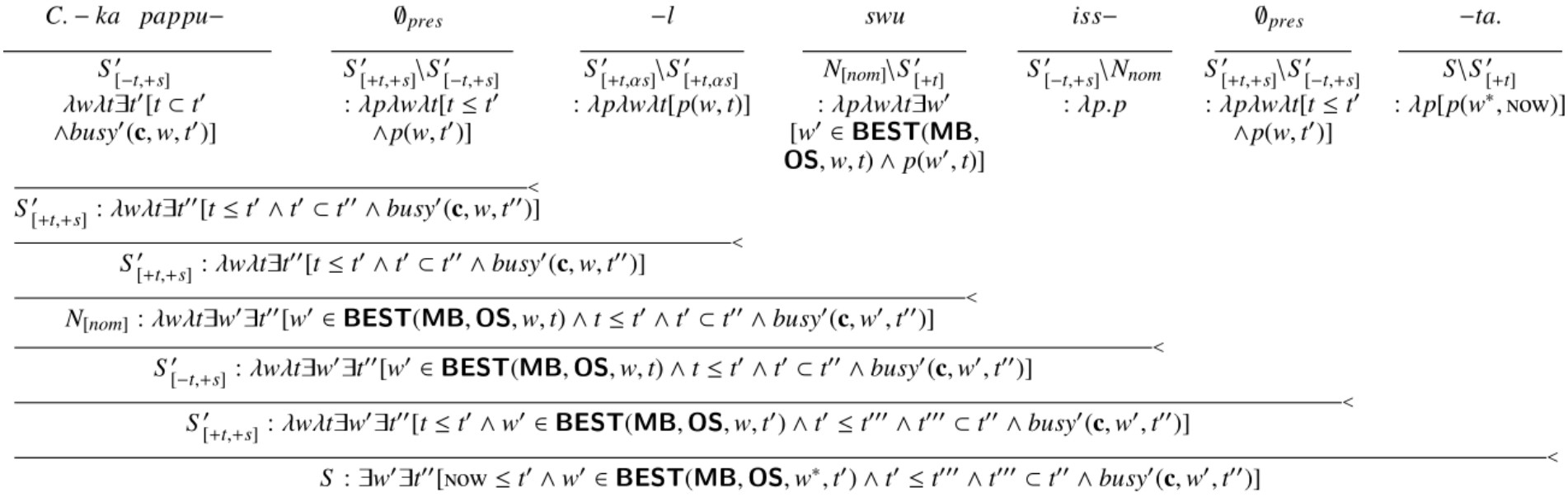


Figure 3. Derivation of a *swu*-sentence with a stative predicate in (20)

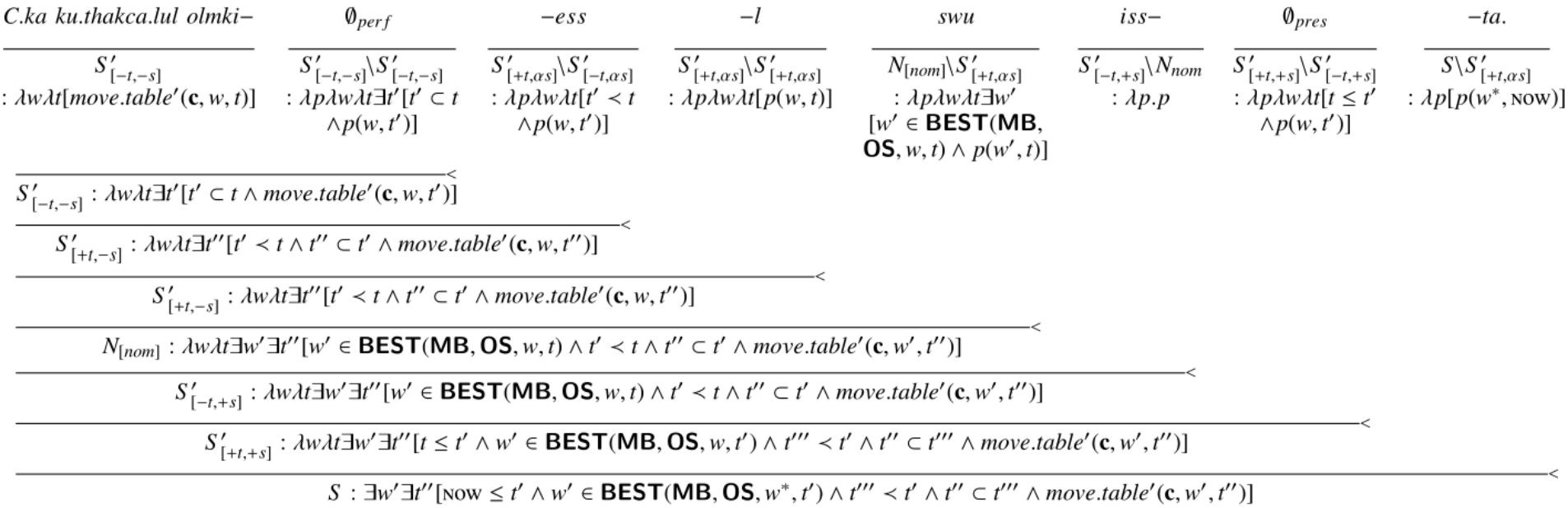


Figure 4. Derivation of a *swu*-sentence with past tense in (22)

Temporal constraints on modal readings

- Following Rullmann & Matthewson (2018), I assume that the diversity condition (adapted from Condoravdi 2002) temporally constrains the circumstantial modal base to descriptions of future eventualities, and present a uniform explanation about the unavailability of the non-epistemic modal readings with a stative predicate, progressive aspect, and past tense in a *swu*-construction in terms of its violation of the diversity condition (cf. Mun 2016).
- I argue that, in contrast, there is not such a temporal constraint on the epistemic modal base, and thus all the TP-TO combinations are allowed for epistemic modal readings in the *swu*-construction.

TO-constraints on circumstantial modal base

Condoravdi's (2002) diversity condition

(44) There $w \in cg$ and $w', w'' \in \mathbf{MB}(w, t)$ such that $\text{AT}([t, \_), w', p)$ and $\neg\, \text{AT}([t, \_), w'', p)$, where $[t, \_)$ indicates a time interval whose initial subinterval is t and it extends to the end of the time.
(Condoravdi 2002, p.71, p.83).

- According to (44), there should be at least one world in which a prejacent proposition p is true, and another world in which it is false.
- Condoravdi argues that in English sentences like (18b), a root reading is available only with the description of a future eventuality since the truth value of its prejacent proposition is not yet settled to be true or false. Conversely, **with a past or present eventuality**, its prejacent proposition is metaphysically settled at the time of TP, and thus the **root reading** is **pragmatically ruled out**.

- Rullmann & Matthewson (2018) show that the same TO-restrictions are extensively observed with circumstantial modals in other languages, and claim that the diversity condition suffices to account for their TO-restrictions.
- I argue that the non-epistemic modal readings with non-Future TOs are excluded in the Korean *swu*-construction for the same reason:

(45) When a modal utterance with *swu* is contextually construed as involving a circumstantial modal base, the dynamic (ability) and the priority (permission) readings can arise if and only if the diversity condition is not violated by non-Future TOs.

- (19) is available with the non-epistemic modal readings as well as the epistemic modal reading, because it receives a future-TO interpretation.
- The **stative predicate** in (20) and the **progressive aspect** in (21) violates the diversity condition, because they constrain the TO to be in the nonpast time of the TP. The past-TO interpretation caused by the embedded **past tense** in (22) violates the diversity condition as well. Consequently, the **non-epistemic readings** are **pragmatically disallowed** in these examples.

No temporal constraint on epistemic modal base

- When we utter an epistemically modalized sentence to describe a past or present eventuality, its prejacent proposition can still be true or false. In other words, **no TO-restrictions** (such as the diversity condition) are imposed on the epistemic modal base.
- With regard to the **TP of epistemic modals**, the literature has assumed that it is necessarily keyed to the utterance time, and thus a past perspective is not expressible with epistemic modals.
  (e.g. Groenendijk & Stokhof 1975, Picallo 1990, Iatridou 1990, Abusch 1997, Condoravdi 2002, Stowell 2004, Hacquard 2006, 2011)

- However, some authors, like von Fintel & Gillies (2008), argue that a past-TP interpretation is available in natural language sentences:

(46) [Context: At the time of utterance, the speaker knows that there is no ice cream in the freezer, but when she is asked about why she opened the freezer, she says:]
There might have been ice cream in the freezer.
(von Fintel & Gillies, 2008, 87)

von Fintel & Gillies (2008) assert that (46) can be construed as expressing the speaker's past epistemic perspective on the possiblity of the prejacent proposition.

- In line with von Fintel and Gillies' view, Rullmann & Matthewson (2018) develop a theory of modal-temporal interaction, according to which there is **no grammatical TP-restriction on epistemic modal base**, on the basis of empirical patterns in languages like Dutch where TP is overtly expressed by tense markings on epistemic modals:

(47) a. De sleutel **moet** / **kan** (wel) (eens) in de la lig-en.
the key NEC.**PRES**.3SG / POS.**PRES**.3SG (PRES) (PRES) in the drawer lie-INF
'The key must/might be in the drawer.' [**Present TP, Present TO**]

b. De sleutel **moest** / **kon** (wel) (eens) in de la ligg-en.
the key NEC.**PAST**.3SG / POS.**PAST**.3SG (PRES) (PRES) in the drawer lie-INF
'The key had to be / might have been in the drawer.'
[**Past TP, Present TO**]
(Rullmann & Matthewson, 2018, 289-290)

- Note that the Korean *swu*-construction exhibits the analogous pattern as Dutch modal constructions: the TP-interpretation is determined (i) by tense realized with modals in Dutch, and (ii) by tense scoping over the modal *swu* in Korean.
- Given the parallels, I argue that the empirical patterns observed with the *swu*-construction provide further support for Rullmann & Matthewson's (2018) claim that there should be **no grammatical restrictions on the past-TP epistemic readings**.

Summary

- I showed how modal readings are affected by temporal elements, by examining the interpretation of the *swu*-construction in Korean.
- I compositionally analyzed the temporal interpretation, and provided a uniform account for the unavailability of the non-epistemic readings with a stative predicate, progressive aspect, and past tense in terms of the diversity condition that restricts the circumstantial modal base to future eventualities (Condoravdi 2002; Rullmann & Matthewson 2018).
- Furthermore, I showed that epistemic modal readings are not temporally restricted in the *swu*-construction, which empirically supports von Fintel & Gillies' (2008) and Rullmann & Matthewson's (2018) claim that epistemic modals are not necessarily evaluated with respect to the utterance time (cf. Groenendijk & Stokhof 1975, Picallo 1990, Iatridou 1990, Abusch 1997, Condoravdi 2002, Stowell 2004, Hacquard 2006, 2011).

REFERNCES (Selected)

Abusch, Dorit (1997) The now parameter in future contexts. In *Context Dependency in the Analysis of Linguistic Meaning*, Barbara Partee & Hans Kamp, eds., Stuttgart: IMS Working Papers, 1–20.

Alexiadou, Artemis (1997) *Adverb Placement: a Case Study in Antisymmetric Syntax*. Amsterdam: John Benjamins.

Beijer, Fabian (2005) *On the Relative Order of Adverbs in the I-domain: a Study of English and Swedish*. Ph.D. thesis, Lund University.

Butler, Jonny (2003) A minimalist treatment of modality. *Lingua* **113**: 967–996.

Chung, Daeho (2007) Korean Modal V-*(u)l swu/li iss/eps* and Polarity Licensing. *Studies in Generative Grammar* **17**(4): 612–651.

Cinque, Guglielmo (1999) *Adverbs and Functional Heads*. Oxford: Oxford University Press.

Condoravdi, Cleo (2002) Temporal interpretation of modals: Modals for the present and for the past. In *The Construction of Meaning*, David Beaver, Luis Casillas Martínez, Brady Clark, & Stefan Kaufmann, eds., Stanford, CA: CSLI Publications, 59–87.

Dowty, David (1986) The effects of Aspectual class on the temporal structure of discourse: Semantics or pragmatics? *Linguistics and Philosophy* **9**: 37–61.

Groenendijk, Jeroen A.G. & Martin J.B. Stokhof (1975) Modality and conversational information. *Theoretical Linguistics* **2**: 61–112.

Ha, Iljoo (2007) NPI licensing in Korean modal constructions. In *Japanese/Korean Linguistics 15*, Stanford, CA: CSLI, 312–323.

Hacquard, Valentine (2006) *Aspects of Modality*. Ph.D. thesis, MIT.

Hacquard, Valentine (2011) Modality. In *Semantics: An International Handbook of Natural Language Meaning*, Claudia Maienborn, Klaus von Heusinger, & Paul Portner, eds., Berlin: Mouton de Gruyter, 1484–1515.

Hinrichs, Erhard (1986) Temporal anaphora in discourses of English. *Linguistics and Philosophy* **9**: 63–82.

Iatridou, Sabine (1990) About Agr(P). *Linguistic Inquiry* **21**(4): 551–577.

Jackendoff, Ray (1972) *Semantic Interpretation in Generative Grammar*. Cambridge, MA: MIT Press.

Kamp, Hans & Uwe Reyle (1993) *From Discourse to Logic*. Dordrecht: Kluwer.

Kamp, Hans & Christian Rohrer (1983) Tense in texts. In *Meaning, Use and Interpretation of Language*, Rainer Bäuerle, Christoph Schwarze, & Arnim von Stechow, eds., Berlin: Mouton de Gruyter, 250–269.

Kim, Shin-Sook (2010) The Structures of Modality in Korean. In *Proceedings of the 6th Workshop on Altaic Formal Linguistics*, H. Maezawa & A. Yokogoshi, eds., Cambridge, MA: MIT Working Papers in Linguistics, 171–180.

Kim, Tae Sik (2014) Bound Noun *swu* in Korean. *Studies in Generative Grammarn* **24**: 385–406.

Klein, Wolfgang (1994) *Time in Language*. New York: Routledge.

Kratzer, Angelika (1981) The Notional Category of Modality. In *Words, Worlds, and Contexts: New Approaches in World Semantics*, *Research in Text Theory*, vol. 6, Hans-Jurgen Eikmeyer & Hannes Rieser, eds., Berlin: W. de Gruyter, 38–74.

Kratzer, Angelika (1991) Modality. In *Semantics: An International Handbook of Contemporary Research*, Arnim von Stechow & Dieter Wunderlich, eds., Berlin: Mouton de Gruyter, 639–650.

Lee, Jungmee (2017) Epistemic vs. root modality in interactions with tense. *Korean Journal of Linguistics* **42**(4): 805–825.

Mun, Bokyung (2016) *The interaction between modal and tense in Korean*. Ph.D. thesis, Georgetown University.

Nilsen, Øystein. (1997) *Adverbs and A-shift*. Working papers in Scandinavian syntax, URL `https://books.google.co.kr/books?id=4L0MPAAACAAJ`.

Partee, Barbara Hall (1984) Nominal and Temporal Anaphora. *Linguistics and Philosophy* **7**: 243–286.

Picallo, Carme (1990) Modal verbs in Catalan. *Natural Language and Linguistic Theory* **8**: 285–312.

Portner, Paul (2007) Beyond the Common Ground: The Semantics and Pragmatics of Epistemic Modals, presented at the International Conference on Linguistics in Korea, Seoul National University.

Portner, Paul (2009) *Modality*. Oxford: Oxford University Press.

Prior, Arthur (1967) *Past, Present and the Future*. Oxford: Clarendon Press.

Rackowski, Andea & Lisa Travis (2000) V-initial languages: X or XP movement and adverbial placement. In *The Syntax of Verb Initial Languages*, Andrew Carnie & Eithne Guilfoyle, eds., Groningen-Amsterdam Studies in Semantics, New York: Oxford University Press, 117–141.

Reichenbach, Hans (1947) *Elements of Symbolic Logic*. New York: MacMillan.

Rullmann, Hotze & Lisa Matthewson (2018) Towards a theory of modal-temporal interaction. *Language* **94**.

Stowell, Tim (2004) Tense and modals. In *The Syntax of Time*, Jacqueline Guéron & Jacqueline Lecarme, eds., Cambridge, MA: MIT Press, 495—537.

Tsujioka, Takae (1996) *The Syntax of Possession in Japanese*. Ph.D. thesis, Georgetown University.

von Fintel, Kai (2006) Modality and Language. In *Encyclopedia of Philosophy . Second Edition*, Donald M. Borchert, ed., Detroit: MacMillan Reference USA.

von Fintel, Kai & Anthony S. Gillies (2008) CIA leaks. *Philosophical Review* **117**(1): 77–98.

Zubizaretta, Maria Luisa (1982) *On the relationship of the lexicon to syntax*. Ph.D. thesis, Massachusetts Institute of Technology.

APPENDIX

The progressive *-koiss* can occur with past tense within an adnominal clause as well:

(48) Present TP, Past TO

(Cikum po-ni,) [ecey nay-ka kkochpyeng-ul kkay-ss-ul.ttay Chelswu-ka ku thakca-lul
now see-as yesterday I-NOM vase-ACC break-PAST-when Chelswu-NOM that table-ACC
olmki-**koiss-ess**]-l swu iss-Ø-ta.
move-PROG-PAST-ADN SWU exist-PRES-DECL

'(In view of what I know now,) it is possible that Chelswu was moving the table when I broke a vase yesterday.'

#'(In view of the present circumstances,) Chelswu is able to have been moving the table when I broke a vase yesterday.'

#'(In view of the present circumstances,) Chelswu is allowed to have been moving the table when I broke a vase yesterday.'

(49) Past TP, Past TO

(Ecey po-ni,) [kucekkey nay-ka kkochpyeng-ul kkay-ss-ul.ttay
yesterday see-as the.day.before.yesterday I-NOM vase-ACC break-PAST-when
Chelswu-ka ku thakca-lul olmki-**koiss-ess**]-l swu iss-ess-ta.
Chelswu-NOM that table-ACC move-PROG-PAST-ADN SWU exist-PAST-DECL

'(In view of what I knew yesterday,) it was possible that Chelswu was moving the table when I broke a vase on the day before yesterday.'
#'(In view of the previous circumstances (yesterday),) Chelswu was able to have been moving the table when I broke a vase on the day before yesterday.'
#'(In view of the previous circumstances (yesterday),) Chelswu was allowed to have been moving the table when I broke a vase on the day before yesterday.'

The above examples have a past-TO interpretation, since the embedded eventuality of Chelswu's moving the table is interpreted as temporally preceding the TP. However, unlike their corresponding examples without the progressive in (28), their embedded eventualities are construed as being in progress at the past reference time, i.e. the time at which I broke a vase.