

Interpretation of Relative Tenses in Korean Time Adverbials*

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1 Introduction

Korean is a relative tense language in the sense that the tense may inherit its locus from a point other than the moment of speech. For instance in a complement clause, the same form *Mary-ka ttena-ess* in (1) - (3) refers to different times depending on the clause into which it is embedded: it refers to some time in the past prior to the time of John's feeling in (1), some time in the past in (2), and some time in the future in (3):¹

- (1) John-un Mary-ka ttena-ess-tako nukki-ess-ta.
John-Top Mary-Nom leave-Compl-Comp feel-Compl-Dec
'John felt that Mary had left.'
- (2) John-un Mary-ka ttena-ess-tako nukki-nun-ta.
John-Top Mary-Nom leave-Compl-Comp feel-Incom-Dec
'John feels that Mary left/has left.'
- (3) John-un nayil Mary-ka ttena-ess-tako nukki-keyss-ta.
John-Top tomorrow Mary-Nom leave-Compl-Comp feel-Fut-Dec
'John will feel tomorrow that Mary has left.'

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¹ I will use the following abbreviations, anticipating the definitions of 'completive' and 'incompletive' in § 2.1:

Top: topic marker, Nom: nominative marker, Acc: accusative marker, Comp: complementizer, Rel: relativizer, Hon: honorific, Dec: declarative mood marker, Fut: future tense marker, Compl: completive marker, Incom: incompletive marker

Moreover, I will ignore most phonologically based variations of orthography in romanizations, hoping this way to facilitate understanding of the data presented for nonnative speakers of Korean.

A similar kind of relativity is found in complex time adverbials as in (4) and (5). The same temporal adverbial expression refers to a past time in (4) and to a future time in (5):

- (4) Mary-ka tochakha- ϕ -ul ttay John-i ttena-ess-ta.
 Mary-Nom arrive-Incom-Rel time John-Nom leave-Compl-Dec
 'John left when Mary was arriving.'
- (5) Mary-ka tochakha- ϕ -ul ttay John-i ttena-kyess-ta.
 Mary-Nom arrive-Incom-Rel time John-Nom leave-Fut-Dec
 'John will leave when Mary is arriving.'

While most time adverbials in Korean show this relativity in tense, there are several non-trivial points that distinguish time adverbials from complement clauses. First, comparing (1) and (6) below, we notice that they are not completely parallel in relativity. Both sentences have the completive tense in the matrix and the embedded clauses. Nevertheless, the event time of the time adverbial in (6) has to be 'immediately' before the event time of the matrix, whereas (1) follows the regular pattern of relativity so that the event time of the embedded clause is 'completive' relative to the event time of the matrix, i.e. roughly the former is prior to the latter.

- (1) John-un Mary-ka ttena-ess-tako nukki-ess-ta.
 John-Top Mary-Nom leave-Compl-Comp feel-Compl-Dec
 'John felt that Mary had left.' (leaving time < feeling time)
- (6) Mary-ka tochakha-ess-ul ttay John-i ttena-ess-ta.
 Mary-Nom arrive-Compl-Rel time John-Nom leave-Compl-Dec
 'John left when Mary had arrived.'
 (arriving time is immediately before leaving time)

Secondly, the difference in tense is neutralized when an atelic predicate appears in a time adverbial. For instance, a distinction does not arise between (7) and (8). (8) means the same as (7) even though (7) and (8) have different tenses; viz. incomplete and completive, respectively:

- (7) Mary-ka aphu- ϕ -ul ttay John-i ttena-ess-ta.
 Mary-Nom sick-Incom-Rel time John-Nom feel-Compl-Dec
 'John left when Mary was sick.' (leaving time \subseteq sick time)
- (8) Mary-ka aphu-ess-ul ttay John-i ttena-ess-ta.
 Mary-Nom sick-Compl-Rel time John-Nom leave-Compl-Dec
 'John left when Mary was sick.' (leaving time \subseteq sick time)

Thirdly, the event time of a time adverbial does not shift when a stative predicate appears in the matrix sentence: the event time of the time adverbial in (9) is understood as the same time as the event time of the matrix.²

- (9) Apeci-ka tola ka-si-ess-ul ttay John-i tases-sal-i-ess-ta.
 Father-Nom back go-Hon-Compl-Rel time John-Nom five-age-is-Compl-Dec
 'John was five when Father passed away.' (dying time \subseteq time of being five)

² It seems that judgements are split about activity predicates: while almost all speakers agree that the distinctions in tense are neutralized for statives in (7), (8), and (9), many speakers do not agree that it is also true for activity predicates. But the neutralization tends to occur more readily with an activity predicate with a typically longer duration. For example, *ca* 'to sleep' and *hakkyo-ccokulo kele-ka* 'to walk towards the school' seem more likely to be neutralized in tense than *kongwon-eyse sanchaykha* 'to take a walk in the park' or *kongpwuha* 'to study'.

Thus, we are apparently left with a non-homogeneous system of relative tense. A complement clause displays complete relativity, whereas a time adverbial shows partial relativity.

This paper is an attempt to give an adequate analysis of time adverbials in Korean, explaining why they exhibit the differences in relativity. Eventually, I will claim that the relativity in tense is consistent with the apparent differences.

2 Korean Data

2.1 Tenses in Korean

In this subsection, I will give a brief overview of the tense system in Korean for a better understanding of the discussion that will follow.

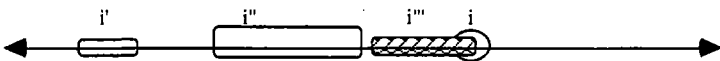
First of all, it has been noted by many that so called 'past tense marker' *-ess* does not directly correspond to the English past tense marker *-ed*. The marker *-ess* in (10) seems to have a function for which English would make use of two different expressions: *-ed* and *have -ed*.

- (10) a. Ecey pi-ka nayli-ess-ta.
 yesterday rain-Nom come.down-Compl-Dec
 'It rained yesterday.'
 b. Ku yeca-ka caknyen-pwuthe an o-ess-ta.
 that woman-Nom last.year-from not come-Compl-Dec
 'The woman hasn't come since last year.'

As is indicated in the English glosses, the marker *-ess* in (10a) is best translated as a past tense marker, whereas the one in (10b) is translated as perfect tense. Since one form apparently functions in two different ways, there are at least four possible analyses. One analysis is that the basic function of *-ess* is to mark past tense and that the perfective meaning as in (10b) derives from the basic meaning. This position is held by Martin (1954), Choe (1977), An (1980), K-D. Lee (1981), and C. Lee (1987). Another analysis goes the other way, assuming that the perfective meaning is basic. This is supported by Huh (1983), Sohn (1975), and Nam (1978). Shin (1988) and S-K. Lee (1988) propose that there are two kinds of *-ess*, the past tense marker *-ess* and the perfective aspect marker *-ess*. Recently some authors proposed that *-ess* has only one meaning, which is indeterminate between past and perfect readings by itself, though further specifications can be provided by contexts and/or time adverbials. This kind of analysis has been proposed by S-H. Choi (1987), H.S. Lee (1991), H-W. Choi (1993), and Yoo (1993).

I will follow Yoo (1993, 1996) in assuming that *-ess* marks what Stump (1985) calls 'a perfect interval', as the definition and some examples of the members are given in (11) and (12). This move is obviously to adopt an approach which views *-ess* as having one interpretation.

- (11) **compl**(ζ) is true at i
 iff i' begins before i and lasts no later than i , where ζ denotes i' .
- (12) i' , i'' , and i''' are completive intervals relative to i .

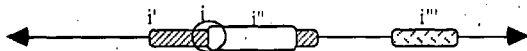


Another issue to be settled is concerned with the morpheme *-nun*, frequently considered as the present tense marker. (13) below shows that *-nun* appear only in a non-past sentence. It is also shown in (12) that it cannot appear with a class of verbs which were traditionally called adjectives but are now called more commonly description verbs or adjectival verbs. The class of these verbs coincides with that of adjectives in English. Without further discussion, I will follow Yoo (1993, 1996) in assuming that *-nun* is required for incompleteness of an event with respect to some time as shown in (14) and (15) and moreover that this is realized as a zero morpheme in adjectival verbs as in (16a).

- (13) a. Mary-ka nayil hakkyo-ey ka-nun-ta.
 Mary-Nom tomorrow school-to go-Incom-Dec
 'Mary goes to school tomorrow.'
- b. Mary-ka hakkyo-ey ka-nun-ta.
 Mary-Nom school-to go-Incom-Dec
 'Mary goes to school/ Mary is going to school.'
- c. *Mary-ka ecey hakkyo-ey ka-nun-ta.
 Mary-Nom yesterday school-to go-Incom-Dec
 (int.) 'Chelwu went to school yesterday.'

- (14) **incom**(ζ) is true at i
 iff i' lasts later than i , where ζ denotes i' .

- (15) i' , i'' , and i''' are incomplete intervals relative to i .



- (16) a. Mary-ka yeppu- ϕ -ta.
 Mary-Nom is.pretty-Incom-Dec
 'Mary is pretty.'
- b. *Mary-ka yeppu-nun-ta.
 Mary-Nom is.pretty-Incom-ta
 (int.) 'Mary is pretty.'

One critical aspect of Korean is that the tenses are all relative. That is, a tense in an embedded clause is evaluated not by the speech time but by the event time of the next higher clause. When there is no next higher clause, i.e., when the tense is in the matrix clause, it is evaluated with respect to the speech time. Then, one implication is that Korean cannot have so-called 'double accessibility readings' (cf. Abusch 1988 and E \check{n} ç 1987). In English a sentence like (17a) is claimed to have a double accessibility reading in that Mary was pregnant at the time of John's saying and moreover that Mary is pregnant at the speech time. However, since every tense is relative to its next higher clause in Korean, it is predicted that there is no double accessibility reading in (17b). (17b) can only mean that Mary was pregnant at the time of John's saying.

- (17) a. John said that Mary is pregnant.
- b. John-nun Mary-ka imsincwung-i- ϕ -lako malha-ess-ta.
 John-Top Mary-Nom pregnant-is-Incom-Comp say-Compl-Dec
 'John said that Mary was pregnant.'

2.2 Structure of Time Adverbials

The canonical structure of Korean time adverbials consists of an NP plus a postposition. A postposition is necessary in most cases, e.g. *caknyen-ey* 'last year'. There are a few time adverbials in which a postposition is optional, e.g. *ku ttay-(ey)* 'at that time', or not possible, e.g. *ecey* 'yesterday'. Where a subordinating conjunction is commonly employed in other languages as in (18), an NP with a relative clause is used in Korean. This use of relative clause constructions for time adverbials, it is reported, is also exhibited by Hausa, Mandarin, Swahili, Hungarian, Turkish, etc. (cf. Thompson and Longacre 1985).

(18) John left when Mary was arriving.

(4) Mary-ka tochakha- ϕ -ul-ttay-(ey) John-i ttena-ess-ta.
 Mary-Nom arrive-Incom-Rel-time-at John-Nom leave-Compl-Dec
 'John left when Mary was arriving.'

Since the construction of the time adverbial in (4) is based on a relative clause, it would be more faithful to gloss it as 'John left at the time when Mary was arriving'. However, (18) seems to be a more natural expression in English and I do not find difference in meaning, so I will continue to gloss in this way.

There are two sets of tense inflections in Korean: one for independent clauses, another for relative clauses. Comparing two kinds of corresponding clauses in (19) and (20), we can represent the inflectional patterns as (21) below:

(19) a. Chinkwu-ka ecey ttena-ess-ta.
 friend-Nom yesterday leave-Compl-Dec
 'A friend left yesterday.'

b. Chinkwu-ka ttena-nun-ta.
 friend-Nom leave-Incom-Dec
 'A friend leaves/A friend will leave.'

c. Chinkwu-ka nayil ttena-kyess-ta.
 friend-Nom tomorrow leave-Fut-Dec
 'A friend will leave tomorrow.'

(20) a. ecey ttena- ϕ -un chinkwu
 yesterday leave-Compl-Rel friend
 'a/the friend who left yesterday'

b. ttena-nu-un chinkwu
 leave-Incom-Rel friend
 'a/the friend who leaves/will leave'

c. nayil ttena-ulchinkwu
 tomorrow leave-Rel friend
 'a/the friend who will leave tomorrow'

(21) Tense Markers in Korean:

a. Independent Clauses:

		non-adjectival verbs	adjectival verbs
realis	completive	-ess	-ess
	incompletive	-nun	- ϕ
irrealis	future	-keyss	-keyss

b. Relative Clauses:

		non-adjectival verbs	adjectival verbs
realis	completive	- ϕ + un(REL)	
	incompletive	-nu + un(REL)	- ϕ + un(REL)
irrealis	future	-ul(REL)	-ul(REL)

However, the *-ul ttay* 'when' time adverbial is an exception to the regular pattern of relative clause inflections in (21b). The pattern for the *-ul ttay* time adverbial is given in (22). Notice that there is no irrealis relativizer with this construction. But once we consider the nature of time adverbials, it is hardly surprising: It has been claimed that time adverbial clauses have factive presuppositions (see Heinämäki 1974). Thus, this lack of irrealis reading is expected. What is unexpected, though, is the use of the relativizer *-ul*. It is used as the irrealis relativizer in the regular pattern. It is unknown why the regular *-un* relativizer is not used for this construction.

(22) Relative Clauses for *-ul ttay* 'when':

		all verbs
realis	completive	ess + ul(REL)
	incompletive	- ϕ + ul(REL)
irrealis	future	

Other time adverbials follow the regular pattern in (21b), e.g. *hwu* 'after' and *ci* 'since'. It is observed that the *hwu* 'after' complex takes only the completive tense:

(23) Mary-ka tochakha- ϕ -un hwu-ey John-i ttena-ess-ta.
 Mary-Nom arrive-Compl-Rel later.time-at John-Nom leave-Compl-Dec
 'John left after Mary arrived.'

(24) *Mary-ka tochakha-nu-un hwu John-i ttena-ess-ta.
 Mary-Nom arrive-Incom-Rel later.time John-Nom leave-Compl-Dec
 (int.)'John left after Mary was arriving.'

(25) *Mary-ka tochakha-ul hwu John-i ttena-ess-ta.
 Mary-Nom arrive-Rel later.time John-Nom leave-Compl-Dec
 (int.)'John left after Mary would arrive.'

The unacceptability of (25) is due to the same reason that accounts for why the adverbial cannot have the irrealis relativizer. Namely, the factive presupposition in time adverbials is incompatible with the presuppositions triggered by irrealis inflections. I will show in Section 3 that (24) is bad on semantic grounds.

3 Semantic Analysis

Given the data displaying nonhomogenous relativity in time adverbials, I will show how they are predicted to yield the readings in § 2. I will draw on Stump's (1985) work as for the general basis of the formal framework. I also follow Yoo (1993, 1996) on the semantics of the completive and incompletive tenses.

3.1 Preliminaries

A category 'temporal abstract' is useful, as Stump proposes in part to account for iterated time adverbials as separate constituents. With this category Stump views a sentence also as denoting a set of times at which the corresponding proposition is true. As a first step I will adopt this category and the rules involving the category. The temporal abstract rule in (26) yields temporal abstracts from a sentence. The main tense adverb rule in (27) modifies a given temporal abstract, yielding yet another temporal abstract, thus making it possible to recursively apply the rule. Then, the existential closure rule in (28) reverses the temporal abstract rule and provides an existential quantifier over times, yielding the final translation of a sentence:

- (26) Temporal Abstract Rule (Stump 1985:105):
 S11. If $\phi \in P_t[-\text{tense}]$, then $F_{11}(\phi) \in P_{\text{TAB}}[-\text{tense}]$, where is $F_{11}(\phi)$ is ϕ .
 T11. If $\phi \in P_t$ and ϕ translates as ϕ' , then $F_{11}(\phi)$ translates as $\lambda t[\text{AT}(t, \phi)']$.
- (27) Main Tense Adverb Rule (Stump 1985:119):
 S12. If $\alpha \in P_{\text{MTA}}$ and $\beta \in P_{\text{TAB}}$, then $F_{12}(\alpha, \beta) \in P_{\text{TAB}}$,
 where is $F_{12}(\alpha, \beta)$ is $\alpha\beta$.
 T12. functional application.
- (28) Existential Closure (Stump 1985:107):
 S13. If $\alpha \in P_{\text{TAB}}[+\text{tense}]$, then $F_{13}(\alpha) \in P_t[+\text{tense}]$, where is $F_{13}(\alpha)$ is α .
 T13. If $\alpha \in P_{\text{TAB}}$ and α translates as α' , then $F_{13}(\alpha)$ translates as $\exists t[\alpha'(t)]$.

Also, the AT operator will be adopted:

- (29) Operator AT (Dowty (1979))
 AT(t_1, ϕ) is true at any time t iff ϕ is true at the time denoted by t_1 .

The model for the intensional logic is a sextuple including the precedence relation and the subinterval relation on the set of times. The overlap relation can be derived from the subinterval relation such that $t \bullet t'$ iff there is t'' such that $t'' \subseteq t$ and $t'' \subseteq t'$:

- (30) Model M for IL = $\langle A, W, T, \prec, \subseteq, F \rangle$
 A, the set of individuals
 W, the set of worlds
 T, the set of times (intervals)
 \prec , the precedence relation on T
 \subseteq , the subinterval relation on T
 F, the interpretation function
 (\bullet , the overlap relation on T)

I specify variable conventions in (31) which are in accord with Dowty (1979) and Stump (1985). The categories and their types in (32) mostly follow Stump except that I propose a

new category POST(position) whose expressions include *ey* 'at'. An expression of POST combines with an expression of TA, resulting in a MTA. A MTA in turn combines with a TAB, yielding another TAB.

(31) Variable Conventions

- $t, t_0, t_1, t_2, t', t''$ are variables of type i .
- x, y, z are variables of type e .
- P and Q are variables of type $\langle s, \langle e, t \rangle \rangle$.
- P' and Q' are variables of type $\langle s, \langle i, t \rangle \rangle$.

(32) Categories and Types:

Syntactic Categories	Types	Basic Expressions
CN	$\langle e, t \rangle$	salam 'person', ...
TA	$\langle i, t \rangle$	caknyen 'last year', ...
IV	$\langle e, t \rangle$	aphu 'to be sick', ...
T	$\langle \langle s, \langle e, t \rangle \rangle, t \rangle$	John, Mary, ...
TV	$\langle \langle s, f(T) \rangle, f(IV) \rangle$	chach 'to seek', ...
t	t	Λ
TAB	$\langle i, t \rangle$	Λ
MTA	$\langle \langle s, f(TAB) \rangle, \langle i, t \rangle \rangle$	Λ
POST	$\langle \langle s, f(TA) \rangle, f(MTA) \rangle$	<i>ey</i> 'at'

As mentioned earlier, I adopt Yoo's proposal for the completive and the incomplete tenses. The tense rules in (33) and (34) introduce two intensional logic predicates, **compl** and **incom**. Their truth conditions are defined in (11) and (14) above.

(33) Completive Rule (Yoo 1993:387)

S14. If $\alpha \in P_{TAB[-tense]}$, then $F_{14}(\alpha) \in P_{t[+tense]}$, where is $F_{14}(\alpha)$ is the result of placing *-ess* in the predicate of α .

T14. If $\alpha \in P_{TAB}$ and α translates as α' ,
then $F_{14}(\alpha)$ translates as $\lambda t[\text{compl}(t) \ \& \ \alpha'(t)]$.

(34) Incomplete Rule (Yoo 1993:388)

S15. If $\alpha \in P_{TAB[-tense]}$, then $F_{15}(\alpha) \in P_{t[+tense]}$,
where $F_{15a}(\alpha)$ is α when it is an adjectival verb,

$F_{15b}(\alpha)$ is the result of placing *-nun* in the predicate of α , otherwise.

T15. If $\alpha \in P_{TAB}$ and α translates as α' ,
then $F_{15}(\alpha)$ translates as $\lambda t[\text{incom}(t) \ \& \ \alpha'(t)]$.

3.2 Analysis

Given the rules in the preceding section, I will illustrate the derivational steps of a sentence with a simple time adverb, to give the flavor of the system that I am employing here. Incidentally, we need one more rule in the derivation which will enable a postposition to combine with a time adverbial and then to take a temporal abstract as an argument. The rule is given in (35):

(35) Postposition Rule:

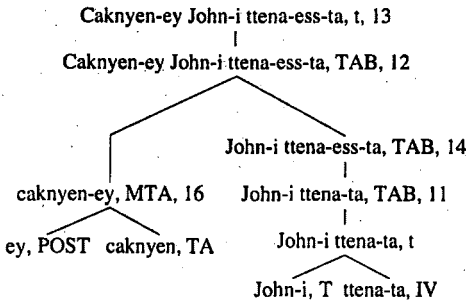
S16. If $\alpha \in P_{POST}$ and $\beta \in P_{TA}$, then $F_{16}(\alpha, \beta) \in P_{MTA}$, where is $F_{16}(\alpha, \beta)$ is $\beta\alpha$.

T16. Functional application.

With the addition of the postposition rule, we can derive the sentence (36) as (36'). The corresponding semantic derivation is given (36'') below:

- (36) Caknyen-ey John-i ttena-ess-ta.
 last.year-at John-Nom leave-Compl-Dec
 'John left last year.'

(36')



- (36'') caknyen 'last year', TA => $\lambda t_1 [t_1 \subseteq \text{last-year}]$, last-year is an interval constant
 ey 'at', POST => $\lambda P^i \lambda Q^i \lambda t [Q^i \{t\} \& AT(t, P^i \{t\})]$
 caknyen-ey, MTA => $\lambda Q^i \lambda t [Q^i \{t\} \& AT(t, t \subseteq \text{last-year})]$
 John-i ttena-ess-ta, TAB => $\lambda t_0 [AT(t_0, \text{leave}'(j))]$
 John-i ttena-ess-ta, TAB => $\lambda t_0 [\text{compl}(t_0) \& AT(t_0, \text{leave}'(j))]$
 Caknyen-ey John-i ttena-ess-ta, TAB
 => $\lambda t [\text{compl}(t) \& AT(t, \text{leave}'(j)) \& AT(t, t \subseteq \text{last-year})]$
 Caknyen-ey John-i ttena-ess-ta, t
 => $\exists t [\text{compl}(t) \& AT(t, \text{leave}'(j)) \& AT(t, t \subseteq \text{last-year})]$, \exists -Closure

The denotation of the postposition may look unnecessarily complex for the derivation of (36). We might as well propose (37) as its denotation with which we will arrive at (38) as (36'') and (38) are equivalent.

- (37) ey 'at', POST => $\lambda P^i \lambda Q^i \lambda t [Q^i \{t\} \& P^i \{t\}]$
 (38) Caknyen-ey John-i ttena-ess-ta, t
 => $\exists t [\text{compl}(t) \& AT(t, \text{leave}'(j)) \& t \subseteq \text{last-year}]$

However, the more complex kind of denotation in (36'') is needed to give a unified account when the postposition combines with a complex TA which has tense specifications, i.e. to capture the relativity of the tense in complex temporal adverbials.

3.2.1 Complement Clauses

The relativity of tense can be captured with ease when we assume that all tenses are relative and use the AT operator. We can derive (1) below with an additional rule which will

combine a transitive verb and a complement clause. I will omit the rule, as it is obvious. Assuming this rule, we will arrive at the translation in (1') for (1):

- (1) John-un Mary-ka ttena-ess-tako nukki-ess-ta.
 John-Top Mary-Nom leave-Compl-Comp feel-Compl-Dec
 'John felt that Mary had left.' (time of leaving < time of feeling)
- (1') $\exists t_0 [\text{compl}(t_0) \& \text{AT}(t_0, \text{feel}(j, \wedge \exists t_1 [\text{compl}(t_1) \& \text{AT}(t_1, \text{leave}(m))]))]$

Notice that in (1') the interval variable t_1 is in the scope of t_0 , thus the former is relative to the latter by the function of the AT operator. However, I should point out that contrary to common assumptions (cf. Stump 1985:124--125, Ogiwara 1992:135), this scope analysis in the current form works only if we consider a proposition simply as a set of worlds, rather than a set of world-time pairs. If we assume that a proposition is a set of indices like as in PTQ, the formula $\exists t_1 [\text{compl}(t_1) \& \text{AT}(t_1, \text{leave}(m))]$ ends up being independent of the event time of the matrix clause. See Yoon (1996, Chapter 5), where I explore a way to capture the relativity of tense but still treating propositions as sets of indices.

3.2.2 Relative Clauses

Relative clauses are crucially distinguished from complement clauses in that tenses within relative clauses can be independent of those in their higher clauses. A sentence like (39) has two readings as indicated. The two readings can be described in theoretical terms by saying that the incomplete tense of the relative clause is relative to the matrix event in the (a) reading but to the speech time in the (b) reading.

- (39) John-i Seoul-ey ka-nu-un salam-ul chach-ess-ta.
 John-Nom Seoul-to go-Incom-Rel person-Acc seek-Compl-Dec
 a. 'John sought a person who was going to Seoul.'
 b. 'John sought a person who is going to Seoul.'

These two kinds of readings for a sentence like (39) are commonly differentiated as *de dicto* and *de re*: (39a), a *de dicto* reading in which John sought whoever meets the description, and (39b), a *de re* reading in which John sought a certain person and the description for the person is given by the speaker.

What is crucial in a relative clause construction is the fact that the *de re* vs. *de dicto* distinction is correlated with the relativity of tense in the clause, as observed in Kang (1988) as well. Thus, if a relative clause receives a *de dicto* interpretation, the tense in the relative clause is relative to the event time of its immediately higher clause. Conversely, if a relative clause is interpreted as *de re*, its tense is relative to the speech time. For example, in the *de dicto* reading of (39), glossed as (39a), the time of going to Seoul is incomplete relative to the time of seeking. Therefore, the time of going to Seoul can be before the speech time in this reading (but also can be after the speech time). On the other hand, the time of going to Seoul is incomplete relative to the speech time in the *de re* reading of (39), glossed in (39b). Hence, the time of going to Seoul cannot be prior to the speech time. In this case the tenses are independent of each other.

Most approaches handle the *de re* vs. *de dicto* distinction by resorting to scopal differences between the readings, cf. the Quantifying-In rule in PTQ or its variants, Quantifier Store (cf. Cooper 1975), Quantifier Raising, etc. Thus, as Ladusaw (1977) does for English tense, it seems a natural move to propose a quantification rule of some sort in order to account this. In fact, Kang (1988) proposes Quantifier Store and Park and Han (1993) suggest a Quantifier Raising approach for Korean in this regard.

Let us assume a standard Quantifier Storage system of Cooper (1975), in which quantificational NPs are stored to be retrieved later in the derivation. The truth conditions in (40a) are obtained when the denotation of the object NP is directly applied to the denotation of the verb *chach-ess-ta* at that level. On the other hand, if we retrieve the object NP denotation at the sentential level, we will get (40b). Note that in (40a) the formula $incom(t_1)$ reflects the fact that the time of going to Seoul t_1 is incomplete relative to the time of seeking t_0 . In (40b) the time t_1 is specified to be incomplete relative to the speech time. Thus, the facts in relative clauses are adequately captured under our analysis.

- (40) a. $\exists t_0[\text{compl}(t_0) \ \& \ \text{AT}(t_0, \text{seek}'(j, \wedge \lambda Q \exists x[\text{person}'(x) \ \& \ \exists t_1[\text{incom}(t_1) \ \& \ \text{AT}(t_1, \text{go-to-Seoul}'(x))] \ \& \ Q\{x\})])]$
 (de dicto)
 b. $\exists x[\text{person}'(x) \ \& \ \exists t_1[\text{incom}(t_1) \ \& \ \text{AT}(t_1, \text{go-to-Seoul}'(x))] \ \& \ \exists t_0[\text{compl}(t_0) \ \& \ \text{AT}(t_0, \text{seek}'*(j, x))]]]$
 (de re)

3.2.3 Time Adverbials

Let us now proceed to treatment of time adverbials, our main topic in this paper. Recall that the canonical structure of a complex time adverbial is based on the relative clause construction. In (41) I propose denotations for the head nouns in the construction. Thus, the meaning of *hwu* 'afterward' is a set of times which are later than some specific time. Likewise, the meaning of *ttay* 'time' is a set of times which are about the same time as some specific time. Notice that each denotation contains a free variable:

- (41) a. *hwu* 'afterward', CN $\Rightarrow \lambda t[t_0 < t]$
 b. *ttay* 'time', CN $\Rightarrow \lambda t[t = t_0]$ ³
 N.B. t_0 is a free variable,
 c. \approx is defined such that

³ David Dowty pointed out that the denotations for *ttay* 'time' here and *ey* 'at' as proposed in (36") above are unintuitive. His objection is based on the observation that (a) *ttay* 'time' in itself does not have anything which amounts to the sense of proximity which is represented by \approx , and (b) *ey* 'at' should provide this meaning of proximity, instead, considering that *ey* 'at' is also used to indicate proximity of spatial locations to events.

I agree with Dowty in these regards. Accommodating his observation, we could propose alternative denotations as in (i) and (ii):

- (i) *ttay* 'time' \Rightarrow 'time'
 (ii) *ey* 'at' $\Rightarrow \lambda P^1 \lambda Q^1 \lambda t[Q^1(t) \ \& \ \text{AT}(t, \exists t_1[P^1\{t_1\} \ \& \ t \approx t_1])]$

These alternatives should cover the same range of data and make the same predictions as the ones proposed in the text. Therefore, these should be preferred on the theoretical ground. After all, they are more intuitive and consistent with the lexical items' behaviors in other environments.

Adopting these alternatives in deriving (23), we will get (iii) as the truth condition of (23), whereas (23') will be derived according to the current denotations in the text, as we will see shortly:

- (iii) $\exists t[\text{compl}(t) \ \& \ \text{AT}(t, \text{leave}'(j)) \ \& \ \text{AT}(t, \exists t_2[\exists t_0[t_0 < t_2 \ \& \ \text{compl}(t_0) \ \& \ \text{AT}(t_0, \text{arrive}'(m))] \ \& \ t \approx t_2])]$
 (23') $\exists t[\text{compl}(t) \ \& \ \text{AT}(t, \text{leave}'(j)) \ \& \ \text{AT}(t, \exists t_2[t_2 < t \ \& \ \text{compl}(t_2) \ \& \ \text{AT}(t_2, \text{arrive}'(m))]]]$

If we compare (iii) with (23'), we find the latter much more perspicuous than the former. Thus, I will keep the denotations as they are, mainly for expository purposes: they should be understood as abbreviations for the alternatives in (i) and (ii).

- $t \approx t'$ iff i) $t \bullet t'$ or
ii) they are immediately adjacent (i.e. no interval between them)

The definition of ' \approx ' follows in spirit Stump's (1985) *when* in English in the sense that the relation indicates 'about the same time' rather than 'exactly the same time'. I will assume without discussion that a relative clause specifies the free variables in the head noun, e.g. t_0 in (41a,b), thus indirectly constraining the set of times its head noun denotes. More specifically, I assume the approach I proposed in Yoon (1993) in allowing the relativizer *-un* and *-ul* to make certain that the free variable is coindexed with the variable of which the relative clause is predicative. For example, the head noun *hwu* 'afterward' combines with a TAB (42) below by way of the relativizer *-un*, resulting in (43a). In (43a) below there is no free variable. We get complex time adverbials like (43b) and (43c) in the same manner:

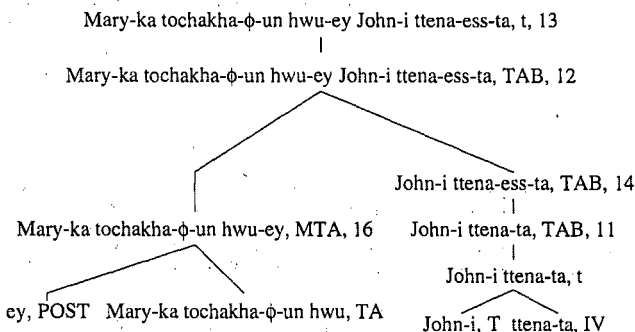
- (42) Mary-ka tochakha- ϕ 'Mary arrived', TAB $\Rightarrow \lambda t_1[\text{compl}(t_1) \ \& \ \text{AT}(t_1, \text{arrive}'(m))]$
- (43) a. Mary-ka tochakha- ϕ -un hwu 'a time after Mary arrived'
 $\Rightarrow \lambda t_1 \exists t [t < t_1 \ \& \ \text{compl}(t) \ \& \ \text{AT}(t, \text{arrive}'(m))]$
- b. Mary-ka tochakha-ess ul ttay 'the time when Mary arrived'
 $\Rightarrow \lambda t_1 \exists t [t_1 \approx t \ \& \ \text{compl}(t) \ \& \ \text{AT}(t, \text{arrive}'(m))]$
- c. Mary-ka tochakha-ul ttay 'the time when Mary is arriving/arrives'
 $\Rightarrow \lambda t_1 \exists t [t_1 \approx t \ \& \ \text{incom}(t) \ \& \ \text{AT}(t, \text{arrive}'(m))]$

Now we are in a position to give a derivation for a sentence with a complex time adverbial like (23), repeated here. Once we make the above assumptions, the derivational steps are essentially the same as the ones with simple time adverbials as in (36') above.

- (23) Mary-ka tochakha- ϕ -un hwu-ey John-i ttena-ess-ta.
Mary-Nom arrive-Comp-Rel afterward-at John-Nom leave-Comp-Dec
'John left after Mary arrived.'

The syntactic and the semantic derivations are given in (23') and (23''), respectively:

(23')



(23'')

- Mary-ka tochakha un hwu, TA $\Rightarrow \lambda t_1 \exists t [t < t_1 \ \& \ \text{compl}(t) \ \& \ \text{AT}(t, \text{arrive}'(m))]$
Mary-ka tochakha un hwu-ey, MTA

- $\Rightarrow \lambda Q^i \lambda t [Q^i \{t\} \& AT(t, \exists t_2 [t_2 < t \& compl(t_2) \& AT(t_2, arrive'(m))])]$
 John-i ttena-ess-ta, TAB $\Rightarrow \lambda t_0 [compl(t_0) \& AT(t_0, leave'(j))]$
 Mary-ka tochakha un hwu-ey John-i ttena-ess-ta, TAB
 $\Rightarrow \lambda t [compl(t) \& AT(t, leave'(j)) \&$
 $AT(t, \exists t_2 [t_2 < t \& compl(t_2) \& AT(t_2, arrive'(m))])]$
 Mary-ka tochakha un hwu-ey John-i ttena-ess-ta, t
 $\Rightarrow \exists t [compl(t) \& AT(t, leave'(j)) \&$
 $AT(t, \exists t_2 [t_2 < t \& compl(t_2) \& AT(t_2, arrive'(m))])]$

If we consider the final step in (23''), it is easy to see that Mary's arriving time is prior to John's leaving time, as desired.

Recall at this point that the *hwu* 'after' construction allows only the completive tense. Thus, it was observed that (24) repeated below, with the incompletive tense, is unacceptable. Given the rules proposed above, we are able to explain why (24) is unacceptable. Applying almost the same set of rules as in (23'), we get the truth conditions in (24') for (24):

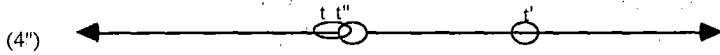
- (24) *Mary-ka tochakha-nu-un hwu ey John-i ttena-ess-ta.
 Mary-Nom arrive-Incom-Rel afterward at John-Nom leave-Compl-Dec
 'John left after Mary was arriving.'
- (24') $\exists t [compl(t) \& AT(t, leave'(j)) \&$
 $AT(t, \exists t_2 [t_2 < t \& incom(t_2) \& AT(t_2, arrive'(m))])]$

Then, it is easy to see that (24') is a contradiction: (a) t_2 is incompletive relative to t , thus $\neg(t_2 < t)$ and (b) $t_2 < t$.

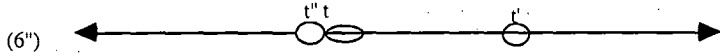
Now let us move on to *-ul ttay* 'when' adverbials. By the standard applications of the rules, we will get (4') and (6') as the truth conditions for (4) and (6), respectively:

- (4) Mary-ka tochakha- ϕ -ul ttay ey John-i ttena-ess-ta
 Mary-Nom arrive-Incom-Rel time at John-Nom leave-Compl-Dec
 'John left when Mary was arriving'
- (4') $\exists t [compl(t) \& AT(t, leave'(j)) \&$
 $AT(t, \exists t'' [t = t'' \& incom(t'') \& AT(t'', arrive'(m))])]$
- (6) Mary-ka tochakha-ess-ul ttay (ey) John-i ttena-ess-ta
 Mary-Nom arrive-Compl-Rel time at John-Nom leave-Compl-Dec
 'John left when Mary had arrived'
- (6') $\exists t [compl(t) \& AT(t, leave'(j)) \&$
 $AT(t, \exists t'' [t = t'' \& compl(t'') \& AT(t'', arrive'(m))])]$

As one can easily verify, these truth conditions coincide exactly with the readings we discussed above. Let us first take (4'). We know from (4') that (a) the leaving time t is completive relative to the speech time t' , (b) the arriving time t'' is incompletive relative to t , and (c) $t \approx t''$. Thus, it follows from (4') that the leaving time and the arriving time cannot be remotely separated from each other. (4'') represents the relations between the times involved in (4) and (4'):



If we take (6') on the other hand, we know that (a) the leaving time t is complete relative to the speech time t' , (b) the arriving time t'' is complete relative to t , and (c) $t = t''$. (6'') satisfies these conditions. Notice that t'' and t are not separated. Moreover, t'' is immediately before t in (6'');



Besides being able to account for most facts about time adverbials, we can also allow time adverbials to iterate, an attractive feature in Stump (1985). We derive (44) as in (44') without an addition of rules. (44'') is the derived truth conditions for (44):

- (44) Caknyen-ey Mary-ka tochakha-ess-ul ttay ey
 last-year-at Mary-Nom arrive-Compl-Rel time at
 John-i ttena-ess-ta.
 John-Nom leave-Compl-Dec
 'Last year John left when Mary had arrived.'

(44')

Caknyen-ey Mary-ka tochakha-ess-ul ttay-ey John-i ttena-ess-ta, t, 13

Caknyen-ey Mary-ka tochakha-ess-ul ttay-ey John-i ttena-ess-ta, TAB, 12

caknyen-ey, MTA, 16 Mary-ka tochakha-ess-ul ttay-ey John-i ttena-ess-ta, TAB, 12
 ey, POST caknyen, TA

Mary-ka tochakha-ess-ul ttay-ey, MTA, John-i ttena-ess-ta, TAB

(44'') $\exists t[\text{compl}(t) \ \& \ \text{AT}(t, \text{leave}(j)) \ \&]$

$\text{AT}(t, \exists t_2[t = t_2 \ \& \ \text{compl}(t_2) \ \& \ \text{AT}(t_2, \text{arrive}(m))]) \ \& \ \text{AT}(t, t \subseteq \text{last-year})]$

3.2.4 The Puzzle

While we have been able to account for most of the facts that time adverbials exhibit with respect to the relativity in tense, there still remains a puzzle: why we get no difference in meaning between (7) and (8) below, despite the difference in tense in the temporal adverbials? Moreover, why is this limited only to atelic predicates?

- (7) Mary-ka aphu- ϕ -ul ttay John-i ttena-ess-ta.
 Mary-Nom sick-Incom-Rel time John-Nom leave-Compl-Dec
 'John left when Mary was sick.' (leaving time \subseteq sick time)

- (8) Mary-ka aphu-ess-ul ttay John-i ttena-ess-ta.
 Mary-Nom sick-Compl-Rel time John-Nom leave-Compl-Dec
 'John left when Mary was sick.' (leaving time \subseteq sick time)

An essentially same observation was made in S. Choi (1987:51--53) with respect to the connective *taka*. He notes that the presence of the marker *-ess* does not add to the meaning in an atelic clause. Thus, the pairs of sentences in (45) and (46) are understood as the same.

- (45) a. Hanul-i malk- ϕ -taka huli-ess-ta.
 sky-Nom clean-Incom-Conn cloudy-Compl-Dec
 'The sky was clear and then got cloudy.'
 b. Hanul-i malk-ess-taka huli-ess-ta.
 sky-Nom clean-Compl-Conn cloudy-Compl-Dec
- (46) a. Chelswu-ka camsi kitali- ϕ -taka
 Chelswu-Nom moment wait-Incom-Conn
 swuhwaki-lul noh-ess-ta.
 phone-Acc put.down
 'Chelswu waited for a while and then hung up the phone.'
 b. Chelswu-ka camsi kitali- ϕ -taka
 Chelswu-Nom moment wait-Incom-Conn
 swuhwaki-lul noh-ess-ta.
 phone-Acc put.down

A similar phenomenon has been reported in Japanese too, (cf. Kuno 1973, Soga 1983, Nakazawa 1985). The examples in (47) are from Soga (1983:71) which give the same meaning, even though (47a) and (47b) have different tenses in the temporal adverbial clauses and Japanese tenses are also relative.

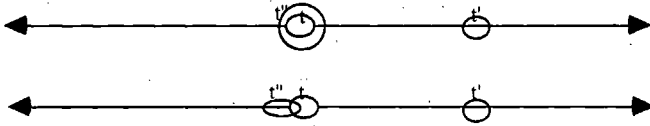
- (47) a. Kyonen Yokohama-ni iru-toki Tanaka-san-ni awta.
 last.year Yokohama-in am-when Mr.Tanaka-Case met
 'When I was in Yokohama last year, I met Mr. Tanaka.'
 b. Kyonen Yokohama-ni ita-toki Tanaka-san-ni awta.
 last.year Yokohama-in was-when Mr.Tanaka-Case met

A viable answer can be found when we consider the pragmatics as well as the semantics of the predicates involved. I claim that (7) and (8) are distinct in truth conditions. In Dowty's (1986) words, they are **asserted differently** but **understood as the same**. Thus, my proposal is that they have two different truth conditions (7') and (8'), as our rules will provide:

- (7') $\exists t[\text{compl}(t) \ \& \ \text{AT}(t, \text{leave}'(j)) \ \& \ \text{AT}(t, \exists t''[t = t'' \ \& \ \text{incom}(t'') \ \& \ \text{AT}(t'', \text{sick}'(m))]]]$
 (8') $\exists t[\text{compl}(t) \ \& \ \text{AT}(t, \text{leave}'(j)) \ \& \ \text{AT}(t, \exists t''[t = t'' \ \& \ \text{compl}(t'') \ \& \ \text{AT}(t'', \text{sick}'(m))]]]$

In (7') and (8') neither entails the other. When we consider the relations between the times, (7'') and (8'') below satisfy the conditions in (7') and (8'), respectively. The question is why (8'') is understood as (7'') when the predicate is atelic:

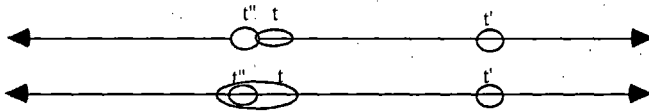
(7'') and (8'')



Before we make any judgement, let us consider parallel cases in other environments. First, let us take a look at (9), where the matrix predicate is atelic. Suppose in the pictures (9') and (9'') below that (a) t' is the speech time, (b) t is the time of being five, and (c) t'' is the dying time. Then, (9') will satisfy the truth condition of (9). However, (9'') is what we take (9) to mean.

- (9) Apeci-ka tola ka-si-ess-ul ttay John-i tases-sal-i-ess-ta.
 Father-Nom back go-Hon-Compl-Rel time John-Nom five-age-is-Compl-Dec
 'John was five when Father passed away.' (dying time \subseteq time of being five)

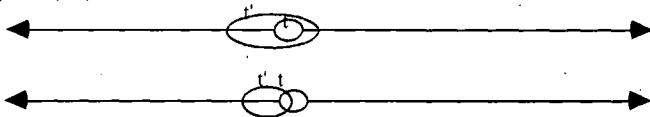
(9') and (9'')



Another parallel case is found in simple sentences like (48) and (49). In these cases we have relations between only two times: the speech time t and the sleeping time t' in (48') and (49'). Given our rules, the truth conditions of (48) and (49) are described correctly by (48') and (49'), respectively. However, both sentences are often understood to describe (48''):

- (48) Mary-ka achim-pwuthe ca-nun-ta.
 Mary-Nom early.morning-from sleep-Incom-Dec
 'Mary has been sleeping since early this morning.'
- (49) Mary-ka achim-pwuthe ca-ess-ta.
 Mary-Nom early.morning-from sleep-Compl-Dec
 'Mary has been sleeping since early this morning.'

(48') and (49')



One generalization from the three different sets of data is that the event time of an atelic predicate expands to contain overlapping or adjacent times. Moreover, what is special about complex time adverbials in the *-ul ttay* 'when' construction is that they always provide this kind of environment. Let me also emphasize that this generalization is about only atelic predicates. A natural move, then, seems to look for a clue in the distinction

between telic and atelic predicates. Let us consider Dowty's summary of the defining criteria of three classes of predicates in (50):

- (50) A defining criteria of three aspectual classes of predicates (from Dowty 1986:42):
- a. A sentence ϕ is stative iff it follows from the truth of ϕ at an interval i that ϕ is true at all subintervals of i .
 - b. A sentence ϕ is an activity iff it follows from the truth of ϕ at an interval i that ϕ is true of all subintervals of i down to a certain limit in size.
 - c. A sentence ϕ is an accomplishment/achievement iff it follows from the truth of ϕ at an interval i that ϕ is false at all subintervals of i .

According to (50), an atelic predicate, i.e. a stative or an activity, is distinguished from a telic predicate in that if an atelic sentence is true at an interval t , it is true of all subintervals of t up to a certain limit in size. Conversely, it follows from (50a,b) that if an atelic sentence is true at t , it can be true at a superinterval of t .

Thus, we now understand why an interval at which an atelic sentence is true has the potential to expand to a superinterval. What we do not understand is why we frequently utilize this potential. I claim that this expansion of intervals is a conversational implicature based on default assumptions about the predicate. First, let us recall that the expansion of intervals occurs only when there is another salient interval close to them. Moreover, recall that activity predicates with a short duration tend not to show the neutralization. Then, one plausible hypothesis is that there is a characteristic implicature with atelic predicates such that we assume an atelic state of affairs to continue at least for a while, unless otherwise specified. This hypothesis is consistent with the fact that the neutralization occurs more readily with activity predicates with a longer duration than ones with a shorter one, since our assumption of a continued state of affairs will be weakened for the latter. Moreover, this position is supported by the cancellable nature of the implicature. Consider (51) and (52), which are exactly like (7) and (8) above in that they describe the same situation even though they have different tenses:

- (51) Mary-ka aphu- ϕ -ul ttay John-i yenayphyenci-lul
 Mary-Nom sick-Incom-Rel time John-Nom loveletter-Acc

hanthong ssu-ess-ta.
 oneunit write-Compl-Dec
 'John wrote a love letter when Mary was sick.'

- (52) Mary-ka aphu-ess-ul ttay John-i yenayphyenci-lul
 Mary-Nom sick-Compl-Rel time John-Nom loveletter-Acc

hanthong ssu-ess-ta.
 oneunit write-Compl-Dec
 'John wrote a love letter when Mary was sick.'

(51) is bad but (52) is good with the continuation (53) in a context where John spent a long time writing the letter.

- (53) Kulentey, phyenci-lul keuy kkethnay-ul cum Mary-ka aphu-ci
 however letter-Acc almost finish-Rel time Mary-Nom sick-Inf

anhkey toy-ess-ta.
 not become-Compl-Dec

'However, Mary became not sick by the time he almost finished writing the letter.'

This result is borne out in our analysis: (i) (51) and (53) are a contradictory sequence of sentences given their truthconditions, while (52) and (53) are compatible. In particular, it is specified in (53) to exclude the common implicature based on the nature of the atelic predicate.

However, this kind of implicature is not available for telic predicates. Dowty showed explicitly that the definition in (50c) excludes the possibility that a telic sentence true at *i* can be true at *i'*, a superinterval of *i*. The logic is simple. Let us take the example in (54) and suppose that it is true at *i*. Also suppose it is true at *i'*, a superinterval of *i*.

(54) John built a house

Now we have the telic sentence in (54) true at *i'*, and it is also true at *i*, a subinterval of *i'*. This contradicts the definition of telic predicates in (50c). By *reductio ad absurdum*, (54) cannot be true at *i'*, if it is true at *i*.

4 Conclusion

Investigating time adverbials in Korean, which exhibit apparent partial relativity in tense, we have explained why they appear to be partial in relativity. It has been also shown why atelic predicates are correlated with this partiality. Given that the facts in time adverbials are consistent with the general relativity of tense in Korean, we maintain that Korean is still a strictly relative tense language.

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