On Sequence of Tense

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Introduction

There is a characteristic phenomenon of tense in an embedded sentence in English, which is generally called *Sequence of Tense* (*SOT*). *SOT* is a phenomenon of morphological agreement between a superordinate clause and the subordinate clause. The past tense of the embedded clause is interpreted in two ways as given in (1a) and (1b).

(1) John said that Mary was in London.

a. John said, 'Mary was in London'. --------- (shifted reading)

b. John said, 'Mary is in London'. ---------- (simultaneous reading)

(1a) is interpreted as "shifted reading" (Enç 1987). On the other hand, (1b) shows that what John says happens simultaneously with his utterance. The latter is explained as "simultaneous reading" (Enç 1987). The crucial question concerning simultaneous reading in an embedded clause is:

(2) Why does the embedded clause have the past morpheme?

This question is motivated by the traditional treatment of tense. Look at the following utterance:

(3) John played soccer.

Tense is introduced into a proposition which is 'untensed' yet in order to produce a perfect English utterance. Its function is to distribute a proposition into a proper time range. Regarding its function, some researchers (e.g. Prior 1967, Montague 1973) considered tense as an operator, which is notated as in (4):

(4) P[play(John, soccer)]

What the notation indicates is that this utterance is true if and only if the event *John's playing soccer* is in the past. In this case, we can symbolize this event time as $t'<t$, the interpretation of which is that the past is an individual of time t' earlier than a criterial time t, so the result is (5):

(5) $\exists t'<t$ [play(John, soccer)]

Let us look again at the utterance (1):

(1) John said that Mary was in London.

The statement that this embedded sentence has the proper sentential operator would be questionable. That is to say, we naturally expect the following logic—form of the

embedded sentence[1]:

(6) $\exists t' < t$ [Mary be in London]

Here in this case, the event 'Mary's being in London' stated in the embedded sentence, however, is not shifted from t under simultaneous reading. So, the truth condition of the past tense '$\exists t' < t$' cannot apply to such an embedded sentence; in other words, it is only a condition for giving shifted-reading predicates. Simultaneous reading means that an event in an embedded clause happens simultaneously with the event time of the matrix clause. Therefore, this reading requires the condition '$t' = t$' as in (7), in the same way as seen in the present tense.

(7) $\exists t' = t$ [Mary be in London]

And the full logical form (LF) of (1) is,

(8) $\exists t' < t$ [John say [$\exists t'' = t'$ [Mary be in London]]

What (8) denotes is that the event time 'John's saying time (t')' is earlier than the moment of utterance (t), and the embedded event time 'Mary's being in London time (t'')' overlaps with t' in the matrix clause. Theoretically, it can be said that the past morpheme is indicated as '$t' = t$'. Thus, this theoretical clash is the chief argument of the question (2).

The aim of this paper is to provide a theory of *SOT* that accounts for the crucial trigger of the simultaneous reading, and to interpret the mechanism of *SOT*. I will conclude, focusing on the syntax-semantics interface, that the proper reading in a sentence where *SOT* occurs is determined by aspectuality of VP, and moreover by a syntactic dependency relation between a matrix and its embedded clause.

1. Stativeness and Simultaneous Reading

Let us first investigate the fundamental question of how a past morpheme carrying either a *shifted reading* or a *simultaneous reading* is determined. This question would be easy to answer; we immediately get a chance to find that stative verbs are used in a sentence containing a simultaneous reading as in the following utterances. In prevailing analyses of *SOT*, the simultaneous reading is assumed to have the property of stativeness in predicates. (Enç 1987, Stowell 2007a).

(9) Sam believed that Terri was in Boston. (sim○) (Stowell 2007a:448)

(10) John said that Mary left. (sim○) (Giorgi and Pianesi 1997:285)

Here, I attempt to generalize the condition for simultaneous reading as in (11):

(11) Generalization1: The simultaneous reading is given only if the verb in the embedded clause denotes stativeness when a verb both in the matrix

[1] Note that the criterial time 't' is the moment of John's utterance time.

and in the embedded clause has a past morpheme.

2. Atelicity and Simultaneous Reading

In order to discuss the problem in detail, it would be better to identify the explicit status of the stative verb through Vendler's paradigm (1967). As a matter of convenience, I will cite Rosen's summary (1999: 326-327):

(12) STATE: non-actions that hold for some period of time but lack continuous tenses. (be, know, resemble, etc.)
a. Terry knows the answer.
b. Terry resembles his brother.

(13) ACTIVITY: events that go on for a time, but do not necessarily terminate at any given point. (read, sing, walk, etc.)
a. Terry walked for an hour.
b. Terrey is driving the car.

(14) ACCOMPLISHMENT: events that proceed toward necessary terminus. (eat, build, make, etc.)
a. Terry built five houses in two months.
b. The child is drawing a circle.

(15) ACHIEVEMENT: events that occur at a single moment, and therefore lack continuous tenses. (leave, reach, knock, etc.)
a. Terry reached the summit in 15minutes.
b. The vase broke.

We can indeed generalize this classification as (11). As further evidence for the simultaneous reading, the following utterances where the relevant verbs (in (12a) and (12b)) are used can be given:

(16) a. John said that Terry knew the answer.
b. John said that Terry resembled his brother.

Although generalization 1 indeed sounds true, this analysis is problematic when we come across the following examples.

(17) Max said that he was reading a book. (sim○) (Stowell 2007a: 448)

(18) Bill said that Max ate apples. (sim○) (Stowell 2007b: 125)

According to Vendler's classification, these verbs in (17) and (18) do not belong to stative verbs, but to activity verbs and accomplishment verbs, respectively. Therefore, we would naturally expect that we have no simultaneous reading in both embedded clauses. Nevertheless, the fact is against our expectation. So, what is going on?

Let us look at the following minimal pairs of (17) and (18), the unique property of

which would receive a clear explanation. And furthermore, I suppose that this property would be the true nature of simultaneous reading.

(18) a. Max said that he was reading a book. (sim○)
b. Max said that he read a book. (sim×)
(19) a. Bill said that Max ate apples. (sim○)
b. Bill said that Max ate an apple. (sim×)

The verb 'read' belonging to ACTIVITY needs to fulfill a task: to completely consume the object when an object is given. In (18b), the embedded predicate 'read a book' alludes to the fact that he finished reading one book. Contrastively, since the embedded predicate of (18a) forms progressive, the predicate states that he was in the course of reading a book. That is, no endpoint of the event exists. In the case of (19), the verb 'eat' invariably requires the object. We can see, therefore, that the interpretation of (19b) is in common with that of (18b); Max finished eating one apple. On the other hand, in (19a) the object in the embedded clause forms the plural, hence we regularly interpret the event denoted by this predicate as an habitual event. Considering all the characteristics of each embedded predicate, we may reasonably conclude that the crucial trigger for simultaneous reading is the absence of a temporal end-point of an event in an embedded predicate, the concept of which is technically called 'atelicity' that is regarded as a more abstract verb type[2].

We should further note that we cannot perfectly deal with the concept 'atelicity' from the view point of lexical aspect such as Vendler's analysis. The telic or atelic verbs easily vary these properties of telicity or atelicity. For example, Krifka (1998) states that *eat two apples* is telic but *eat apples* is atelic. Furthermore, in/for distinction is also popular. 'In' is interpreted as telic, and 'for' is atelic. Kiparsky (2002) also analyzes stativeness of an embedded clause by means of atelicity. And likewise, Chiba (2017) shows an interesting example.

(20) John said that Mary had left.

This embedded verb is an episodic (viz. telic) verb. Despite this fact, the verb 'leave' gains stativeness as a consequence of the perfect construction. This means that the embedded clause originates in 'Mary has left' and therefore because of *SOT*, the vacuous past morpheme is derived. This phenomenon shows that the independent PAST interpretation of the lexical telic verb 'leave' (i.e. shifted reading) is prohibited by the result of atelicity of

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[2] Bertinetto (2001) analyzes atelicity using the concept "homogeneous".
According to his explanation (178-179), the property of homogeneous denotes an event without inherent temporal boundaries. Therefore, the distinction between telicity and atelicity is in the same conflict as STATE and ACTIVITY vs ACCOMPLISHMENT and ACHIEVEMENT.

the whole embedded predicate. And Stowell (2007b) states that if a lexical telic verb is put in an atelic predicate, *SOT* is applied. ((21b) is equal to (18)).

(21) a. Bill said that Max ate an apple every day.

b. Bill said that Max ate apples. (Stowell 2007b:125)

On the other hand, as in (22) if the atelic predicate is modified by the temporal adverbial, it easily turns into the telic predicate.

(22) Sam thought that Terri was in Boston the day before. (Ogihara 2007:411)

Therefore, focusing on the atelicity of the predicate is more appropriate than on the lexical aspect viewpoint. Then, we need to improve our generalization 1 as (23):

(23) Generalization 2: The simultaneous reading is given only if the whole predicate in the embedded clause is tinged with atelicity when a verb both in the matrix and in the embedded clause has a past morpheme.

3. Wurmbrand's Time Interval Constraint (2014)

Generalization 2 has a prima-facie adequacy as one of the countermeasures to *SOT*, while this is not excellent as an explanation. So, an essential question is raised:

(24) Why does the concept 'atelicity' generate *SOT*?

In order to give the answer to this question, we must investigate the absolute reason why there is no constraint on *SOT* except for atelicity. Additionally, the reason would be able to explain the mechanism of *SOT*. Let us, therefore, more theoretically discuss the plausible mechanism of *SOT*.

I attempt the time-interval analysis in this paper. So, I will introduce Wurmbrand's constraint of time intervals (2014). He pays attention to a combination of a reference time interval and an event time interval. Let us look at the following utterance:

(25) Leo sang in the shower yesterday. (Wurmbrand 2014:426)

What (15) indicates is that the time interval of the verb 'sing' (the event time interval) must be included in that of the referential adverbial 'yesterday' (the reference time interval). In (26), we can observe that the event time interval denoted by 'sing' is not included in the referential time interval (when-clause). And this utterance is recognized as an unacceptable sentence.

(26) *Leo sang in the shower when the mailman arrived. (428)

However, if this ACTIVITY verb 'sing' grammatically changes into an atelic form such as progressive, then this predicate can co-occur with 'when the mailman arrived' as seen in (27).

(27) Leo was singing in the shower when the mailman arrived. (ibid.)

From these characteristics concerning time intervals, Wurmbrand (427) proposes a time

interval constraint[3] as below:

(28) a. $[\![$ IMPERFECTIVE $]\!] = \lambda P_{(vt)}. \lambda t_{(i)}. \exists e_{(v)}[t \subseteq \tau(e) \& P(e)]$

b. $[\![$ PERFECTIVE $]\!] = \lambda P_{(vt)}. \lambda t_{(i)}. \exists e_{(v)}[\tau(e) \subset t \& P(e)]$

What this condition states is that when a predicate expresses atelicity, its time interval must include the reference time interval, and when a predicate conveys telicity, its time interval must be included in the reference time interval. Look again at the example (27). The grammaticality of (27) can be explained by (28). In this case, the reference time is when-clause, so the following relationship concerning time-interval is given:

(29) [Leo was singing in the shower] $\supseteq$ [when the mailman arrived]

Let us consider (10) in section 1 again.

(10) John said that Mary left.

This embedded predicate is interpreted only as shifted reading (not the simultaneous reading). If this interpretation is restricted by telicity, then the restricted interpretation can be attributed to the condition that the telic predicate cannot include the matrix predicate time interval i.e. John's utterance time, while atelicity can include the matrix predicate time interval. Wurmbrand (2014) also makes a further comment on this interval restriction: the matrix event time is attached to the reference time; speaker's holding time 'NOW'. As a result, only in the case of atelic embedded predicates such as (9), (17) and (18) in Section 1, would the simultaneous reading be generated.

(9) Sam believed that Terri was in Boston.

(17) Max said that he was reading a book.

(18) Bill said that Max ate apples.

With special reference to (17), if this embedded clause is not atelic i.e. the past form 'read', the time interval cannot include Max's saying time, and this predicate immediately loses the simultaneous reading as in (30):

(30) Max said that he read a book. (sim×)

Therefore, we can conclude that when we interpret an aspectual information of a predicate as atelic, the constraint of (28a) functions in our brain. I argue that this constraint is the principle at the back of our generalization 2, and that it can be the answer to the question (24).

4. Going Further with a Theoretical Explanation

We have discussed the prime trigger for the simultaneous reading. In short,

(31) The simultaneous reading must contain an atelic embedded predicate.

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[3] (Im)perfective stands on a par with (a)telicity.

(32) The atelic predicate must be restricted by the condition of (28a).

By (32) above, an utterance containing *SOT* could be represented as (33):

(33) $e<u[e$ (x: x is an utterancer, $e')] \wedge [e' \supseteq e]$

The symbol e shows a matrix event, and e' is its embedded event. The crucial point in this formula is that there is an inclusion relationship between a matrix event time interval and an embedded one in complex sentences, such as $[e' \supseteq e]$ in (33), which is the pattern of the simultaneous reading (i.e. *SOT*).

In this final section, besides more theory-central consideration, I suppose that the inclusion relationship coming along with simultaneous reading is attributed to a syntactic framework.[4] This approach will strengthen the assumption that the central aim of investigating an aspect of natural language is to clarify the property of the syntax-semantics interface. As we can see, those two statements (31) and (32) above are a semantic enterprise, so what I have to do is to adapt them to syntax.

4.1. Uninterpretable Past Morpheme

Before proceeding to the discussion of the inclusion relation, let us tackle the issue of (2) raised in the introduction.

(2) Why does the embedded clause have the past morpheme?

Theoretically speaking, there are two possibilities of the generating process of the embedded past morpheme as follows:

(34) (i) forming the proper meaning

↓

(ii) copying the past morpheme

(35) (i) copying the past morpheme

↓

(ii) forming the proper meaning

The process in (34) is the system of Enç (1987), and (35) is that of Ogihara (1995, 2007). Although I have no idea of which is more adequate, it may be assumed that the assignment of the past morpheme to the embedded verb is nothing more than a concord phenomenon. This past morpheme, namely, does not have any semantic contribution, but a syntactic contribution[5].

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[4] Among various theoretical approaches with respect to the relation between a matrix event and its embedded one, for an 'anaphoric analysis', see Higginbotham (2009), and for an 'indexical analysis', see Enç (1987) and so on.

[5] In Ogihara's analysis (1995, 2007), when a matrix has a past morpheme and the

Let us follow Zeijilstra's syntactic theory (2012). He adopts agreement operations inspired by Chomsky (1995, 2000, 2001), the theory of which is that some semantically uninterpretable and lexically unvalued formal feature must be in the c-command domain of a semantically interpretable and lexically valued formal feature. What this framework indicates, specifically, is that the syntax of the natural language is built on the syntactic dependency between formal features.

On Zeijilstra's theory, for example, the reflexives carry the uninterpretable φ (phi)[6] feature (u-φ). They must be in the c-command domain of DPs containing the interpretable φ feature (i-φ) as follows:

(36) a. I [i-φ] like myself [u-φ].

b. * Myself [u-φ] like I [i-φ].

We can formally illustrate this syntactic dependency with respect to DPs as below:

(37) [...i-φ...u-φ...]

Therefore, the ungrammaticality of (36b) is explained by the violation of the layer of (37). Turning to *SOT*, the embedded past morpheme would carry an uninterpretable feature (u-past), while the matrix past morpheme has the interpretable one (i-past); 'John said [i-past] that Mary was [u-past] in London.'

4.2. The Inclusion Relationship Between Time Intervals

As we have discussed, the process 'copying the past morpheme' is affected by the syntactic dependency, while in the process 'forming the proper meaning', the condition of (28a) is applied, and then (33) is given.

(33) $e<u[e$ (x: x is an utterancer, $e')] \wedge [e' \supseteq e]$

In this subsection, I will try to cope with the inclusion relation '$[e' \supseteq e]$' in terms of

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embedded clause has also the same one, the embedded one is deleted before LF as below (C=Clause):

(i) a. C1. PAST-C2. PAST

b. C1. PAST-C2. ~~PAST~~

That is, the embedded past is vacuous in interpretation.

(ii) a. Sam thought that Terri was in Boston.

b. Sam PAST think that Terri **ø** be in Boston

On my understanding of his analysis, it can be said that if the embedded past is not deleted before LF, PAST interpretation is straightforwardly sent to LF, which means the occurring of past-shifted reading. And besides, past adverbials sometimes introduce an unapplied interpretation of (i)b. Ogihara (2007: 411) gives the following examples.

(iii) a. Sam thought that Terri was in Boston the day before.

b. Sam PAST think that Terri **PAST** be in Boston the day before.

[6] φ-feature is the generic term of the person feature (e.g. first person and singular, etc.).

event entities.

On this insight of theoretical linguistics, binominal distributions are generally based on the principle 'c-command'. The scope of quantifiers and that of other expressions are determined by this principle. Firstly, let us look at the following examples (cited from Koeneman & Zeijlstra (2017)):

(38) a. Edith often doesn't eat breakfast.
b. Edith doesn't often eat breakfast. (247)

(39) a. Bill never deliberately teased Mary.
b. Bill deliberately never teased Mary. (248)

Both of a and b have different meanings respectively by the anteriority of adverbs and the negation. In (38a), since the adverb 'often' implies 'more than 50% frequency', Edith eats breakfast once-two days. In (38b), however, that she does not eat even once-two days is implied. In (39), a indicates that Bill teased Mary, but not deliberately. On the other hand, b indicates that he did not actually tease her. Judging from these facts, from the effect of c-command, the constituents located in the higher position carry a wider scope over others, which are represented as follows:

(38') a. often>not
b. not>often

(39') a. never>deliberately
b. deliberately>never

Secondly, let us consider the case of quantifiers. According to the general design of the natural language[7], the scope relation is dealt with at the level of LF, in which quantifiers perform a covert movement in order to treat two possible meanings that is called *Quantifier Raising* (*QR*) as in (40):

(40) Every woman loves some man.
(i) every>some: for all women, they love a man each.
(ii) some>every: there is a man who is loved by all women.

These logical interpretations are obtained in terms of the *QR*, the procedure of which is the 'adjoining Q to TP' as in (41a) and (41b), respectively.

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[7] There are four levels of representation as below:

D-structure
↓
S-structure
↓ ↓
Phonetic Form (PF) Logical Form (LF)

(41) a. [every women$_i$ some man$_j$ [t_i loves t_j]]

b. [some man$_j$ every women$_i$ [t_i loves t_j]]

Recall the discussion about the inclusion relation '[$e' \supseteq e$]' in *SOT*. What this representation denotes is that the embedded event interval e' takes a wide scope over the matrix one e as follows: $e' > e$, hence it is possible that an event interval element in an embedded clause in which *SOT* is applied semantically (covertly), making adjunction to the higher position than an event interval element in the matrix one in order to capture the proper reading (simultaneous reading) at LF as in (42):

(42) [e'_j e_i [John said t_i that Mary was t_j in London]]

This logical representation is in the similar way as seen in *Neg-Raising* (*NR*). When a certain verb in a matrix clause is negated, this negation is generally recognized as the element that is transferred from within the embedded clause as in (43b):

(43) a. Bill doesn't think that Mary is here. (Gajewski 2007: 289)

b. Bill _ think that Mary is <u>not</u> here.

There are two reasons to assume that the covert movement in *SOT* acts like *NR*.

First, as is generally known, *QR* is a clause-bounded movement. For example, as we can see in the following utterance (44), there is no reading that the universal quantifier takes a wide scope over the existential quantifier, because any quantifier cannot stride over the clause border (in this case this border is shown by the Complementizer 'that')

(44) Some student thinks that John saw every band. (Poole 2011: 207)

(i) some student>every band

(ii) * every band>some student

Contrastively, in the case of *NR*, the negation can cross over the clause border as seen in (43). To elucidate the reason why the negation can do so is beyond the limits of this paper, but it seems that *NR* is closely associated with a certain property of the predicate used in matrix clauses. This discussion is closely related to the second reason that the covert movement in *SOT* resembles *NR*.

In the second reason, many *NR* predicates are useful in embedded predicates in which *SOT* can be applied. According to Gajewski (2007)[8], these predicates include: *think*, *believe*, *suppose*, *imagine*, *expect*, *reckon*, *feel*, etc. In order to give a proof of this assertion, as we can see in (45), a telic verb such as *say*[9] is not permitted to perform *NR*, or *SOT*.

(45) Bill didn't say that Mary is here. (Gajewski: 290)

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[8] He follows Horn's analysis (1989).

[9] Telic verbs that are applicable to *NR* are *choose*, *plan*, etc. (See Gajewski :292)

≠Bill said that Mary isn't here.

(46) John said that Mary said something stupid. (sim×)

Namely, there might be a possibility that the scoping beyond the clause border is connected to some indefiniteness like atelicity as a temporal standard. However, a further study would have to be made to ascertain the adequacy of this consideration.

Conclusion

This discussion roughly consists of two points; to describe the phenomenon of *SOT* (in sections 1 and 2) and to explain the mechanism of *SOT* (in sections 3 and 4). I have argued in section 1 that the general insight properly grasps the environment where *SOT* occurs, and proposed in section 2 that the crucial trigger for *SOT* is closely tied with 'atelicity' of embedded predicates. After considering the property of the syntax-semantics interface in the natural language, I have shown the theoretical explanations toward the true nature of *SOT* with respect to the constraint on atelicity in section 3. Moreover, I have discussed the syntactic dependency concerning formal features in 4.1, and the semantic scope phenomenon in 4.2.

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