Conditions on the Temporal Interpretation of Embedded Tenses

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The effect of syntactic structure on the interpretation of tenses of complex sentences is examined with reference to the proposal in Enç (1987). An attempt to explain temporal dependency in sentences with embeddings purely in terms of syntactic constraints is shown to have a number of difficulties. An extension of Enç's Anchoring Conditions for anaphorically unspecified tenses is presented.

1. Introduction

What is the relationship between the semantic interpretation of tenses and the syntactic structures where the temporal expressions appear? In this area of generative grammar, a syntactic approach has been predominant: tenses contribute to meaning by virtue of their position in phrase markers before or after the application of transformational rules. For example, Emonds (1975: 351) once argued that "the semantic tense values of clauses are assigned according to the distribution of tense markers in trees, subsequent to the application of certain syntactic transformations." Smith (1981) also maintains that the surface structure position of temporal expressions affects the interpretation of temporal dependency in complex sentences.

More recently Enç(1987) proposes a theory of tense that derives a well-observed set of facts about the interpretation of embedded tenses from their syntactic or configurational properties. In the following sections, I would like to discuss some inadequacies of the syntax-oriented approach to tense

interpretation and consider an alternative approach. I will begin by outlining the constraints on tense interpretation formulated by Enç (1987).

2. Enç's Treatment of Tense Interpretation

The central idea of Enç's theory of temporal interpreation is that tenses can be interpreted if and only if they are 'anchored' in one way or another. Their anchoring is configurationally constrained by the "Anchoring Conditions", which govern the temporal interpretation of sentences.

(1) Anchoring Conditions (Enç 1987: 643)
   a. Tense is anchored if it is bound in its governing category,[1] or if its local COMP is anchored.[2] Otherwise, it is unanchored.
   b. If COMP has a governing category, it is anchored if and only if it is bound within its governing category.
   c. If COMP does not have a governing category, it is anchored if and only if it denotes the speech time.[3]

Unlike the classical treatment of tenses as operators on propositions manipulating indices of a model, Enç regards tenses as referential expressions. As a consequence, the interpretation of tenses is subject to syntactic conditions that are reminiscent of the binding conditions for the interpretation of anaphors and pronominals.

An example will illustrate. Since we are concerned with embedded tens-

[1] The notion of governing category adopted here is the one proposed by Chomsky(1986b) : the governing category of an expression is the Complete Functional Complex containing the expression, the governor and a subject that c-commands the governor. Enç adopts the definition of government in Aoun and Sportiche(1983).

A governs B iff
a. A is X^0, and
b. A and B are contained in all the same maximal projection.

Enç also adopts the notion of head government such that a head governs its complement and the head of its complement.

[2] Enç defines a "local COMP" as follows: a COMP x is the local COMP of tense y iff x governs y or x governs a tense z and z binds y.

[3] COMP is regarded as the specifier of tense if and only if it governs tense.

es, let us examine sentences like (2):

(2) John heard that Mary was pregnant.

The sentence is ambiguous depending on the temporal relation between the event of John's hearing the news and the event of Mary's being pregnant. On one reading, which Enç calls 'shifted reading', the interval i_1 when John heard the news is prior to the interval i_2 during which Mary was pregnant. On the other hand, there is also a 'simultaneous reading' where i_1 and i_2 significantly overlap. The classical analysis of embedded tenses would fail to provide the second reading, because tenses in this analysis substitute new time for the temporal coordinate of the model.[4]

In Enç's theory, the ambiguity is accounted for by allowing two anchoring strategies for the complement tense in (2). The embedded tense can be anchored either through its COMP or by being directly bound by the higher tense. First, the complement tense is governed by the complement COMP and its governing category is the matrix S. The matrix tense can bind the complement COMP, yielding the indexing in (3) for the shifted reading. To generalize, let us call this mode of indexing (i.e., the binding of the complement COMP by its superordinate tense) Indexing Strategy A, or Strategy A for short.

(3) Strategy A
[COMP_o [NP [PAST_1 [V [COMP_1 [NP [PAST_2

For the simultaneous, or exophoric, reading, the complement tense is directly bound by the matrix past tense, as illustrated in (4). To distinguish this

[4] The most well-known approach to the interpretation of complement tenses is the Sequence-of-Tense analysis originally proposed by Costa (1972). According to this approach a sentence like

The Republicans believed that they won the election

has the present tense in its complement in its underlying representation.

The Sequence-of-Tense rule can be regarded as a late morphological rule. In this analysis the relation between embedded tenses and higher tenses follows with a minimum of their syntax, such as embedded clause and matrix clause. The mode of embedding is not important in the interpretation of tenses.

type of indexing from Strategy A in (3), let us refer to this as Strategy B.

(4) Strategy B
[COMP$_0$ [NP [PAST$_1$ [V [COMP [NP [PAST$_1$

This direct binding is possible, since the governing category for the two tenses is the matrix S and the matrix tense is a possible antecedent for the complement tense. In either case, embedded tenses are indirectly related to the time of utterance as dictated by the Anchoring Conditions (AC's hereafter).

3. Tense Embedding

We have seen an example where a past tense is embedded under another past tense. Let us now turn to example (5) where a present tense is embedded under the future (or modality) tense.

(5) John will assert that Mary loves Bill.

According to Ejerhed (1980 : 239), (5) is ambiguous between an opaque reading on which the complement is required to be true at the future point of reference introduced by *will*, and a transparent reading on which it is required to be true at the time of utterance of (5).[5] If she is correct, then (5) poses a problem for Enç, since the opaque reading will not be obtained. This is because in Enç's analysis of English present tense, there is a reindexing rule.

(6) At LF, change the referential index of the present tense and its COMP to 0.

In Enç's model, both COMP and INFL containing tense may carry a tem-

[5] The auxiliary verb *will* induces transparent/opaque contrast in a parallel way to referential expressions do. In fact, Enç (1987) suggests that the modals "might shift the temporal coordinate, resulting in ambiguities of sentences containing them."

poral index. If a complementizer bears a temporal index, its denotation is the same as that of tenses, i.e. an interval T that is made up of moments t. When a COMP is assigned 0 as its index, it denotes the speech time. The reindexing rule is needed to block undesirable coindexing between the matrix tense and the lower COMP (Strategy A) or between the matrix past tense and the complement tense (Strategy B) in sentences like (7) and (8):

(7) Mary said that Bill buys the diamond ring for her.
(8) Mozart believed that Constance is pretty.

Following Enç, let us assume that the present tense in English only denotes the speech time. Then, neither Strategy A nor Strategy B will yield a correct interpretation for (7) and (8). Therefore, after the indexing takes place at D-Structure, the reindexing rule applies to undo the tense binding at LF. Thus, no opaque interpretation is possible for the present tense of the complements in (7) and (8). However, the reindexing rule is too strong in that the opaque reading is not available for any embedded present tense. The interval that the present tense of a clause denotes is determined with reference to the interval denoted by its semantic specifier - its local COMP, in the following way.

(9) Where α is a present tense, β is a COMP with a temporal index, and β is the local COMP of α, $\| \alpha \|$ is an interval T such that $T = \| \beta \|$.
($\| \tau \|$ is the denotation of an expression τ and a COMP β is the local COMP of a tense α if and only if β governs α.)

When the reindexing rule changes the index of the embedded tense and its local COMP to 0, then the complement tense has no relation to the matrix tense and thus the subordinate clause is only read as true at the time of utterance.

Furthermore, a past tense complement to a future main clause shows the same type of ambiguity. Let us consider the following example from Ejerhed(p.243) :

(10) John will report that Mary was in Rome.

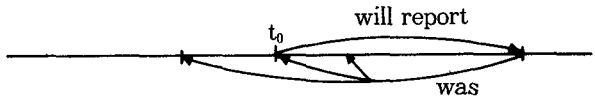
Using Dowty's AT-operator, we can represent the two readings of (10) as follows:[6]

(11) a. transparent reading
$\exists t_1[FUT(t_1)$ & $AT(t_1$, report-that′ (j, $\exists t_2[PAST(t_2)$ & $AT(t_2$, be-in-Rome(m))])]

b. opaque reading
$\exists t_1[FUT(t_1)$ & $AT(t_1$, report-that′ (j, $\exists t_2[t_2 \leq t_1$ & $AT(t_2$, be-in-Rome(m))])]

It is obvious that in (10) the matrix tense cannot be the antecedent of the embedded tense. Therefore, Indexing Strategy B, viz. a direct binding of the lower tense by the higher one, is to be avoided, although nothing in Enç's model prevents this possibility. Moreover, on the opaque reading the interval denoted by the complement tense is not uniquely determined with respect to the speech time, represented as t_0 in (12).

(12) opaque reading (Ejerhed, p. 244)



In the terminology of interval semantics, there are three ways the interval T of the past tense of the complement clause is interpreted: 1) every moment of time in T precedes the speech time, 2) T spans over the speech time and 3) the final bound of T precedes the initial bound of the interval denoted by the matrix tense. Thus, for the correct interpretation of the embedded past tense in (10) it is not enough to examine the denotation of the past tense with respect to its local complementizer alone as stated in Enç's definition of tenses.

Note that there is no significant difference in the syntactic structure between (3) and (10). Even if the structure is held constant, however, the mode of interpretation of tenses cannot be the same. Enç's syntax-oriented explanation is too strong on the one hand, because it allows direct binding

[6] See Dowty (1979) for the AT-operator.

of the embedded tense by the matrix tense to apply in sentences where the matrix tense cannot serve as the antecedent of the subordinate tense. On the other hand, it is too weak because it fails to provide an account of the opaque readings of the sentences like (10).

This inadequacy arises from her hypothesis that complement tense can not be directly linked to the speech time. We have seen that the tense in a complement clause can sometimes be interpreted as though it is not embedded. The relative clause tenses in English reveal the same property: the relative clause tense is sometimes independent of the matrix tense. When a relative clause has a past tense as in (13), its interpretation follows the pattern that we saw for the complement tense. For example,

(13) John saw the man who was crying

The time reference of the embedded past tense of (13) can be either the time of utterance or the past interval denoted by the matix tense. As we have seen earlier in sentences with complements, there are two possibilities of anchoring the relative clause tense: it can be anchored through its COMP (Strategy A) or by being bound directly by the matrix tense (Strategy B) as represented in (14).

(14) a. Strategy A

$[COMP_0\ [NP\ [PAST_i\ [V\ [NP\ [COMP\ [...PAST_j$

b. Strategy B

$[COMP_0\ [NP\ [PAST_i\ [V\ [NP\ [COMP\ [...PAST_i$

On the other hand, when the relative clause has a non-past (i.e., present or future) tense, we cannot have an endophoric reading: the time reference for the relative clause tense is the speech time, not the matrix tense. Consider the following example from Richards (1982: 82):

(15) James bought a stamp that will be priceless.

(15) is not ambiguous between shifted reading and simultaneous reading of the sort we saw earlier. The future tense of the relative clause cannot be coindexed with the higher past tense; the embedded tense is independent of the matrix tense. (15) poses the same problem for Enç as (5)－the em-

bedded tense is determined relative to the speech time, not to the matrix tense.

Then a question is what is the syntactic import of relating the speech time and the embedded tense? What is the syntactic representation of Reichenbachian notion of the speech time? This is an area where we bring in semantics, since no pure syntactic analysis can handle this. Tenses always tend to retain their deictic character,and thus to be interpreted relative to the speech time. However, syntax limits the freedom of tenses when they occur in non-simplex sentences and organizes their scopal relations in a principled way as dictated by the constraints such as Enç's Anchoring Conditions. But the AC's are not enough for an example like

(16) James bought a stamp that cost him almost nothing but will be priceless soon

where the past tense in the relative clause is bound by the matrix tense, but the future tense in the same relative clause is anchored through its COMP, denoting the speech time. But this 'disjoint' anchoring is impossible in Enç. To argue that all the complement tenses are interpreted by being bound by the c-commanding higher tense in their governing category is as incorrect as to say that the NPs in the complement clause are bound by their antecedent in a sentence like (17):

(17) The man forgot that he had been talking to him.

Finally, another problem for Enç's syntax-oriented tense anchoring is that the availability of different readings is affected by the nature of matrix verbs in Japanese or Korean. For instance,

(18) John-un Mary-ka talchwulhay-ass-tako malhay-ass-ta.
-TOP -NOM escape-PAST-COMP say-PAST-DEC
'John said that Mary escaped/had escaped.'

(18) is ambiguous in the same way as (5) and its ambiguity is accounted for in a parallel way. However, sentences in the same construction are not always ambiguous in Korean. For example, (19) has the same structure as (18), but it has the shifted reading only.

(19) John-un Mary-ka yeyppu-ass-tako malhay-ass-ta.
-TOP -NOM pretty-PAST-COMP say -PAST-DEC

'John said that Mary had been pretty.'

To have a simultaneous reading, a present tense (or tenseless) form is used for the embedded verb as in (20).

(20) John-un Mary-ka yeyppu-ϕ- -tako malhay-ass-ta.
-TOP -NOM pretty-PRES-COMP say -PAST-DEC
'John said that Mary was pretty.' (ϕ has no phonetic content)

The problem is how to block the binding of the complement tense by the matrix tense in sentences like (19), while allowing two possibilities of anchoring in cases like (18). To accommodate this, additional information like the class of verbs has to be stated in the anchoring conditions for complement tenses.

4. Unspecified Tense Anchoring

In the previous sections we have focused on the interpretation of tenses that are phonetically non-null. However, it is well-known that tenses can be unspecified (or underspecified) and thus have no phonetic matrix if they are anaphorically recoverable. By way of an example, consider (21) from Amele. (Here, 'ϕ' indicates an underspecified inflectional category).

(21) Ho busale-ce-b-ϕ dana age qo-ig-a
pig run out-DS-3s man 3p hit-3p-PST
'The pig ran out and the men killed it.' (Roberts, 1988: 52)

In (21) the tense of the first conjunct is anaphoric in the sense that its interpretation is dependent upon the other element in the sentence.[7] The first

[7] Hale (1989) calls this kind of underspecified INFL "anaphoric INFL". He argues that a clause bearing a dependent INFL cannot stand alone as a root clause, since its tense is anaphoric, and therefore, must be bound. As pointed out by Smith (1981), temporal dependencies in some complex sentences have all of the properties of anaphora, which is defined by Hankamer (1976) as follows:

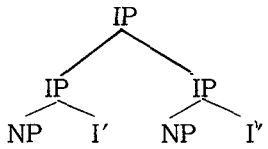
Given surface segments of A and B in a sentence or discourse, B is anaphoric to A if:

a. A and B are disjoint ;
b. The reading of B and the reading of A have identical subparts; and
c. If A is varied both readings vary, but if B is varied the reading of A remains constant.

conjunct in (21) is semantically a proposition, i.e. function from the possible worlds to truth values. If it is false, the whole sentence will be false, following a simple truth function of *and*-coordinate sentences in logic.

Now, how do we account for the temporal interpretation in (21) by means of the AC's? There have been two different structures proposed for sentences like (21). First, Roberts (1988) argues that (21) involves symmetric coordination like (22):

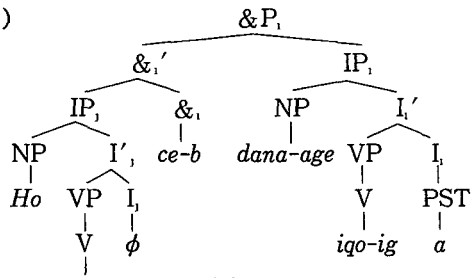
(22)



One immediate problem for Enç's analysis that the symmetric structure (22) poses is that government as defined in Aoun and Sportiche (1983) cannot operate across such multi-headed coordinate structure.[8]

On the other hand, Finer (1985) and Collins (1988) hypothesize that the structure of sentences like (21) involves asymmetric conjunction. Particularly, Collins (1988) would argue that (21) has the following endocentric structure, where the complementizer & is the head of the whole sentence.

(23)



('ϕ' is an underspecified inflectional category)

In (23) the conjunction (&) functions to identify a clause (more accurately, its INFL head) as anaphoric and bound. To account for the temporal de-

[8] As we saw earlier in fn 1, the notion of government defined by Aoun and Sportiche (1983) requires the governor and the governee be contained in all the same maximal projections. A coordinate structure does not fulfill this requirement.

pendency between &,′ and IP, we need to introduce a device that mediates them. This mediating device takes the form of agreement. Thus, the head & and its specifier IP, are coindexed by "SPEC-head agreement" as defined in Chomsky (1986). As a consequence, the head of IP, and the projections of the complementizer & are coindexed. SPEC-head agreement also holds between IP, and &′, and thus its head &. Being a form of feature sharing, SPEC-head agreement allows the elements involved to share some grammatical features ("phi-features"). We will assume that tense is such a feature that can be shared by the elements in SPEC-head agreement.

Now we are ready to extend Enç's syntactic constraints for the interpretation of the underspecified tenses in complex sentences.

(24) Anchoring Condition for anaphoric tenses
A tense α_1 and a tense α_2 form a chain of temporal indexing, such that α_2 inherits the temporal index of α_1, if α_2 is followed by the local COMP and has no phonetic matrix.

The AC in (24) is needed also to account for the temporal dependencies in so-called participial constructions like (25):

(25) a. Walking along the street, I met an old friend of mine.
b. Walking along the street, I often stop in front of the church.

The interpretation of the tense of the participial clauses in English depends on that of the matrix clause. However, since COMP precedes INFL in English, we need to revise slightly the AC in (24) to capture the parametric variation: in SOV languages like Amele and Korean, COMP follows INFL, while the reverse is true in SVO languages like English.

(26) Anchoring Condition for anaphoric tenses
A tense α_1 and a tense α_2 form a chain of temporal indexing, such that α_2 inherits the temporal index of α_1, if α_2 is adjacent to the local COMP and has no phonetic matrix.

5. Summary

The purpose of this paper was to present an examination of Enç's proposal that the interpretation of embedded tenses is constrained by the syntactic conditions called Anchoring Conditions. It was suggested first of all that the proposal to characterize temporal dependency between tenses in complex sentences in terms of their configuration alone is both too strong and too weak. This is largely because the AC's prevent complement tenses from being linked to the speech time. The semantic interpretation of tenses, or temporal expressions including time adverbials for that matter, is subject to some syntactic constraints. At the same time, however, a generalization can be given at a higher level. For example, temporal dependency can occur across sentences as in

(27) The secretary told me that Mary came to see me at nine.
I believe that she will come again in two hours.

Finally, an extension of the anchoring conditions is suggested to account for the temporal dependency in sentences containing anaphorically unspecified tenses.

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