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On Reichenbach's Approach to Tense*

Kazuhiko Tanaka

1. Various attempts have been made in the linguistic literature attempts at formalizing the precise relation between tense and time in English (see Reichenbach (1947), Hornstein (1977), Comrie (1981, 1985), Declerck (1986) and many others). The most influential of these is no doubt Reichenbach.

In the present article, we wish to take a close look at Reichenbach's theory, and point out its deficiencies; we will then propose an alternative theory that overcomes these deficiencies.

2. In this section, we will review the tense system proposed in Reichenbach (1947), which is called the SRE system, and point out that this system goes wrong in some respects. As is well known, Reichenbach suggested for English a semantic model (the SRE system) in which every tense is defined in terms of linear combinations of three theoretical entities: Speech Time, Event Time, and Reference Time (symbolized by S, E, and R). S is the time at which a given sentence is uttered. E refers to the moment at which the situation[1] referred to by the sentence occurs. R, which is a controversial theoretical entity, is the time indicated by the sentence, especially, by the time adverbial in the sentence. In addition to these three time points, two relations are defined: a relation of temporal coincidence, indicated by a comma, and a relation of temporal distance, indicated by a line, where the symbolization X---Y is to be interpreted as 'X precedes Y'.

Reichenbach allowed for thirteen different combinations of three points.[2] In this article, however, we will deal with six of them as shown below:

(1) Present = S, E, R
Present Perfect = E---S, R
Simple Past = E, R---S
Past Perfect = E---R---S
Simple Future = S---E, R
Future Perfect = S---E---R

Illustrations of these formulas are given in (2)-(7) (where S is omitted for convenience):

(2) Megumi lives in Kanazawa(E) now(R). =Present
(3) Megumi has lived in Kanazawa(E) since last year(R). =Present perfect
(4) Megumi was in Kanazawa(E) yesterday(R). =Past
(5) When Kazuhiko came(R), Megumi had arrived(E) already. =Past perfect
(6) Megumi will marry Kazuhiko(E) next month(R). =Simple future
(7) Megumi will have married Kazuhiko(E) next month(R). =Future perfect

The major innovation by Reichenbach is the introduction of R in the description of the tenses. In his system, R is involved not only in complex tenses(i.e., perfect tenses) but also in simple tenses (i.e., present, past and future tenses). In this way, his theory can differentiate the present perfect from the simple past by saying that in the former case, R is simultaneous with S and in the latter case, R coincides with E, as shown below:

(8) a. Present Perfect: E---S, R
b. Simple Past : E, R---S

Although this SRE system appears to have been accepted by a vast majority of linguists, some linguists (Comrie, Declerck, Prior and so on) have criticized it for various reasons. Firstly, Reichenbach's system generates more possibilities than are actually to be found in natural languages(Comrie, 1981; Declerck, 1986). For example, as mentioned in note 2, his system provides for three different future perfect tenses (S---E---R, S, E---R and E---S---R), but no language appears to have these three different tenses.

Secondly, Reichenbach's system, which provides for only one R, is too simple to capture a complex tense system of natural languages (Prior, 1967; Comrie, 1981, 1985). According to Prior, the following sentence clearly needs more than one R as shown in (9b):

(9) a. I shall have been going to see John
b. S---R---E---R (Prior 1967, p.13)

Though the above points of criticism per se are interesting and important, I will not go into them any further. But, of course, these deficiencies will be solved in our system.

The most crucial deficiencies in Reichenbach's system specifically center around the notion of R itself. We have three major problems about R here:

(10) a. What is reference time?
b. How should we treat time adverbials in the tense system?
c. Do we really need reference time in the description of the tenses?

To begin with, we will consider (10a), namely, what reference time is.

As many linguists have mentioned, the notion of R never receives an adequate technical definition. In Reichenbach(1947, p.288) the idea is introduced in informal terms in the description of a particular tense (i.e., the past perfect). This is why it is apparently left to the reader to infer the definition. As far as we can judge from his examples and comments, R must be something like a speaker's (temporal) viewpoint, the vantage point from which a speaker views the situation referred to (Nakau, 1985e, p.24).

If we consider R to be something like a vantage point, Reichenbach's system seems to be compatible with our linguistic intuition. For instance, according to Reichenbach's system, the present perfect has R simultaneous with S and E in past time, as in (8):

(8) E---S, R Present perfect

Representation (8) shows that when we use the present perfect, we refer to a situation in past time from a temporal viewpoint simultaneous with S. This is in keeping with the observation that the present perfect is often used for past events related to the present by their recency and current news value. At present, we will take R as a speaker's temporal viewpoint.

Next we will deal with the problem of the treatment of time adverbials in the tense system. Reichenbach argues that time adverbials specify, or modify only R in his tense system. But this is not right. Consider the following example:

(11) Now Megumi will marry Kazuhiko next month.

Under the SRE theory, the 'future tense' sentence (11) must have the representation in (12):

(12) S---E, R

In (12) there is an entity which next month can modify, that is, R. However there is nothing that now can modify. Thus the SRE representation cannot describe the sentence with two time adverbials which each refer to different times, as in like (11). In this respect, Reichenbach's treatment of time adverbials is problematic.

Finally, we will consider the most controversial problem. It is whether we really need reference time in the description of tense.

Up to now many linguists have dealt with this problem. Comrie (1985) claims that there is no need for R especially when we are talking about simple tenses.[3] Declerck (1986) subscribes to Reichenbach's principle that every tense involves a point of reference.[4] Nakau (1985e), assuming the AUX-as-main verb hypothesis, mainly discussed in Ross (1969) and Huddleston (1976), rejects R in all tenses, and proposes that tense should be represented with S and E only. He maintains that R is a secondary notion which is to be derived from an interaction of S and E. (In our tense system, we will adopt Nakau's idea. The reason will be made clear later.)

Thus it is the introduction of R in the description of all tenses that makes Reichenbach's theory influential but controversial.

3. In this section we present a new tense system, the SE system, based on Nakau(1985e); this new system presupposes the Aux-as-main-verb hypothesis.

Before turning to the new system, let us say a few words about the notion of "tense" again. The term tense has been used in different senses in the linguistic literature. Some linguists (Smith, Nakau and others) hold that English has only two tenses, viz. the past tense and the present tense. Others (Reichenbach, Comrie, Declerck and many others) distinguish among a wider array of tenses, maximally including the present tense, the past tense, the future tense, the present perfect, the past perfect, the future perfect, the condi-

tional, and the conditional perfect.

Here we will adopt the former convention. In our system, English has no future tense. That is to say, there is no verbal inflection in English whose primary function is to locate in future time the situation described in the sentence. This is opposed to the widespread assumption that will and shall are future tense markers. In this article, following Nakau(1985e), we assume that the finite verb (the leftmost verb in the sentence) has no future time reference, whereas a nonfinite verb(a verb next to the finite verb) can have future time reference. In other words, will and shall have no future time reference: they have present time reference, but the bare infinitive form verb next to will or shall can have future time reference. There are some strong arguments supporting this assumption in Smith (1978) and Nakau (1985). Consider the sentences below:

(13) a. Will George be at home now?
b. He will be in Paris at the moment.
c. That will be James at the door, I expect.
d. She won't have heard the news last night.

(Nakau: 1985c, p.24)

It should be noted that will can occur in present and past as well as future sentences in the above examples. If will were to be treated as a future tense marker, or it were to have future time reference, then it would be necessary to set up more than one kind of will to account for all the above sentences. But this is undesirable, because such an analysis would be tantamount to saying that the wills are mere homonyms, but in fact all sentences in (13) have one thing in common. That is, they have "the same predictive meaning"(Smith, 1978, p.49), i.e., the speaker's prediction at the speech time about a future event (Nakau, 1985c, p.30). Hence will is not a future tense marker with no meaning; rather it does have a predictive meaning.

There is another piece of evidence leading to the conclusion that will should not be treated as a mere future tense marker. Note the following examples:

(14) a. I can use a type-writer perfectly now.

b. I can see you tomorrow afternoon. (Nakau; 1985c, p.22)

(15) a. You may eat this apple now.

b. You may go out shopping tomorrow.

(16) a. You must stay here now.

b. You must take a final exam the day after tomorrow.

As we can see from the above examples, can, may, and must also can occur in future as well as present sentences. It should be noted here that all time adverbials indicating future time reference in (14b), (15b) and (16b) modify the nonfinite verbs see, go, and take respectively, not the finite verbs can, may, and must; for example, in (14b) tomorrow afternoon specifies the event time of my seeing you. Clearly, can, may, and must refer to the present time. These sentences exemplify our assumption that the nonfinite verb can refer to the future time, while the finite verb cannot.

What has been said so far can be summarized as follows: tense should be treated as a grammatical (syntactic) property of the leftmost finite verb in the sentence, i.e., English has two kinds of tenses, viz., the present and the past tenses. Therefore, the highest verb in the sentence can never have future time reference. On the other hand, future time reference in English is semantic: nonfinite verbs which end in -ing, -en or neither can also refer to the future time, depending on context or adverbs with which they occur. Thus the ternary contrast of past, present, and future is a question of time rather than tense.

Now we turn to our new system. As mentioned before, what is crucial in our system is that it presupposes the Aux-as-main-verb hypothesis. According to this hypothesis, a 'perfect tense' sentence such as John has lived in Kanazawa, which has been usually supposed to involve only one verb, will have to be regarded as involving two verbs(the finite verb has and the nonfinite verb lived). Because each of the two verbs describes one situation, the above sentence is taken to describe two situations. Assuming this hypothesis, we can develop a system, the SE system, in which there are only two well-defined elements involved in the description of tense: speech time and event time. This system seems to be superior to the SRE system, at least in that it does not need reference time, which has never received any adequate technical definition.

Here We will develop Nakau's SE system(1985e, pp.25-26) and analyze the

following sentences, with speech time and event time only. First of all, we propose the rules and the lexical information of will and have as below:

(17) The E to which the finite verb refers is determined by Tense: namely it is either present or past.

(18) The E to which the nonfinite verb refers is determined by the following lexical properties of a preceding verb.

i) Have takes the -en complement indicating past time reference. (Nakau; 1985e, p.26)

ii) Will takes the bare infinitive complement indicating present or future time reference.
(Whether it indicates present or future depends on context or adverbs with which they occur.)

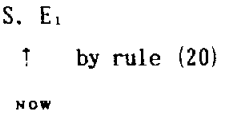
(19) Replace S_n by E_{n-1}[5] (Nakau; 1985e, p.26)

(20) Time adverbials(temporal specifiers) modify E

By the above rules and lexical information, each of the following sentences has its SE representation. First, consider the present tense sentence like (21):

(21) Megumi $lives_1$ in Kanazawa now.

(21) has only one verb(viz. lives). By rule (17), E_1 has present time reference and now modifies E_1 by rule (20) as in (22):

(22)


(22) shows that the event time of Megumi's living in Kanazawa is simultaneous with speech time, and that its time is specified by now. This representation reflects the observation that the primary function of the present tense is to locate the situation in present time.

Then we turn to the past tense sentence:

(23) Megumi was_1 in Kanazawa yesterday.

(23) has also only one finite verb (viz. was). By rule (17) E_1 has past time reference and yesterday modifies E_1 by rule (20), as in (24):

(24)
E_1---S
↑ by (20)
YESTERDAY

(24) says that the event time of Megumi's being in Kanazawa precedes the speech time, and that its time is specified by yesterday. This representation is also compatible with the common observation that the past tense serves straightforwardly to locate the situation in past time.

Next let us look at the so-called future tense sentence:

(25) Miho will$_1$ marry$_2$ him next month.

Unlike (21) and (23), (25) has two verbs: the finite verb will and the nonfinite verb marry. E_1(will) has present time reference by rule (17), as shown in (26), and E_2(marry) has future time reference by rule (18) and the lexical information of will, as in (27). Rule (19) unites the temporal structures in (26) and (27) on the same time axis, and next month modifies E_2 by (20), as in (28):

(26) S_1, E_1 by rule (17)
(27) S_2---E_2 by rule (18) and the lexical information of will
⇩ by rule (19)
(28) S, E_1---E_2
↑ by rule (20)
NEXT MONTH

(28) shows that the time of Miho's marrying him follows the speech time, and its time is specified by next month, and that the event time of the speaker's prediction about her marrying him next month coincides with the speech time.

It is worthwhile here to return to the problem of the SRE system which we have mentioned before. The problem is that the SRE system cannot properly describe a sentence like (29):

(29) Now Miho will$_1$ marry$_2$ him next month.

Under the SRE theory, (29) can have the following representation:

(30) S---E, R

In (30) there is no element that now can modify: in Reichanbach's analysis, time adverbials must modify reference time. But in our new representation (31), there is an element that now can modify(i.e., E_1):

(31) S, E_1---E_2

In our system, time adverbials modify event time. Thus our new system can properly describe sentence (29), and we can solve one of Reichenbach's problems here.

So far we have considered 'simple tense' sentences. Next we will turn to 'complex tense' sentences. First, let us consider the present perfect sentence:

(32) Megumi has$_1$ lived$_2$ in Nagano since three years ago.

(32) has two verbs (has and lived). E_1, which has refers to, has present time reference by rule (17), as in (33). E_2, which lived refers to, has past time reference by rule (18) and the lexical information of has, as in (34). And rule (19) unites (33) and (34) on the same time axis, as in (35):

(33) S_1, E_1 by rule (17)

(34) E_2---S_2 by rule (18) and the lexical information of has

⇩by rule (19)

(35) E_2---S, E_1 (SE system)

It is worthwhile here to compare our new representation of the present perfect with Reichenbach's, presented in (36):

(36) E---S, R (SRE system)

Our new representation is compatible with a well-known observation about the present perfect, namely, that present perfect is often used for a situation obtaining from a time in past up to and including the present. In contrast, Reichenbach's SRE representation (36) does not properly reflect this observation. To illustrate, consider the following sentence:

(37) Megumi began to live in Nagano three years ago and still lives there now.

Both (32) and (37) are considered to describe almost the same situation; namely with 'perfect tense' there is no implication that the situation is now completely finished-- quite the contrary.[6] Reichenbach's representation (36) can describe the situation of Megumi's having lived in Nagano for the past three years, but cannot explicitly describe the situation of Megumi's living in Nagano now, because (36) describes only one situation in the past; this is due to the fact that reference time is only something like speaker's temporal viewpoint; R cannot describe a situation. On the other hand, our new system can describe both situations, because it is presupposed that present perfect describes two situations: the nonfinite verb (lived) describes a situation in the past and the finite verb (has) a situation in the present. This strongly shows that our new system is better than the SRE system.

Then we will consider the past perfect sentences in (38) and (39)

(38) Kyoko had$_1$ already arrived$_2$ when Kazuhiko came.

(39) Kyoko had$_1$ arrived$_2$ when Kazuhiko came.

(38) and (39) have two verbs (had and arrived). E_1, which had refers to, has past time reference by rule (17), as in (40). E_2, which arrived refers to, has also past time reference with respect to E_1 (had) by rule (18) and the lexical information of have, as in (41). Rule (19) unites (40) and (41) on the same time axis, as in (42):

(40) E_1---S_1 by (17)

(41) E_2---S_2 by (18) and the lexical information of have

⇩ by (19)

(42) E_2---E_1---S (a) E_2---E_1---S (=38) (b) E_2---E_1---S (=39)

when Kazuhiko came when Kazuhiko came

In (39) Kyoko's arrival may coincide with or precede Kazuhiko's arrival (i.e., the temporal specifiers, when Kazuhiko came, can modify either E_1 or E_2), but (38) has only the latter reading (i.e., when Kazuhiko came must specify E_1). This is due to the presence or the absence of the adverb already. Its lexical meaning (by or before a stated or suggested time (LDCE; p.25)) forces the temporal specifier to specify E_1. Representation (42a) is in keeping with the observation that Kyoko's arriving is not simply past in relation to the time of utterance, but it is past in relation to some contextually given time (the time when Kazuhiko came) that is itself past in relation to the speech time.

Let us now observe a more 'complex tense' sentence, the so-called future perfect tense sentence:

(44) Next month Miho will$_1$ have$_2$ married$_3$ him already.

(44) has three verbs (will, have and married). E_1, which will refers to, has present time reference by rule (17), as in (45). E_2, which have refers to, has future time reference by rule (18) and the lexical information of will, as in (46). E_3, which married refers to, has past time reference with respect to E_2(have) by rule (18) and the lexical information of have, as in (47). Rule (19) unites (45), (46) and (47) on the same time axis, as in (48):

(45) S, E_1 by (17)
||
(46) S_2----E_2 by (18) and the lexical information of will
||
(47) E_3--S_3 by (18) and the lexical information of have
⇩ by (19)
(48) S, E_1---E_3---E_2
↑
NEXT MONTH

Up to now, we have presented our new tense system and shown that our SE system is superior to Reichenbach's SRE system in some respects. Though we have not mentioned explicitly, our new system can also solve two problems involved in Reichenbach's SRE system, mentioned before and also discussed in Comrie (1985), Declerck(1986) and Prior(1967). As mentioned earlier, one of them is its over-capacity: the SRE system generates more possibilities than are actually to be found, and the other is its oversimplicity: it is too simple to capture a complex tense system of natural languages. The former problem can be solved by the rules in (17), (18) and (19) and the lexical information, as should be clear from the above discussion. On the other hand, the latter problem can be dealt with by assuming the Aux-as-main-verb hypothesis; for example, the following example, which, according to Prior (1967), needs more than one R, can be easily described under our SE system: (49) can have a temporal representation as in (50):

(49) I shall$_1$ have$_2$ been going to$_3$ see$_4$ John.

⇩ by rule (17), (18), (19)

(50) S, E_1---E_3---E_4---E_2

4. We have argued in this paper that all we need for the description of temporal structure of a sentence is S and E only, showing that our SE system is superior to Reichenbach's SRE system in many respects. We can say that the major problem with Reichenbach's SRE system lies in the introduction of R, which is an undefined theoretical entity in the description of tense. Our system can describe all tenses without such a controversial entity..

Notes

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[1] We will use the term 'situation' as a cover-term for anything that can be referred to by a verb phrase. That is, a situation may be either a state, a process or an action. This tripartite classification is proposed by Nakau(1985 f).

[2] Reichenbach's thirteen configurations are as follows:

E---R---S	past perfect
E, R---S	past
R---E---S	conditional
R---S, E	conditional
R---S---E	conditional
E---S, R	present perfect
S, R, E	present
S---E---R	future perfect
S, E---R	future perfect
E---S---R	future perfect
S, R---E	future
S---R, E	future
S---R---E	future

[3] In his theory, all we need for representing the three 'absolute' (i.e., simple) tenses is two time points (S and E) and three relations (simultaniety, anteriority and posteriority):

a. present : E siml. S
b. past : E before S
c future : E after S

For the representation of other tenses, one more time point is necessary, viz the reference point (R):

d. past perfect : E before R before S
e. future perfect: E before R after S

[4] In his system, there are four elements involved in the description of the tenses: time referred to (T.R.), time of orientation (T.O.), time of situation (T.S.) and time of utterance (T.U.). According to Declerck(1986: p.320), "T.O.

indicates the time to which a situation is related: whenever we use a tense to describe a situation this situation is located relative to a T.O. and T.R. is established by a time adverbial."

[5] According to Nakau(1985e, p.358), this rule serves to unite one temporal structure indicated by finite verbs and another temporal structure indicated by nonfinite verbs on the same time axis.

[6] According to Huddleston(1988, p.76), "with perfect aspect the emphasis is on the current or resultant state."

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Doctoral Program in Literature and linguistics
University of Tsukuba