Chapter IV

Reference time

One of the topics discussed in the previous chapter was the phenomenon of delimitedness. Delimiting temporal expressions, as has been shown, influence temporal interpretation of sentences in discourse. The examples that illustrate this are repeated here from chapter III:

(1) [It was a lovely performance]. The entertainer told jokes for fifteen minutes, sang for half an hour and danced for another half an hour.
(2) [It was a lovely performance]. The entertainer told jokes, sang and danced.

The relevant difference between (1) and (2) is that only the delimited predicates in (1) can trigger a sequence interpretation: the entertainer first told jokes, then sang and then danced. In (2), an overlap interpretation arises, i.e. telling jokes, singing and dancing eventualities are not temporally ordered. However, as has been argued earlier, having an indicated temporal boundary, which is usually done by delimiting expressions like ‘for 5 years’ or ‘from January till May’, does not change the basic properties of predicates or eventualities. This means that there should be another entity that delimiting expressions operate on.

The idea to relate delimitedness to the notion of Reference time was put forward in Reinhart (1986, 2000). On her analysis, which will be presented in detail in section IV.3, delimiting adverbials are treated like modifiers, but the modified entity is crucially different. Reinhart argues that delimiting adverbials do not operate on a predicate itself and, therefore, do not modify, change or influence the properties of a predicate. What delimiting adverbials are taken to restrict is actually the Reference time interval.

The notion of Reference time (or, more precisely, the relation between Reference time and Speech time) is the closest conceptual entity to the informal notion of ‘perspective’ or ‘point of view’ in the literature on aspect. Then the following connection is established: Reference time, which is already a well-known linguistic notion, is a tool to account for both
perspective, which underlines the point of view approach to aspect, and delimitedness, which is often considered to be relevant for aspectual theory at the discourse level.

In this chapter, I will ‘trace’ the development of the notion of Reference time, starting from a brief review of Reichenbach (1947) in IV.1. As will be shown in IV.2, there are two main areas in linguistics that use the notion of R-time: temporal semantics and discourse studies, especially those that focus on narrative progression principles, where the phenomenon of delimitedness becomes especially relevant. The rules of temporal organization of narrative discourse have been extensively discussed in the literature (e.g., Partee (1984), Hinrichs (1986), Dowty (1986), Hatav (1997) and Kamp & Reyle (1993) among many others). The challenge is, however, to define the notion of Reference time in such a way that it can be successfully applied in both areas without distinguishing several notions of R-time (like, for instance, in Kamp & Reyle (1993)). A theory of Reference time based on such a definition should capture both the basic properties of tense systems across languages and account for the fundamental facts discussed in the discourse literature on the temporal properties of narration. It will be shown, that the two uses of Reference time, the one for the tense systems (section IV.2.1) and the one for the discourse analyses (section IV.2.2), have existed independently. A unified treatment of Reference time based on the proposal of Reinhart (1986, 2000) is discussed in IV.3.

IV.1. The notion of Reference time

The concept of Reference time is well known in linguistics. It was introduced by Reichenbach (1947) and has been widely used in the literature on tense and aspect since then. Reichenbach himself does not give a definition of R, but illustrates its use in linguistic theory, and this is one of the reasons why R has always been the subject of reinterpretation.

The interpretation of R in the present work will be similar, but not identical to Reichenbach’s original interpretation. Reichenbach (1947) is not explicit about the temporal nature of R-time: in his analysis, temporal expressions like yesterday or in 1943 determine the R-time, which suggests that R-time is not really a temporal point (i.e., it is considered to be a moment of time), but the analysis of tenses developed in Reichenbach’s work does not involve temporal intervals. In this work, however, I assume the temporal interval to be a semantic primitive. Following Bennett & Partee (1972/78), Dowty (1979) and others, R(eference time), as well as S(peech time) and E(vent time) are taken to be interpreted not as points, but as temporal intervals. This step will be discussed in more detail in section IV.3.
IV.1.1. Reichenbach (1947)

In “Elements of Symbolic Logic” Reichenbach proposes an analysis of the English tense system, based on three notions: S, which corresponds to the point of speech, E, the point of event, and, finally, R, the point of reference. There are two temporal relations that can be established between these entities: precedence and simultaneity. The intuitive interpretation of the first two notions seems to be relatively straightforward: S is the point in time which correlates with the time of the actual act of speech reporting on a certain state of affairs, which took place at some other point in time, referred to by E. This is the simplest way of establishing temporal relations that natural languages use: the placement of two related events on the time axis. Languages usually conceptualize real time as a vector directed from ‘past’ to ‘future’ and the basic linear relations (like, e.g., precedence) between different points on this axis are relatively easy to establish. The relation between S and E defines three basic temporal relations in natural languages: present, past and future. In Reichenbach’s notation, simultaneity is expressed by comma, precedence by _.

(3)  
   a. I see John S,E  
   b. I saw John E_S  
   c. I will see John S_E

However, operating with only two notions, E and S, a system of temporal relations for a language like English cannot be built. Reichenbach observes that it is not possible to give different representations for the following sentences on the basis of a direct relation between S and E:

(4)  
   a. Mary has seen John E_R,S  
   b. Mary saw John E,R_S

Both sentences are interpreted as reporting on an eventuality that occurred in the past, i.e. prior to the Speech time. Therefore, the representation for both of them in terms of just S and E would be the same, namely E_S. To solve this problem, Reichenbach introduces the third notion, the Reference point, which is required in his analysis to distinguish between the two examples in (4), ascribing them the representations in (5)a and (5)b respectively:

(5)  
   a. E_R,S  
   b. E,R_S

More generally, the reason for Reichenbach to introduce R was his wish to deal with so-called "complex" tenses, i.e. perfect tenses in English. He motivates this step as follows (Reichenbach 1947:288):
‘From a sentence like ‘Peter had gone’ we see that the time order expressed in the tense does not concern one event, but two events, whose positions are determined with respect to the point of speech. … the point of the event is the time when Peter went; the point of reference is a time between this point and the point of speech’

The representation assigned to past perfect is given in (6):

\[(6) \quad \text{I had seen John} \quad \text{E \_ R \_ S}\]

Reichenbach also notes that, if not restricted, the system with 3 time points extensively overgenerates in the sense that the logical possibilities of ordering \(S, R\) and \(E\) allowed by the original system are not exhausted. To make the system more restrictive, he proposes to consider only two ‘main’ types of relations (ibid.:297):

‘The position of \(R\) relative to \(S\) is indicated by the words ‘past’, ‘present’ and ‘future’. The position of \(E\) relative to \(R\) is indicated by the words ‘anterior’, ‘simple’ and ‘posterior’, the word ‘simple’ being used for the coincidence of \(R\) and \(E\)’

This leaves us with \(3 \times 3 = 9\) possibilities, which is too many for English anyway. Therefore, in Reichenbach’s analysis some of the English tense forms receive several representations. It has been noted as a disadvantage of the system in, e.g., Verkuyl & Le Loux-Schuringa (1985), Vikner (1985). The tenses in English that receive more that one interpretation are Simple Future, Future Perfect and Future in the Past:

\[(7) \quad \begin{align*}
a. \text{I will walk} \\
& \text{S, R \_ E or S \_ E, R or S \_ R \_ E} \\
b. \text{Mary will have seen John} \\
& \text{E, S \_ R or E, S \_ R or S \_ E \_ R} \\
c. \text{Mary would see John} \\
& \text{R \_ E \_ S or R \_ E, S or R \_ S \_ E}
\end{align*}\]

Note also, that in a sentence with Past Perfect, e.g., ‘I had met him yesterday’, in Reichenbach’s words, “what was yesterday is the reference point, and the meeting may have occurred the day before yesterday” (Reichenbach 1947:294). The function of temporal expressions with ‘when’, ‘before’ or ‘after’ is to compare the reference points of different clauses, i.e. to establish a certain temporal relation between them. Thus, it is also noted by Reichenbach that the \(R\)-times in complex sentences obey some rules. He considers two examples. The first one is ‘How unfortunate! Now that John tells me this I have mailed the letter’, where the reference point of the
sentence ‘John tells me this’ coincides with the speech point and does not change with the sentence ‘I have mailed the letter’, justifying the use of the perfect tense:

(8) \[
\begin{align*}
\text{John tells me} & \quad \text{I have mailed} \\
E_R S & \quad E_R S \\
\end{align*}
\]

This is an example of the rule of ‘the permanence of the reference point’, in Reichenbach’s words. In cases like ‘He telephoned before he came’, the two reference points are ordered sequentially. In other words, in the last example, the R-point of the first clause precedes the R-point of the second one:

(9) \[
\begin{align*}
\text{He telephoned} & \quad \text{he came} \\
E_R S & \quad E_R S \\
\end{align*}
\]

To conclude this section, I would like to point out again, that the notion of Reference time is introduced to account for the English tense system in Reichenbach’s analysis, but he also notices that Reference times can be ordered and participate in establishing temporal interpretation of parts of complex sentences. The latter use of Reference time can be extended from complex sentences to a sequence of sentences, i.e., to discourse, and it is currently known as the phenomenon of Reference time movement.

IV.2. Reference time movement

There is general agreement about the importance of Reference time in the temporal analysis of narrative discourse. The crucial role that R plays in discourse studies is not a matter of controversy, but nevertheless, it would be useful to review some arguments that would justify the use of this notion. Consider, for instance, the following observation. If two reported eventualities share an R-time, which is specified by a temporal expression like Sunday, it is possible to get any ordering between them, including overlap:

(10) On Sunday John’s sister got married and he left for Africa.

In this case, John might or might not be at his sister’s wedding, i.e. he might have left earlier, later or at the same time as his sister was getting married. There is nothing in a given discourse that would preclude either interpretation, because both eventualities share the same reference time, i.e. ‘Sunday’. Notice, that in the ‘real world’ these two eventualities were probably chronologically ordered, but we cannot establish a linguistic sequence in (10).
Reference time appears to be a very useful tool in analyzing temporal dependencies that are established between sentences in discourse. It was noticed in, e.g., Kamp & Rohrer (1983) and Reinhart (1984), that for a sequence of sentences in a narrative text, if they all appear in the past tense form, it is not sufficient to say that the eventuality described in a given sentence occurred before the speech time, which is just the basic meaning of the past tense. In the cases like “John went to the kitchen. He made some tea for his guests” one has to provide not only the interpretation of every given sentence in isolation, but to establish the ordering of the eventualities reported to get the right temporal dependencies. A model that allows for doing that was developed in Kamp (1981), Partee (1984), Kamp & Reyle (1993) within Discourse Representation Theory (DRT). In this theory, sentences are not only evaluated with respect to Speech time, but are also accommodated into the preceding discourse. Every subsequent sentence brings about some new information, which has to be incorporated into the structure (discourse representation structure or DRS), which has been formed as a result of processing the information conveyed by the preceding sentences in a given discourse. This theory allows us to formalize certain relations between sentences and provides a means to model anaphoric and temporal dependencies in discourse. Each particular sentence in the past tense, for example, is given the truth conditional interpretation that requires the described eventuality to precede the Speech time. The sentence is further evaluated with respect to other sentences in discourse, and one of the relations that can be established as a result of this evaluation is temporal ordering.

The range of temporal relations that can be established between sentences can by no means be reduced to sequence and overlap. Lascarides & Asher (1993) develop a formal analysis of some discourse relations between propositions. I will focus only on one of them, namely, narration. The organization of a narrative text is always temporal: narrative texts report on a sequence of temporally ordered eventualities. Some studies on temporal relations in narrative discourse include Kamp & Rohrer (1983) and de Swart & Molendijk (1999) for French, Hatav (1997) for Biblical Hebrew.

The overview of Reichenbach (1947) in the preceding section shows that originally the notion of R was needed for two purposes: to interpret the tense forms and to help to ‘hook up’ parts of complex sentences and create sequences by ordering reference times. Kamp & Rohrer (1983) suggest that the rules for determining the temporal interpretation of a sequence of sentences should, in principle, be similar to the rules that deal with the interpretation of tense forms in complex sentences. In many cases R-time in Reichenbach’s system is specified by contextual information, which points to the discourse-oriented character of this notion. Kamp & Rohrer use the past perfect as an illustration of how R actually works for discourse. The representation given by Reichenbach to the past perfect form in English is repeated in (11):

(11) Mary had left when I talked to John.
    E R S
The italicized part of the sentence, i.e., the temporal subordinate clause, specifies the Reference time to justify the use of the past perfect in the first clause. Kamp & Rohrer (1983) note, that when the complex sentence ‘breaks up’ into two simple sentences, the interpretation remains the same:

(12) I talked to John. Mary had left.

Thus, there is no relevant difference between (11) and (12). In both cases the sentence I talked to John provides a Reference point for the other sentence, which locates the eventuality of my talking to John before that R. The order of the sentences does not appear to be important. The sentence with the past perfect always needs a specified R-time to be interpreted. This is what has been called the ‘parasitic’ nature of the perfect (Hatav 1997).

Partee (1973) introduced the notion of ‘temporal anaphor’. Although she does not explicitly use the notion of R time, the ‘anaphoric relations’ that she considers are very closely related to the relations between sentences or a sentence and the preceding discourse that are explicitly accounted for in terms of Reference time in the current literature. She notices that in order to give the right truth conditions for the past tense sentences, they should be evaluated with respect to some contextually given temporal interval, not the whole period of time before the speech time. Consider, for instance, her famous example ‘I didn’t turn off the stove’. When such a sentence is uttered by a person who is driving on the highway, it does not have to be the case that the speaker never ever turned off the stove. The interpretation that we get is, rather, that turning off the stove did not take place in some contextually relevant temporal interval before the S-time, when the speaker was leaving home. This interval is an unspecified Reference time. Hinrichs (1986) discusses more cases of ‘anaphoric’ relations in temporal domains and provides an analysis in terms of Reference time. One of the cases that Hinrichs considers is the ‘temporal anaphora’ between simple past tense sentences, which results in a sequence or overlap interpretation.

The notion of Reference time in relation to the temporal interpretation of a succession of sentences, or, more specifically, in the narrative discourse, emerges in Partee (1984), Hinrichs (1986) and Reinhart (1984) among others. The analyses developed in these papers explain the temporal sequence in terms of Reference time movement: each sentence in the narrative sequence describes an eventuality that is located in a corresponding Reference time. Simultaneously, a new R-time is introduced into the discourse structure, which, in turn, includes the eventuality described by the following sentence and so forth.

Another fact that has been noticed and extensively discussed is that the aspectual type of the predicate of a sentence, i.e., its telicity properties, influences

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1 The idea pursued in Partee (1973, 1984) is that the behavior of the temporal anaphor is identical to the behavior of pronouns. This analogy is supported by a solid body of facts, but there are, nevertheless, some important differences between temporal and pronominal anaphora. The details of this analysis do not appear to be crucially important for the present work; the interested reader is, therefore, referred to Partee’s original papers for discussion.
the temporal interpretation of this sentence in a narrative discourse. We understand the succession of sentences in (13) as reporting on a temporally ordered sequence of eventualities. On the other hand, (14) is interpreted as a temporal overlap between the reported eventualities (i.e., they do not follow each other, but rather occur roughly at the same time):

(13) The man arranged the stiff table linen, filled the two tumblers from a huge cut-glass pitcher, and set them in their proper places.
(14) Jaime was building another boat. He sang happily as he worked, the muscles of his brown arms rippled in the sun, and crispy wood shavings made a carpet between his bare feet and the sand.

The difference between (13) and (14) (the examples are from Hinrichs 1986:67-69) is explained by the distinction between events (=eventive sentences) and states (=stative sentences). The former type contains a telic predicate, while the predicate in the stative sentences is atelic. It is a succession of eventive sentences, as in (13), that creates the effect of a sequence, or 'time movement' in narrative discourse, whereas stative sentences, as in (14), usually bring about a temporal overlap interpretation. The notions of state and event are taken to be primitive ontological notions in some work (e.g., Kamp & Reyle (1993), henceforth K&R). I will not follow K&R in this assumption, so for the time being, the reader should interpret both terms as referring to different types of sentences, not ontological categories.

The observations concerning the interpretation of (13) and (14) have led a number of researchers to stipulate different representations for stative and eventive sentences to account for their different behavior in discourse. Since temporal relations in narrative texts are usually analyzed in terms of Reference time, different types of sentences are assumed to relate to the current R-time in different ways. This is the line of reasoning taken in Partee (1984), Hinrichs (1986) and K&R (1993).

Let me now introduce the basic mechanism of R-time movement. In the presentation here, I will mostly rely on Partee (1984), who, in turn, provides a synopsis of a number of proposals, in particular, Hinrichs (1981), Kamp (1979, 1981) and Bach (1981).

Suppose that all tenseless sentences can be classified into states and events, depending on the type of a predicate they introduce (or the type of the situation they describe). The crucial idea can be formulated as follows: an event $e$ is said to be contained in a current reference time interval, whereas the relation is reversed in the case of states $s$: they contain the current reference time, as depicted in ((15)a,b):

(15) Events are contained in their R, states contain it:
   a. $e \subseteq R$ for events
   b. $R \subseteq s$ for states
In the subsequent presentation I am going to use notations \([r, e]\) for (15)a and \([s, R]\) for (15)b. The inclusion relation in the notations is represented by using square brackets. Symbols \(s\) and \(e\) stand for ‘state’ and ‘event’ in these notations.

Depending on the framework, the R-time has either to be viewed as a semantically empty (i.e. contentless) event or as an interval, which can be accommodated into event structure using, for instance, the ‘translation’ mechanism, as proposed in Kamp (1979). The first sentence in a past narrative discourse cannot be interpreted without some default past reference time (Partee 1973), so there is always an initial R-time present in the discourse representation. As an illustration of how this approach works in general, consider now (16). A simple narrative discourse is given in (16)a, with the suggested DRS in (16)b (Partee 1984:254-255):

(16)  

a. Jameson entered the room \((e_1)\), shut the door carefully \((e_2)\), and switched off the light \((e_3)\). It was pitch dark around him \((s_1)\), because the Venetian blinds were closed \((s_2)\).

b. DR (discourse representation):

\[
\begin{array}{c}
  r_0 \ e_1 \ r_1 \ e_2 \ r_2 \ e_3 \ s_1 \ s_2 \ r_3 \\
  e_1 \subseteq r_0 \\
  e_1 < r_1 < r_s \\
  e_2 \subseteq r_1 \\
  e_2 < r_2 < r_s \\
  e_3 \subseteq r_2 \\
  e_3 < r_3 < r_s \\
  r_3 \subseteq s_1 \\
  r_3 \subseteq s_2 \\
\end{array}
\]

\[
\begin{array}{c}
  e_1: \text{Jameson enter the room} \\
  e_2: \ldots \\
\end{array}
\]

In (16)b, \(r\) stands for Reference time, \(r_s\) for Speech time. In the first row of (16)b, a number of discourse referents is listed. They can (i) be assumed to always be a part of discourse representation, like \(r_0\), a default R-time, and \(r_s\), Speech reference time; (ii) be introduced by actual sentences or clauses \((e_1, e_2, e_3, s_1, s_2)\); or (iii) be introduced during the construction of a representation \((r_1, r_2, r_3)\). This representation is not very precise, but it serves the present purpose, which is to illustrate a basic mechanism of R-time movement. As can be seen, when an event reference is introduced, it is always contained in a current R-time and triggers the introduction of a subsequent R-time. Thus, \(e_1\) is launched by the default R-time \(r_0\), then a new R-time, \(r_1\) is generated and the relative order between \(e_1, r_1\) and \(r_s\) is established. The next event, \(e_2\), is included in \(r_1\) and the procedure repeats once again. At the point when \(e_2\) is introduced into discourse, it is already known that \(e_1\) precedes \(e_2\) due to

\(^2\) As far as I can see, Speech reference time and Speech time are essentially the same notions.
the relative order of \( e_1 \) and \( r_s \), which includes \( e_2 \). Both \( e_1 \) and \( e_2 \) precede \( r_s \), i.e. it is a sequence of events that happened in the past. When the system encounters the first state, \( s_1 \), the R-time movement rule says that a current R-time should be included in this state and no new R-time should be introduced. This is why in the above representation \( s_1 \) and \( s_2 \) both include \( r_3 \), which was a current R-time when the first state appeared.

If the relations in (15) are assumed to hold, as in (16)b, then in the default case, a chain of events is interpreted sequentially: each event is contained in its reference time, the reference times are ordered. The default interpretation, however, can be overruled under certain conditions, so that in principle, events can be interpreted as occurring simultaneously, e.g., *He read a letter and ate an apple (at the same time).* It means that only eventive sentences can give rise to a sequential interpretation. This part of the generalization indeed holds. As for the stative sentences, there are tricky cases, namely, sentences with delimited predicates (see section IV.2.2.). However, the generalization in (15) really captures a lot of data, (16) being just one representative example of the application of rule (15). On the other hand, (15) is stipulative: it is derived from the description of the relevant facts, but not independently motivated. There are further problems with (15), which deserve special attention. They will be discussed in the next subsection.

### IV.2.1. Tense issues

The first question that I want to consider with respect to (15) is whether or not it allows for a uniform representation of tenses. (15) is a central assumption in Partee (1984) and Hinrichs (1986), and their primary concern is to analyze the discourse relations. Recall, however, that the R-time is the notion that was originally introduced for the representation of the tense system. On the assumption that we are still working with the same ‘Reichenbachian’ notion, the stipulation about states and events relating to the R-time in different ways seems to work for discourse effects, but would it work for the tense system? The question appears to be especially important when it comes to the representation of the present perfect.

First consider an ‘easy’ case, namely, the English simple past. Reichenbach’s representation of it is repeated below:

\[
(17) \quad E, R_S
\]

Note that ‘E’ in this case is a primitive and it refers to an eventuality, which is a common term for both states and events. The representation is uniform, i.e., the type

\*3 It is also well-known that a neat sequence is not always established if the subjects of the sentences that constitute a narration are different:

(i) John entered the room and switched on the lights. Mary closed the Venetian blinds.

\*4 From now on I will refer to these two papers as Partee/Hinrichs analysis, keeping in mind that the unifying relevant feature for both approaches is the stipulation of different relations between the R-time and states vs. events.
of the predicate of a given sentence is not taken into account here. Moreover, in
Reichenbach’s representation, E, R and S are treated like points and now have to be
translated into a representation based on intervals. The notion of temporal interval
will not be properly introduced until section IV.3.1, so the reader has to take it for
granted at this point, on the basis of a quite standard intuition about intervals. For
events, the ‘translation’ of Reichenbach’s representation in (17) into the framework
of interval semantics is given in (18), where E, R and S all denote temporal
intervals:

\[(18) \quad E \subseteq R \land R < S\]

The analysis along the lines of Partee/Hinrichs is based on the assumption that
stative and eventive sentences behave differently with respect to the current
Reference time: states include R, but events are included in R. They do not discuss
the tense issues, but if one wishes to unify the uses of R-time, one can consider some
logical options. It appears that the system advocated in Partee/Hinrichs leads to
different representations for one and the same tense, depending on whether a
sentence in question is stative or eventive. For instance, the representations for
the simple past tense in English should look like this:

\[(19) \quad \begin{array}{ll}
a. & e \subseteq R \land R < S \quad \text{for events} \\
& b. & R \subseteq s \land R < S \quad \text{for states} \\
\end{array}\]

Similarly, for present (20) and future (21), two sets of representations should be
given: one for events in each tense, the other one for states:

\[(20) \quad \begin{array}{ll}
\text{Reichenbach:} & E, R, S \\
\text{Partee/Hinrichs:} & a. e \subseteq R \land S \subseteq R \quad \text{for events} \\
& b. & R \subseteq s \land S \subseteq R \quad \text{for states} \\
\end{array}\]

\[(21) \quad \begin{array}{ll}
\text{Reichenbach:} & S \cup E \quad \text{R} \\
\text{Partee/Hinrichs} & a. e \subseteq R \land S \prec R \quad \text{for events} \\
& b. & R \subseteq s \land S \prec R \quad \text{for states} \\
\end{array}\]

The necessity to give two different representations for different types of sentences,
although a disadvantage in comparison to any system with a uniform representation
for the same tense, is not a fatal problem for the approach yet. Besides, in the
representations given above it is obvious that the relation between S and R is the
proper ‘tense’ relation, in accordance with Reichenbach (1947). Moreover, (19)
predicts that the described eventuality does not hold at S in the case of events, which
is also a desirable result. In order to discover a real problem, let us now look at the
representation for the present perfect tense.

Note that in Reichenbach’s system, future is associated with three different configurations, as illustrated
in (7). Here, for simplicity’s sake, I choose the representation in which R and E are simultaneous. It also
provides better comparison with the representation for past tense.
The essence of Reichenbach’s representation for the present perfect, repeated in (22)a, is that Reference time coincides with Speech time. As Reinhart (1986) argued, a translation of Reichenbach’s representation into the framework of interval semantics, combined with the DRT insight that the basic relation between E-time and R-time is a subset relation (at least for events), should derive the representation for present perfect as in (22)b. This representation states that both E and S intervals are contained in the R-time, but E still precedes S.

\[(22)\]
\[
\begin{align*}
\text{a. Reichenbach} & \quad E \subseteq R, S \\
\text{b. Reinhart} & \quad E \subseteq R \land S \subseteq R \land E < S
\end{align*}
\]

Since the early DRT did not offer an analysis for tenses within their framework, it may be assumed that it would be done along the same lines as in (22)b. Given the generalization in (15), a distinct representation for states in present perfect is needed, similarly to other tenses:

\[(23)\]
\[
\begin{align*}
\text{Reichenbach} & \quad E \subseteq R, S \\
\text{Partee/Hinrichs} & \quad \begin{align*}
\text{a. } e & \subseteq R \land S \subseteq R \land e < S \quad \text{for events} \\
\text{b. } R & \subseteq s \land S \subseteq R \land s < S \quad \text{for states}
\end{align*}
\]

However, as Reinhart (2000) pointed out, the representation for states in (23)b is contradictory, since all the requirements in the first, second and last conjuncts cannot be fulfilled simultaneously. The last conjunct in (22)b, i.e. E<S, is required to render the interpretation of the present perfect tense, which asserts that the described eventuality occurred prior to the S-time. When this applies to events in DRT framework, as in (23)a, the result is straightforward. In a representation for states, present perfect should also capture the fact that s(tate) precedes S-time, hence this condition (s<S) must be maintained in (23)b. However, if s must both contain its R-time and precede S-time, S cannot be contained in R at the same time.

Now let me turn to the representation of tenses in Kamp & Reyle (1993), especially because they assume, exactly like Partee and Hinrichs, that states and events bear different relations to the R-time. Their system does not derive contradictory or inconsistent representations for the present perfect tense. Nevertheless, as I hope to show, K&R face problems of a different character.

### IV.2.2 Kamp & Reyle’s (1993) representation of tenses

K&R give a representation for each sentence in the form of DRS, Discourse Representation Structure, a simplified version of which was given in (14b), which includes all temporal information, as well as the relevant aspectual information. Two types of relations have been determined for sentences in their DRSs that are important for our present purposes. The first one is the precedence relation (with an
option of equality) which is established for \( t \) (temporal location) with respect to \( n \) (now, or utterance time). The second one is an inclusion relation which is established between a temporal location \( t \) and the aspectual type of a predicate, similarly to the Partee/Hinrichs analysis.

K&R postulate two primitive aspectual notions: states and events (\( s \) and \( e \)). It is specified for each sentence what kind of primitive it introduces. Thus, the sentence *Mary wrote a book* introduces an event \( e: Mary write a book \), but *Mary lived in Amsterdam* introduces a state \( s: Mary live in Amsterdam \). The distinction intuitively corresponds to the telic/atelic type of predicates, but is formulated in completely different terms.

The different relations between states and events and their respective temporal location times \( t \) are also represented in a given DRS. The DRSs for events always contain ‘\( e \subseteq t \)’, which reads ‘\( e \) is included in \( t \)’. The DRSs for states feature ‘\( t o s \)’, which means that \( t \) and \( s \) overlap. Intuitively, the temporal location \( t \) in this model comes close to the notion of Reference time, \( n \) obviously correlates with the Speech time. Note, however, that K&R need more than one theoretical tool to capture all the functions of Reference time. As they put it, Reichenbach ‘wanted his notion of reference point to do too many things at once’ (K&R, 1993:594). Therefore, they break up the notion of Reference time into the Reference point (Rpt), which accounts for narrative progression in their analysis and the temporal perspective point (TPpt), which is needed for the analysis of past perfect. In combination with their notion of temporal location \( t \), which seems to correspond directly to Reichenbach’s R-time in the analysis of tenses, K&R’s system needs three notions to replace Reference time. In principle, a model that operates with fewer theoretical tools and can capture the same collection of facts should be preferred on general conceptual grounds.

Let me concentrate on the representation of the ‘tricky’ tense, namely, present perfect in English. Generally, in K&R’s model perfect is an aspectual operator that takes eventualities of any type as input and always yields a state as output. The resulting state is an ‘outcome’ of some event that happened in the past, i.e. before ‘now’. For a sentence like ‘Mary has met the president’ it means that the event of Mary meeting the president happened in the past and immediately after that the state of Mary having met the president began. Below I provide DRSs for 3 sentences in the present perfect, taken from K&R, chapter 5, section 5.3.4.

---

6 This is also how perfect is treated in de Swart’s (1998) analysis, discussed in section III.2.
This is the first representation. What the DRS for this sentence says is the following: there is an event $e$ of Mary meeting the president and it abuts the state which results from this event (i.e. the state of Mary having met the president), this state $s$ overlaps with the temporal location time $t$, which, in turn, coincides with $n$ ‘now’. The presence of an event, which occurs before the state introduced by the present perfect is crucial in K&R’s treatment of this tense. This will always work fine if the event is introduced in a DRS because of the aspectual properties of a sentence. If a sentence, however, introduces a state variable, then the event that ‘abuts’ this state has to be somehow stipulated. It brings us to the next two DRSs, which both represent stative sentences.

First of all, I should mention that K&R distinguish between stative sentences with and without temporal modification. As they claim, these two types of sentences have different interpretations. For (25), the sentence without temporal modification, K&R’s interpretation is that the state described by the perfect tense, i.e. the state $s$ of Mary having lived in Amsterdam, is the result of the termination of the state $s'$ of Mary living in Amsterdam, so that $s'$ precedes $s$.

The DRS for this sentence says that there was an event $e$ consisting of terminating the state $s'$ of Mary living in Amsterdam. By postulating a special event of termination in the representation of stative present perfect sentences K&R achieve a

---

1 The ‘abut’ relation in the DRT renders the ‘immediately before’ meaning and is written as ‘$\sqsupset$’.
certain uniformity in the representation of present perfect: in both (24) and (25) there is an event that abuts the state described by a perfect tense, which holds at the utterance time. Their prediction is, however, that the sentence ‘Mary has lived in Amsterdam’ without any temporal modification entails that Mary does not live in Amsterdam any longer. This seems to be the correct prediction in some cases, although the verb ‘be’ in the present perfect does not appear to confirm it. Consider, for instance, (26):

(26) (the conversation takes place in Paris, where Mary is originally from)
    I know Mary has been in Amsterdam. I don’t think she’s back yet though,
    she only comes home for Christmas.

The interpretation of this sentence allows for the state $s$ of Mary being in Amsterdam to hold at the moment of speech, which means that there should be no event of termination of the state of Mary being in Amsterdam in the DRS of this sentence.

In fact, it seems that with stative verbs like hate or love in the present perfect tense the implication that the described state of affairs does not hold any longer is a cancellable inference. Consider the following examples:

    b. I’ve hated John with all my heart. Actually, I still hate him.

The contrast with eventive sentences is really sharp:

(28) a. *I have eaten breakfast. In fact, I’m still eating breakfast.
    b. *I have written this memo. Actually, I’m still writing it.

Thus, K&R’s requirement that in the present perfect sentences the state $s$ described by a stative predicate always terminates is too strong.

Now let me turn to the second group of stative sentences, namely, the ones with temporal modification. All sentences in the present perfect modified by delimiting adverbials like for an hour allow for the interpretation where the termination of the state described is not required. To account for this fact, K&R claim that it is the temporal modifier that gives rise to the ambiguity in the meaning of the sentence. The reading that is achieved depends on which part of the sentence is being modified, or, more precisely, on the place of the attachment of a temporal modifier. I illustrate this point on the example in (29):
One possibility is that the temporal adverbial for three hours modifies the state of Mary’s living in Amsterdam, $s'$ in the DRS (29)a and attaches to the VP at the same level as the PP ‘in Amsterdam’. In other words, the temporal adverbial here limits the duration of $s'$: *Mary lived in Amsterdam*. Semantically, *for three years* introduces a discourse referent $mt$ (=amount of time), which measures the duration (cf. $\text{dur}$-function in the corresponding DRS) of a given eventuality.

However, this representation yields a wrong empirical result. What is predicted is that Mary no longer lives in Amsterdam, but consider (30):

(30) Mary has lived in Amsterdam for three years and now she’s got a PhD position at the University. So now she’s staying in Amsterdam for 4 more years.

In order to avoid this problem, K&R claim that there is always the second reading available for stative sentences with temporal modifiers, which is represented in DRS (29)b. The temporal modifier this time attaches to a ‘bigger’ piece of structure,
somewhere at the level of the PERF operator. As K&R say, it is difficult to determine if the modifier in this case measures the duration of the state $s$:'Mary lived in Amsterdam', just like in (29)a. They, however, assume it does, because there seem to be no other examples where the for-adverbial would measure the duration of the resulting state described by the perfect. In general, the DRS in (29)b says that “the perfect describes the result state $s$ as starting at the beginning of the underlying state $s'$ and as lasting for as long as three years, with the proviso that $s'$ has not yet come to an end” (K&R, 1993:586-7).

To sum up, the system that K&R suggest, works according to the following algorithm. The first step is to establish whether a given sentence in present perfect introduce an event or a state discourse referent ($e$ or $s$). In the former case, no more information is needed: the already introduced event primitive abuts the state that is described by a perfect tense (i.e. *have V-ed*) and this state holds at the utterance time. This case is illustrated in (19). If a sentence introduces a state, there is one more condition to be considered, namely, the absence/presence of a temporal modifier. If there is no modifier, like in (25), an additional event referent $e$ is postulated. This event is associated with the termination of a state described by a tenseless predicate and abuts the resulting state, described by the perfect tense. If there is a temporal modifier, then further interpretational ambiguity arises. In any case, an additional event referent has to be introduced for stative sentences. If a state described by a perfect tense (*have V-ed*) does not hold at the utterance time, the procedure is the same as for sentences without temporal modification: the event is associated with the termination of the state described by a tenseless predicate, as in (29)a. If, however, a resulting state does hold at the utterance time, i.e., there is no termination of a state described by a predicate, then the additional event referent is associated with the beginning of the state. This was shown in (29)b.

Obviously, the different treatments of several types of sentences with the same tense form considerably complicate the analysis. My concern is that although K&R’s theory is designed in a way that allows for capturing a lot of data, it gets more and more complex and quite unwieldy by the time all the relevant cases are accounted for.

One immediate question concerning their treatment of the perfect tense is the following: why is it the case that the possibility to associate an additionally introduced event referent with either the beginning or the end of a relevant state directly depends on the presence of a temporal modifier? This connection, as far as I can see, is completely arbitrary and there is no principled independent reason why it should exist. There is no theory-internal motivation either: nothing in K&R’s model can predict such a close tie between these two entities. If we go back to the example in (25) and try to re-write the relevant piece of DRS such that the event $e$ equals the beginning of state $s'$, i.e. $e=beg(s')$, the interpretation arises that K&R explicitly rule out: the sentence *Mary has lived in Amsterdam* would mean that Mary still lives in Amsterdam. This arbitrariness is, definitely, a serious flaw of K&R’s system.

Moreover, the interpretational differences between present perfect sentences in English with and without temporal modifiers are not so strong and sharp. I have
provided some examples in (26) and (27) to illustrate that the so-called ‘ambiguity’ in the interpretation of stative present perfect sentences (the described state finished vs. not finished) is not really determined by the presence of a temporal modifier. These examples allow for an interpretation where a state described by a predicate holds at the utterance time. In other words, the state of Mary being in Amsterdam (as in (26)), and me loving or hating John (as in (27)) does not have to terminate. These facts point to the conclusion that one uniform representation of the present perfect tense is enough, providing that there is an additional independent distinction between telic and atelic predicates, which we need anyway, as was demonstrated in chapter I. These two classes of predicates trigger different entailments with respect to the present moment, ‘now’. If this is the case, then K&R’s system turns out to be extremely complicated for no apparent reason.

My other objection concerns the status of the additionally introduced discourse referent itself, an event in the case of present perfect stative sentences. The system forces us to introduce a random, arbitrary event that abuts (i.e. occurs before) a state of John living in Amsterdam in the case of a sentence like ‘John has lived in Amsterdam for his whole life’. It is absolutely irrelevant for the interpretation of a sentence to establish when John started living in Amsterdam. This information cannot be explicitly given in the sentence and this type of knowledge is not needed in the linguistic representation of a quite simple English sentence ‘John has lived in Amsterdam for his whole life’.

Finally, I would like to compare the representations of present perfect and simple present tenses in K&R’s system. If we try to single out the common part in DRSs (24), (25) and ((29)a,b) given above, which should be exactly the general representation of the present perfect tense in English, the result that we get is (31):

\[
\begin{array}{c}
\text{n} & \text{t} & \text{s} & \ldots \ldots \\
\text{t} = \text{n} \\
\text{s} & \text{o} & \text{t} \\
& & & \ldots \ldots \\
\end{array}
\]

Note, that the first relation, the one between \( t \) and \( n \), determines temporal morphology. If, for instance, in a given DRS \( t \) and \( n \) coincide, then present tense morphology should surface on a finite verb form. This is my interpretation of K&R’s model, they themselves are not particularly specific about the issues of tense morphology. My conclusion is based on the fact that in the tenses like simple present and present perfect \( t \) and \( n \) always coincide, therefore present tense morphology shows up on a main or auxiliary verb respectively, whereas in the representation of the sentences with the past tense \( t \) always precedes \( n \).
Now let us have a look at the representation that K&R give for the simple present. They claim that all simple present sentences are of the stative type and give them the following interpretation:

(32) DRS for ‘Mary knows French’ (K&R, 1993:538-9)

\[
\begin{array}{cccc}
\text{n} & \text{s} & \text{x} & \text{y} \\
\text{n} \subseteq \text{s} & \\
\text{Mary (x)} & \\
\text{French (y)} & \\
\text{s}: [x \text{ know } y]
\end{array}
\]

This is a shortened representation. In particular, the \( n \subseteq s \) part should be written properly as \( n = t & t \circ s \). But K&R assume that both \( s \) and \( n \) are punctual. If \( s \) and \( n \) are not treated like punctual, \( n = t & t \circ s \), when shortened, gives only \( n \circ s \), which is weaker than \( n \subseteq s \). On K&R’s assumption, however, \( n = t & t \circ s \) can, indeed, be shortened to \( n \subseteq s \), which is exactly the common part for all the present perfect sentences. Thus, the burden of differentiating between the simple present and the present perfect lies on the ‘abut’ relation and, again, depends on our abilities to be able to identify an event that abuts the state described by the perfect tense. Differentiating between two tenses really looks like too much of a job for a discourse referent that is just assumed to be present.

To summarize the content of this section, I started the discussion of the tense system here assuming, along the lines of Partee (1984) and Hinrichs (1986), different relations that stative and eventive sentences bear with respect to their R-times. I have shown that a straightforward application of this assumption to the system of tenses in English leads to a controversial definition of present perfect. K&R’s system, also based on this assumption, has to create quite different complex representations for what appears to be the same tense, present perfect, in order to avoid inconsistencies. Later in this chapter, I will present a model that is empirically as strong as K&R’s and has a conceptual advantage of regular predictability and, therefore, should and will be preferred to K&R’s theory. Before that, one more issue need to be examined carefully, since it is directly related to the Reference time: the behavior of stative sentences in discourse.

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10 For the discussion of present tense see K&R (1993:534-541).
IV.2.3. States in a sequence

The assumption that is still under discussion is that stative and eventive sentences behave differently with respect to the current Reference time: states include R, but events are included in R, as in Partee/Hinrichs analysis presented in the previous section. Now I would like to discuss one empirical problem with this generalization.

This system of relating different types of sentences to the current R-time is designed to account for the fact that eventive, but not stative sentences can create a sequence interpretation in narrative discourse. Although the generalization about the eventive sentences is correct, stative sentences can also give rise to a sequential interpretation under certain conditions. Consider (33):

(33) John came home early and cooked dinner. He worked for a couple of hours. At 10 p.m. he saw his friends in a pub.

In this example, a state of working is ordered with respect to a previous event (i.e. cooking) and the following event (i.e., meeting friends).

The fact that stative sentences can be interpreted sequentially has been recognized in the literature. It is, however, problematic for the Partee/Hinrichs’ type of analysis for the following reason. If a state always includes the current R-time and does not introduce a new one, no Reference time movement effect is predicted in the case of stative sentences, hence, their appearance on the time line in a sequence is not predicted and remains unexplained. Hinrichs (1986) and Dowty (1986) develop the analyses of the R-time movement that could account for the sequential interpretation of stative sentences. Let me repeat an example that both Partee (1984) and Hinrichs (1986:68) use, to illustrate the problem further:

(34) Jameson entered the room, shut the door carefully and switched off the light. It was pitch dark around him because the Venetian blinds were closed.

The last two clauses are both stative, since they both contain an atelic predicate. The problem is, however, that the first stative clause, it was pitch dark around him, is understood as if it appeared on a time-line, i.e. the state of it being pitch-dark follows the event of switching off the light.

Hinrichs (1986) proposes an account of R-time movement that does not seem to face this particular problem. Suppose there is a default R₀ which is the R the first clause of a given discourse establishes the relation to. In our particular example, the first clause describes an event, i.e. Jameson entered the room, which is contained, according to both Hinrichs and Partee, in the R₀ and introduces the new R, namely R₁. The second clause, i.e. shut the door carefully is an event, too. Let us label it e₂.

---

11 In Chapter III I have argued against the analysis that treats sentences with temporal modifiers as eventive.
It is included in the $R_1$ interval and also introduces $R_2$. The procedure repeats one more time, with *switched off the light* and we end up with the newly introduced $R_3$. The next sentence is, however, a state ($s_1$), so it is supposed to contain $R_3$ and not be contained in it. Since states do not introduce new Reference time, the next state, *the Venetian blinds were closed* also contains $R_3$. The DRS for this example was given in (16)b. Schematically, it looks like (35):

\[(35) \quad [R_0 \ e_1] \ [R_1 \ e_2] \ [R_2 \ e_3] \ [s_{1,2} \ [R_3]]\]

This specific execution of Hinrichs’ analysis successfully captures the interpretation of (28) because the relation between $s_1$ and $e_3$ remains unspecified. The first introduced state $s_1$ is not required to overlap with the event $e_3$, it only has to include a current R-time, but it can either follow a previous event, like in (34), or overlap with it, like in (36):

\[(36) \quad \begin{align*}
\text{a. John came home at 6. He was very hungry} \\
\text{b. } [R_0 \ e_1] \ [s_1 \ [R_1]]
\end{align*}\]

This ambiguity of interpretation, depending on the particular context, is ensured by the specific formulation of the Reference time movement rule, adopted in Partee/Hinrichs. According to this rule, a current event $e_n$ is not included in its ‘own’ Reference time $R_n$, but in the one previously introduced, i.e., $R_{n-1}$.

Hatav (1997) notices that Hinrichs’ analysis makes the following prediction. If (34) above is continued as in (37)a, so that the sentence that follows the last stative one is eventive, then, according to Hinrichs’ analysis it is not only allowed to, but also required to overlap the last introduced state, since the event is included in the Reference time, which the state includes, as in (37)b:

\[(37) \quad \begin{align*}
\text{a. Jameson entered the room, shut the door carefully and switched off the light. It was pitch dark around him because the Venetian blinds were closed… Jameson took off his clothes and went to bed.} \\
\text{b. } [R_0 \ e_1] \ [R_1 \ e_2] \ [R_2 \ e_3] \ [s_{1,2} \ [R_3 \ e_4]]
\end{align*}\]

In this particular case the prediction is borne out, because the state of being pitch dark, as well as the state of Venetian blinds being closed, still holds at the time when the subsequent events (i.e. taking off the clothes and going to bed) occur. But Hatav (1997) provides some examples, which clearly refute Hinrichs’ prediction. For instance:

\[(38) \quad \begin{align*}
\text{a. John reached the summit, stayed there for a while and went down.} \\
\text{b. It was a lovely performance. The entertainer told jokes for fifteen minutes, sang for half an hour and danced for another half an hour.}
\end{align*}\]
In (38)a, we have a sequence created by event-state-event, where the last event, described by *went down*, must follow the previous state. In (38)b a sequence is created by stative sentences only and they are all sequentially ordered. In general, the examples in (38) show that Hinrichs’ wrongly predicts a uniform interpretation of an event that is introduced after a state: on his analysis there has to be an overlap between the two, whereas the interpretation of (38)a shows that the sequence interpretation is possible.

Dowty (1986) suggests a different way to solve the problem with stative sentences that appear in a sequence. His proposal is that all eventualities, irrespective of their aspectual properties, introduce and are included in their own Reference time. In other words, Dowty rejects the assumption of Partee/Hinrichs that states and events bear different relations to a current R-time in discourse. On his view, stative sentences are treated exactly like eventive ones at the discourse level: both states and events are included in their R-times. Thus, the aspectual differences between the predicates of different sentences are not directly reflected in Dowty’s version of discourse representation. Therefore, whenever a stative sentence appears on the time line, Dowty’s account does not face a problem. For instance, the example in (38)a is represented on Dowty’s analysis as follows:

\[
[r_1 e_1] [r_2 s_2] [r_3 e_3]
\]

Note in passing one more difference between Partee/Hinrichs’ and Dowty’s analyses. Dowty does not assume that there is always a default R-time available. The first sentence in a discourse introduces the first R-time.

I consider it an important advantage of Dowty’s theory that it does not have to stipulate different relations of states and events to an R-time. This feature will be preserved in the unified theory of R-time, which will be presented in section IV.3. In Dowty’s approach, the problem of giving a uniform representation of tenses discussed in the preceding section, in principle does not arise. Cases like (34), (38) above and also (40), which exemplifies the inchoative interpretation of a stative sentence, just fall out for free in his analysis (Dowty, 1986:38):

\[
\begin{align*}
(39) & \quad [r_1 e_1] [r_2 s_2] [r_3 e_3] \\
(40) & \quad \text{a. John entered the president’s office. The president realized why he had come.} \\
& \quad \text{b. John sat in his chair going over the day’s perplexing events again in his mind. Suddenly, he was asleep.}
\end{align*}
\]

Cases where states obviously overlap with previous events and, therefore, have to overlap with the previous R-time as well, are accounted for in terms of pragmatic implicature (ibid.:49):

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12 Note, however, that an analysis along the lines of Kamp & Reyle (1993) and de Swart (1998) could attempt to account for (38)b by saying that the sequence interpretation in this example is created by events. See chapter III for the reasons why this approach is not adopted in the present work.
Dowty’s principle of temporal discourse interpretation predicts that ‘the time of the budget’s being on the president’s desk was immediately after Mary entered the room, but that we are expected to assume in addition that this was not the first moment that it was there’ (ibid.:49). In other words, even though we can infer that the copy of the budget was sitting on the president’s desk for a long time before Mary came, what matters in this particular context (and for Mary) is that the copy was there after Mary entered the room. Some adverbs, like, e.g., suddenly in (40)b cancel the inference that a state has begun to hold earlier than it is reported.

Unfortunately, Dowty’s assumption that both stative and eventive sentences introduce their own R-times strikes back. As Reinhart (1999) points out, Dowty’s analysis actually predicts that the states always create the Reference time movement effect, just like events. Recall, that the difference in the temporal interpretation of a succession of stative vs. eventive sentences was exactly the reason why Partee and Hinrichs assumed that different relations hold between a current R-time and states vs. events. What creates the R-time movement in Dowty’s model is the introduction of a current R-time, so both states and events are predicted to behave the same way. But they do not and this can be tested. On the assumption that the word ‘now’ specifies the current R-time accommodating a given eventuality, it would be equally felicitous with both stative and eventive sentences: in either case it would introduce an R-time for an eventuality to be located. But (42) shows that this is not the case:

(42) a. (Now) John enters the room.  
b. (Now) he picks up the newspaper.  
c. (*Now) The main headline is scandalous.

The difference in acceptability of ((42)a,b) vs. (42)c suggests that the reasonable assumption to make is that events, but not states, introduce an R-time. This would explain why now is only felicitous with eventive sentences. Hatav (1997) draws a similar conclusion. She derives the following generalization, concerning R-time movement and sequence interpretation of sentences in narrative discourse: A new R-time can be introduced, and, therefore, an R-time movement effect can be created either by an event or by a delimited state\(^1\).

The class of delimited states is formed by those sentences that have an atelic predicate, which is modified by a temporal delimiting adverbial (e.g., (38)). These are the cases that have been discussed in chapter III, where I argued that they couldn’t be treated just like events. At the same time this is exactly the group that constitutes an exception to the R-time movement rule proposed in Partee (1984) and Hinrichs (1986). As Hatav (1997) points out, in order to account for this new

\(^1\)Although I briefly mentioned inchoative interpretation that stative sentences sometimes give rise to, I will not discuss it any further in this thesis. This is why I reproduce Hatav’s generalization here abstracting away from the inchoatives.
generalization, the notion of Reference time has to be redefined. In particular, one is forced to give up the idea about the reversed relation of a state vs. event to a current Reference time. In the next subsection I will give a summary of Reinhart’s (1986, 2000) work, where it was done. After introducing the system, I will come back to the discussion of the tense system of English. Then the examples of delimited states will be re-examined and it will be shown how the ‘problematic’ group of cases is treated in this theory.


In this section, I am going to present a theory of Reference time based on Reinhart (1986, 2000). It is a unified theory, in the sense that it unifies the two basic uses of R-time that have been discussed throughout this chapter: the one for the analysis of tense and the other one for the analysis of narrative discourse. When Reinhart’s model has been presented, I will show that her theory is not only able to account for tenses and R-time movement effects, but also derive the progressive entailment. The topic of this section is crucially important for my subsequent discussion, since the theory presented here will be used in chapter V for the analysis of Russian data.

IV.3.1. Assumptions and definitions

There is an ongoing debate in the semantic literature about the primitive status of two entities: events (=eventualities) and times (=instants or intervals). Ever since Davidson (1967), the presence of the event argument in predicate’s specification is often taken for granted in the semantic and syntactic literature, so that representations like (43) are found quite regularly:

\[ \lambda e [ P \ldots (e) ] \]

I am not going to re-examine all the arguments in favor or against event semantics, but I would like to point out that the battle between the two frameworks is far from being over. The proponents of interval semantics (Bennett & Partee 1972/78, Dowty 1979, Reinhart 1986, 2000) take time to be a primitive notion, the (neo-)Davidsonian branch of semanticists (Kamp 1979, Bach 1982, Kamp & Reyle 1993, Parsons 1990) argue for the primitive status of events and there are even attempts to define times in terms of events (Kamp 1979, Landman 1991, Pianesi & Varzi 1996). Galton (1984), although he assumes that events are primitive notions, also needs times for the definition of states. Similarly, Krifka (1998) has both times and events as primitives in his semantic model. Verkuyl (1999, 2001) claims that we do not need either of them as primitives, although he uses times and temporal intervals at some level of semantic representation. Rather than having \( e \) as an ontological primitive in (43), he assumes a more abstract index (a natural number),
which in the realization of the tenseless predication in real time is connected with a temporal interval.

To give one example of how interval semantics and event semantics tackle different problems, consider the notion of change.14 There are momentary (explode) and prolonged (put on weight) changes. If change occurs in time, than it takes some time, i.e. there is a temporal interval which corresponds to a process of changing from A to B. The problem is, however, to define precisely what happens between the initial boundary of that interval and its final boundary. If A holds at some initial part of this interval and B at some final part, how can the state of affairs in between be described? Evidently, A ceases and B comes to exist and when it happens, it can be said that the change has taken place. To describe this process, temporal frameworks have to employ the notion of vagueness15 to account for a precise moment of change, when neither A nor B holds. An alternative to this analysis has been proposed, which is to treat change as a minimal event (Kamp 1979). This step means to give a notion of event a primitive status. When events become a part of the ontology of a model, there are two possibilities to deal with time: either time is taken to be another primitive notion or a mechanism of deriving times from events has to be proposed.

It is outside the scope of this work to review all the arguments of the existing frameworks and try to justify one or the other, so I will not do it here. For a discussion and an overview of the problems that either of the approaches faces see Kamp (1979), Dowty (1979), Landman (1991) among others, whereas I will restrict myself to giving my own view. However, as I already said, this thesis is not the best place for arguing frameworks.

I consider time (and space) one of the basic components of our conceptualization of reality. I do not want to claim it is impossible to express times in the event semantic framework, it may very well be that there is, indeed, a way to define times via events. This, however, would be just another formalization or another way to construct the model of the representation of reality. In this thesis, I opt for the framework of interval semantics. Although the main definitions that I give in this section can, in principle, be stated both in terms of intervals and events, I will not use the notion of event as a primitive now or later in the presentation.

From the perspective of temporal semantics, sentences are interpreted with respect to a certain stretch of time, i.e., a temporal interval. The crucial assumption that I am going to make is that a verbal predicate, along with its nominal arguments, also has a temporal argument, which is indicated by the symbol $I$ (which stands for an interval) in predicate’s specification. The specific implementation I assume here for incorporation of temporal interval into Reinhart’s analysis was proposed by Yoad Winter (p.c.):

\[(44)\quad P(x_1, x_2, \ldots x_n, I)\]

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14 This paragraph is inspired by a very nice discussion of this issue in Landman (1991).
15 This notion is also used in the semantics of gradable adjectives, e.g., Barker (2002).
In (44), $x_1, x_2, \ldots x_n$ are variables corresponding to all the nominal arguments of a given predicate and $I$ is a variable that corresponds to its temporal argument. One and the same predicate can hold at different, distinct intervals $I$, just like one and the same predicate can hold for arrays of different nominal arguments $x_1, x_2, \ldots x_n$.

Now I will give the definitions of telic and atelic predicates.

**DEF.1:** For all $P$, $I$, $x_1, x_2, \ldots x_n$, a predicate $P(x_1, x_2, \ldots x_n, I)$ is atelic iff
\[ P(x_1, x_2, \ldots x_n, I) \land \exists I' \subset I (P(x_1, x_2, \ldots x_n, I')) \]
which reads: $P$ is atelic iff for all intervals $I$, such that predicate $P$ holds at $I$, there is an interval $I'$, such that $I'$ is a subinterval of $I$, and $P$ holds at $I'$, given that the denotations of all the nominal arguments remain the same. Some examples of the predicates that are atelic under this definition are *be in Amsterdam, walk in the park, drive a car, work.*

The existential quantification in DEF.1 above clearly deviates from the definition of atelicity given in terms of subinterval property as formulated in Bennett & Partee (1972/78). Let me first repeat their definition (ibid.:14):

"Subinterval verb phrases have the property that if they are the main verb phrase of a sentence which is true at some interval of time $I$, then the sentence is true at every subinterval of $I$…"

This definition requires a predicate $P$ to be true at *every subinterval* of an interval $I$, at which $P$ is true. This condition is too strong, as was pointed out in section I.4.2, where a number of problems for Bennett & Partee’s definition were indicated.

Now let me reassess these problems. The first one has to do with the observation that we want to allow for gaps in a certain activities. For instance, if it is true that ‘Mary walked in the park for two hours’, than it is required that at every subinterval within these two hours the predicate ‘Mary walked in the park’ is true. Suppose, however, Mary had got tired and had sat down on a bench for ten minutes. Then if we pick exactly this interval of ten minutes, which is one of the subintervals of the interval denoted by ‘two hours’, the predicate ‘Mary walked in the park’ comes out false at this 10-minute interval.\(^\text{17}\)

How does DEF.1 handle this problem? Well, the question simply does not arise under DEF.1, due to the existential quantifier over the subintervals. DEF.1 asserts that it is sufficient to find at least one subinterval of the two-hour interval at which a predicate is true. In this case, it is guaranteed that the predicate of ‘Mary walked in the park’ would be atelic. DEF.1, therefore, does allow for gaps.

As was also discussed in Chapter I, there is a finer cut, so to say, within the class of atelic predicates: some of them have the homogeneity property down to

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\(^{16}\) The same stated with the event argument:
\[ P(x_1, x_2, \ldots x_n, e) \land \text{at}(e, I) \rightarrow \exists I' (I' \subset I) \text{ at } (e, I') \]

\(^{17}\) See the discussion of Dowty’s (1979) ‘minimal interval’ in I.4.2. Verkayl (1978) argues that $P$ should hold at the majority of subintervals.
instants (like love John or be in Amsterdam) and some of them are homogeneous
down to ‘minimal intervals’ (walk in the park, drive a car). This difference was not
a real problem for the homogeneity approach before, but it is not even an issue
anymore, given that DEF.1 is stated in terms of existential quantification. Recall that
all instant predicates can also be evaluated at intervals, so DEF.1 works in a uniform
way for all atelic predicates.

Finally, I would like to go back to the problem that concerns temporal
expressions like yesterday or last year. The sentence that was discussed in chapter I
as problematic, under Bennett & Partee’s definition of homogeneity (or subinterval
property) was Mary walked in the park yesterday. If this sentence is true for
yesterday, then, given the atelicity of a predicate, it should be true at every
subinterval of yesterday. Suppose that we break up the interval denoted by
‘yesterday’ into two subintervals, I’=‘before dinner’ and I”=‘after dinner’. Then, if
Mary’s walking took place during I, the predicate is not true at I”. Once again, due
to the existential quantifier in DEF.1, this problem does not arise. If we find one
subinterval of ‘yesterday’, at which the predicate ‘Mary walked in the park’ is true,
then it is also true of ‘yesterday’.

One more comment is in order here. From now on, I will replace the expression
‘a predicate is true at an interval’ from Bennett & Partee’s definition with ‘a
predicate holds at an interval’, thereby reserving the expression ‘is true at’ for
sentences.

A telic predicate is defined as follows:

**DEF.2:** For all P, I, x₁, x₂, …xₙ, a predicate P(x₁, x₂, …xₙ, I) is telic iff
P(x₁, x₂, …xₙ, I) & ∀Ι’ ⊆ I (P(x₁, x₂, …xₙ, Ι’) → Ι’=I)

DEF.2 is equivalent to the statement that for all intervals I such that a predicate P
holds at I, P is telic iff there is no Ι’ such that Ι’ is a proper subinterval of I and P
holds at Ι’. DEF.2 is a reverse of DEF.1 and defines a complement set to the set of
atelic predicates. Thus, the two definitions classify the whole class of predicates into
telic and atelic. Predicates like read a book, walk to the store or meet the president
are telic.

These are all the prerequisites that are needed to introduce a unified theory of
Reference time in the next subsection.

**IV.3.2. Reinhart’s proposal**

The theory of Reference time that will be presented in this section is developed in
Reinhart (1986), (2000). In her work, Reinhart gives a uniform account of R-time, a
theory that does not need either several notions of R-time or different rules for the
tense system. In this model, the familiar Reichenbachian notions of S(peech time),

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18 Again, the same with the event argument:
P(x₁, x₂, …xₙ, e) & at(e, I) → ∀Ι’(Ι’⊂ I) (at(e, Ι’) → Ι’=I)
E(vent time) and R(eference time) are used, but the system of interactions between the three differs from the original Reichenbach’s systems. Reinhart’s theory is cast in the framework of interval semantics, which means that the denotation of E, R or S is always a (set of) temporal interval(s). In what follows, I will demonstrate how the modified system of S-E-R relations can account for the English tense system and how the same notion of R can be used in a theory of R-time movement.

Reinhart’s modified system of S-R-E relations is given in (45) below. In the following subsections, I will go through each relation in (45) and discuss various implications of Reinhart’s analysis.

(45) the E-R relation is fixed, i.e. E \subseteq R by default (except for progressive);
the S-E relation determines the truth conditions and the temporal interpretation of a sentence;
the S-R relation determines perspective and morphological tense.

Note, that Reinhart (1986) develops this system for English, but in the next chapter I will argue that this theory can be implemented to give an analysis of the tense-aspect system of Russian.

IV.3.2.1. E-R

As was pointed out earlier, in the early DRT framework (Kamp 1981a, Hinrichs 1981, Partee 1984), it was assumed that states (i.e. atelic predicates) and events (i.e. telic predicates) bear different relations to their Reference time. While events are contained in their Reference time, states contain it (cf. (15) in section IV.2). The innovation of Reinhart’s theory is that she proposed to establish a unified relation between E and R, irrespective of the telicity status of a predicate. This idea is based on a modified view of what it means for an E-time to be contained in a R-time.

It has been noted in the literature, that an eventuality described by an atelic predicate, can bear 3 different relations to the R-time: it can include, be included or overlap with the current R-time. It has been illustrated on the assumption that the value of the R-time is given directly by adverbs like last week. As will become clear later in this section, I assume that the denotation of this type of adverbs is more complex, but let me review the argument here anyway. Consider the following examples:

(46) a. Last week Mary was sick.
b. Last week Mary was sick but by Friday she had recovered.
c. Last week Mary was (still) sick and she has not recovered (yet).

19 Note that Kamp’s (1981) and Hinrichs’ (1981) analyses were executed in the framework of event semantics, which means that the different relations were established between events or states (semantic primitives) and ‘reference events’ (an analogue of Reference time in the temporal semantic framework).
In addition, a special mechanism for ‘translating’ events into times was proposed (Kamp 1981).
20 But note that Reinhart follows the main DRT line in the analysis of progressive. See section IV.3.3.1.
Let us focus on the relation between the temporal interval specified by ‘last week’ (R-time interval) and the interval at which the homogeneous predicate ‘be sick’ holds of Mary (E-time interval). In the case of (46)a the relation between E and R should be mere overlap, since this is as much as we can tell from the information given in this sentence. (46)b, however, suggests that the interval of Mary being sick is included in the R-time: she was not sick through the whole week, but had recovered by the weekend. The interpretation that arises in (46)c is that Mary got sick before last week and is still sick at the S-time, so the inclusion relation here seems to be reversed: the period of sickness includes last week.

Despite these differences, there is a common thing that all examples in (46) share: they presuppose the existence of some interval I at which Mary was sick and which is contained in the interval of time denoted by last week. Reinhart proposes to take this as the basic underlying relation of E- and R-intervals for all predicates: an interval I at which a given eventuality holds is contained in the R-time interval. This relation will be represented as $E \subseteq R$ in this work, in order not to deviate from the familiar notation. This representation is a ‘name’ for the relation defined below:

**DEF. 3:**

a. E(ventuality) time:

If $P$ is an n-ary predicate and $x_1, x_2, \ldots x_n$ are its arguments, then any interval I, such that $P(x_1, x_2, \ldots x_n, I)$ (informally: $P$ holds at I) is called predication time and labelled E(ventuality time).

b. $E \subseteq R$:

$\exists I, \exists R$ such that $P(x_1, x_2, \ldots x_n, I)$ & $I \subseteq R$

Notation: $[I \in E]$

E(ventuality) time is a label for an interval I at which P holds, as stated in the first part of DEF.3. The second part of DEF.3 says that at least one of the intervals at which a given predicate $P$ holds has to be included in R. R can, in principle, contain more than one such interval.

DEF.3 is uniform for all types of predicates, both atelic and telic ones. It fixes the relation between R and E, radically restricting the number of possible combinations of R, E and S. The default configuration $[I \in E]$, which is a notation that I will use as short for $E \subseteq R$, is assumed to be a default configuration in all basic tenses.21

Following Reichenbach’s basic idea, I will assume that temporal adverbials like ‘yesterday’ or ‘last year’ provide some specification of the Reference time. However, unlike Reichenbach, I do not assume that the denotation of, for instance, ‘last year’ is the R itself. The interpretation of this type of temporal adverbials that I adopt in the present work is the following: ‘last year’ and similar temporal expressions do not simply denote an interval that equals the period of time indicated by ‘last year’, but a set of all subintervals of the interval indicated by ‘last year’. Let me exemplify this.

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21 By ‘basic’ tenses I mean non-progressive.
Suppose ADV is an adverb in question. It can be ‘last year’ or similar temporal adverb, which, according to Reichenbach, specifies R-time. What I suggest is that R is just a member of a set given by the denotation of ADV, ADV′:

\[ E \subseteq R \text{ & } R \in \text{ADV′} \]

(47) can be illustrated on a couple of examples. Consider first a sentence with a telic predicate. Looking a little bit ahead, I will give a representation of the sentence in (48), already taking the information provided by the past tense into account:

(48)  
\begin{align*}
\text{a. John built this house last year} \\
\exists E \exists R \exists S \left( \text{build} \left( j', h', E \right) \text{ & } E \subseteq R \text{ & } R \in \text{LAST YEAR' & } R < S \right)
\end{align*}

The sentence in (48)a is represented in (48)b, which says that a predicate *build a house* holds of *John* at *E*, which is one of the intervals *I*, at which this predicate holds. *E* is a subinterval of *R*, the *R*-time is a member of the set of all subintervals of the interval denoted by the expression ‘*last year*’, hence *R* ∈ ‘*last year*’ and *R* is located before *S*, because this relation is the general representation of the past tense. The representation \( E \subseteq R \text{ & } R \in \text{LAST YEAR'} \) makes sure that the building of the house may, but does not have to take the period of entire year. If John in fact built his hours in three months, the representation given in (48)b captures this as well. It follows from DEF.2 that there is no subinterval of *E* for which a given predicate also holds.

Now let me explain the examples with the atelic predicate in (46). Consider the common part for all three sentences, i.e., *Last week Mary was sick*, ignoring the rest of the sentences in (46)b and (46)c, which is not crucial for my current purposes. The representation for all three examples in (46) will be the same. Moreover, it is actually the same as for the sentence with the telic predicate *build the house*, except for the lexical differences:

(49) \[ \exists E \exists R \exists S \left( \text{sick} \left( m', E \right) \text{ & } E \subseteq R \text{ & } R \in \text{LAST WEEK'} & R < S \right) \]

Exactly like in the previous example, the *R*-time is a member of a set of all subintervals of the interval specified by *last week*. The past tense is expressed by the *R*-S condition. However, in (46) we are dealing with an atelic predicate. According to DEF.1, an atelic predicate holds at least one subinterval of a given interval *E*. What is required by DEF.3(b) of the *R*-time, is that some interval at which the predicate holds is included in *R*. This condition is a common requirement for the representations of the sentences in (46)a, (46)b and (46)c. The important thing is that in the case of atelic predicates, for any given interval *E* at which *P* holds, there is at least one subinterval *E′*, at which it holds as well. Or, the interval *E* might have a superinterval *E″*, which is not fully included in the R-time, at which, again, the same predicates holds. In this case the ‘subinterval property’ is stated for *E″*, with *E* being

\[ \text{22 The tense system will be discussed in detail in IV.3.2.3.} \]
a relevant subinterval of $E''$. Hence, for all the possible variations in (46), the only condition that has to be met is that there is some interval $E$ included in $R$, at which a predicate holds.

It is very important to realize, that the tense representation for the sentences with telic and atelic predicates are precisely the same. The differences that I just explained are derived from the definitions of atelicity and telicity and do not bear on the relation of an interval at which a predicate is said to hold to the $R$-time interval.

Finally, let me indicate one important distinction between Reinhart’s system and some other proposals for tense systems in the Reichenbachian style. The distinction concerns exactly the relation between $R$ and $E$. What happens more often is that Reichenbach’s system is split into two types of relations: $S$ and $R$ on the one hand, and $R$ and $E$ on the other (e.g., Hornstein (1990), Klein (1994)). It should be clear by now that Reinhart’s model does not allow for configurations like $R<E$ or any other kind of representation in which $E$ is not included in some $R$ in a non progressive tense.23 This is reminiscent of the condition for events in Partee/Hinrichs’ analysis (cf. (15)). Reinhart, however, does not distinguish between different aspectual types of predicates or sentences, therefore, in her system, we do not expect to have two sets of temporal representations for each tense. I see the motivation for this step in Reinhart’s theory in the desire to bring together two uses of $R$-time that unfortunately have existed quite independently: $R$-time as a tool to capture some discourse effects and $R$-time as a sentence-internal notion.

At this point I conclude the discussion of the first relation, i.e. $E-R$, and move now to the relation between $S$ and $E$.

IV.3.2.2. S-E

The next pair that I will look at is $S-E$. Reinhart (1986) proposes that the $S-E$ configuration determines the truth conditions and the temporal interpretation of a sentence. Temporal interpretation just tells us how to relate the eventuality described in a given sentence to a default anchoring point, i.e. the $S$-time. Given that both $S$ and $E$ are taken to be temporal intervals, the number of relations that can be established between them is limited. Two intervals can overlap (inclusion being a special case of an overlap) or, if the intersection between them is empty, a precedence relation can be established, i.e. they can be ordered. In the case of overlap, i.e., if $S \cap E \neq \emptyset$, the temporal interpretation which arises is present. What we assert is that the eventuality holds at the Speech time. If, however, $S$ and $E$ are ordered, then we get either past or future interpretation. In other words, the position of $E$ relative to $S$, tells us whether the eventuality described in a given sentence is anterior to, overlapping with, or posterior to the $S$-time. Using more common terminology, we usually refer to these three options using the words ‘past’, ‘present’ and ‘future’.

23 The representation of past perfect will be given in section IV.3.3.2.
Let me step back now and return to the representations that are ascribed to the simple future in English in Reichenbach’s system:

(50) I will walk  
    S, R _ E  
    S _ E, R  
    S _ R _ E

Empirically, it is not possible to differentiate between these three representations, at least in English. In general, I think it would be rather surprising to find a language that encodes the difference between the first and the third configurations in (50). What is striking, however, is that there is something that all representations for the future share, namely, the S_E part. However, it is logical to suggest, that exactly this ‘ingredient’ of the three configurations above should account for the future interpretation of (50).

In Reinhart’s system, it becomes important to make a clear distinction between morphological tense and temporal interpretation of a sentence: they are not determined by the same relation. One of the reasons to distinguish between them is the interpretation of the simple past and present perfect tenses in English:

(51) a. John ate breakfast  
    b. John has (already) eaten breakfast

Reinhart points out that the two sentences in (51) above have the same truth conditions and temporal interpretation in the sense that they both refer to some temporal interval at which the predicate ‘eat breakfast’ holds and which precedes S-time. On the other hand, the sentences show different tense morphology, which is the reason to distinguish between the temporal interpretation and tense marking.

As mentioned before, Reinhart (1986) claims that there are no truth-conditional differences between (51)a and (51)b. Note, however, that there is still a debate on this issue. For instance, Hatav (1997) argues that perfect tenses do have an influence on the truth conditions. She gives the following examples (Hatav, 1997:166):

(52) a. Reagan has only been shot once during 1981.  
    b. Reagan was only shot once during 1981.

She refers to Heny (1982), who, in turn, claims that knowing that Reagan was shot only once, on June 11, 1981, only the sentence in (52)a comes out true if it is uttered on June 12, whereas (52)b would be false.

Another observation goes back to Chomsky (1972), who discusses the following example:

(53) Einstein has lived in Princeton

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24 This example was also discussed earlier, in section IV.1.1.
The sentence sounds inappropriate, because it entails that Einstein is still alive. The simple past tense in English should be used instead, since it does not give rise to any entailments concerning the ‘aliveness’ of Einstein.

In this work, however, I will not dwell on the issues of truth conditions and the relation that determines them. I am going to maintain Reinhart’s proposal that the relation between S and E determines a temporal interpretation of a sentence. She also argues, on the basis of empirical evidence from English, that this relation is not important for determining tense morphology of a finite verb. Although this seems to be the case in English, I will argue in the next chapter that in Russian, tense morphology is established exactly by this relation.

IV.3.2.3. S-R

The S-R relation is going to be crucially important for the purposes of the present work, especially for the theory of aspect, which will be proposed in the next chapter. The reason for giving this relation a ‘special status’ is that in Reinhart’s system the S-R relation is held ‘responsible’ for morphological tense and perspective. Perspective is a new notion, but I have already discussed some issues concerning tense systems. Let me start with a more familiar topic.

Consider again example (51) above. We have already seen that the temporal interpretation of the two sentences is the same, i.e., they report on something that occurred in the past, hence the relative order of S and E is E < S in both cases. Nevertheless, they show different morphological tense marking. On the basic assumption that E is included in R in both cases, the only relation that can account for this difference is the S-R relation. The present morphology on the finite (i.e. auxiliary) verb in (51)b suggests that S and R should overlap.

This is captured by the following definitions:

\begin{align*}
\text{a. simple past: } & \exists E \exists R \exists S (P(x_1,x_2,\ldots,x_n, E) & \&(E \subseteq R \& R < S)) \\
\text{b. present perfect: } & \exists E \exists R \exists S (P(x_1,x_2,\ldots,x_n, E) & \&(E \subseteq R \& S \cap R \neq \emptyset \& E < S))
\end{align*}

In what follows I will mostly use the shorter representations:

\begin{align*}
\text{a. simple past: } & E \subseteq R \& R < S \\
\text{b. present perfect: } & E \subseteq R \& S \cap R \neq \emptyset \& E < S
\end{align*}

or, schematically:

\begin{align*}
\text{a. simple past: } & [R \ E ] < S \\
\text{b. present perfect: } & [R \ E < S]
\end{align*}

Note that in (56)b, E is used as a name for an interval I, as defined in DEF.3. Similarly, S is a ‘name’ for an interval I, such that I \subseteq S and I \subseteq R. In other words, S in
this notation stands not for the whole interval of S, but for its subinterval (which may be the same as S itself, but need not be) included in R. This only concerns the interpretation of the notation $[s, S]$.

These representations imply that the temporal interpretation in English is determined by participial morphology in present perfect, whereas the tense morphology on the auxiliary verb reflects the relation between S and R. It follows then, that the terms present, past or future are ambiguous. They can either refer to the present morphology, which is determined by the S-R relation, or to the present temporal interpretation, which is determined by the S-E relation.

In the preceding sections, I showed that if different kinds of predicates are taken to relate differently to a current R-time, a number of questions arise. Let me re-address this subject and show how Reinhart’s system handles it. In order to do this, I have to go back to K&R’s representations for present perfect given in (24), (25) and (29) in IV.2.1. K&R have to provide different DRSs for stative and eventive sentences to capture the fact that a predicate of a stative sentence can hold at the moment of speech or ‘now’ in their terminology. In particular, they had to make sure that the sentence John has lived in Amsterdam for 3 years does not entail that John does not live in Amsterdam any longer. In Reinhart’s system it follows independently of the representation of tense, which is exactly the same for both types of sentences.

(57) a. DEF.1:

For all P, I, x₁, x₂, …, xₙ, a predicate P(x₁, x₂, …, xₙ, I) is atelic iff

\[ P(x₁, x₂, …, xₙ, I) \land \exists I' \subseteq I (P(x₁, x₂, …, xₙ, I')) \]

b. present perfect: E < S \& S \cap R \neq \emptyset

If we look at DEF.1 repeated above, it says nothing about the ‘extension’ of the interval E at which a predicate holds. In particular, E itself might be a subinterval of a bigger interval E". The representation for present perfect requires only that there is at least one interval E, such that E precedes S. But the combination of DEF.1 and the present perfect representation does not make any prediction about the state of affairs at the present moment, i.e. whether the eventuality still holds or not. This is a desired result, because with atelic predicates (or stative sentences), it is never certain, if no other contextual information is available, whether the eventuality terminates before the S-time.²⁵

For eventive sentences, however, the prediction is that the eventuality described does not hold at the S-time.

(58) a. DEF.2:

For all P, I, x₁, x₂, …, xₙ, a predicate P(x₁, x₂, …, xₙ, I) is telic iff

\[ P(x₁, x₂, …, xₙ, I) \land \forall I' \subseteq I (P(x₁, x₂, …, xₙ, I') \Rightarrow I'=I) \]

b. present perfect: E < S \& S \cap R \neq \emptyset

²⁵ The reader should keep in mind that these observations are made for English. Present perfect in, for instance, Dutch behaves differently.
According to the DEF.2, telic predicates cannot hold at any subinterval of a given interval $I$. $I$ itself cannot be a subinterval of any bigger interval either, otherwise $P$ would not hold at $I$. Thus, $P$ cannot hold at $S$ unless $S$ and $E$ in (58)b are the same. Since $E < S$ is a part of the representation of the present perfect, this possibility is discarded immediately. Therefore, $P$ cannot hold at $S$.

The conclusion so far is that different licensing properties of the predicates are derived from their telicity properties only. The definition of (a)telicity is independent of the representations of tenses. This ensures that identical representations of tenses can be given for both types of predicates. No additional assumptions concerning the relation of an eventuality to the R-time are needed either. The E-R relation is uniform for all types of predicates, and yet the difference in entailments with respect to the present moment in the case of the present perfect tense is derivable. I consider this as an essential advantage of Reinhart’s system.

To conclude this discussion, the system in (59) is given, which presents morphological tenses in Reinhart’s system:

(59)  
a. $R < S$: finite verb form in the past tense  
b. $S < R$: finite verb form in the future tense  
c. $S \cap R \neq \emptyset$: finite verb form in the present tense.

Next, let me give the representations for the basic tenses in this system. Schematically:

(60)  
a. future: $S < [\_ R E]$  
b. present: $[\_ S \cap E]$, which reads “$R$ contains an overlap of $S$ and $E$”  
c. past: $[\_ E < S ]$  
d. present perfect: $[\_ E < S ]$

or, formally:

(61)  
a. future: $\exists E \exists R \exists S (P(x_1, x_2, \ldots, x_n, E) \& E \subseteq R \& S < R)$  
b. present: $\exists E \exists R \exists S (P(x_1, x_2, \ldots, x_n, E) \& E \subseteq R \& E \cap S \neq \emptyset)$  
c. past: $\exists E \exists R \exists S (P(x_1, x_2, \ldots, x_n, E) \& E \subseteq R \& R < S)$  
d. present perfect: $\exists E \exists R \exists S (P(x_1, x_2, \ldots, x_n, E) \& E \subseteq R \& E < S \& S \cap R \neq \emptyset)$

As I have already mentioned, the S-R relation is Reinhart’s theory also determines perspective. I will introduce this notion with the help of the same minimal pair of examples in (51), repeated below:

(62)  
a. John ate breakfast

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26 Future tense is not always morphologically marked. In English future is expressed by means of auxiliary ‘will’. In Russian it is auxiliary ‘be’ or just the present tense form (see the discussion in the next chapter). Romance languages have special future morphology.
b. John has (already) eaten breakfast

Note that in Reichenbach’s system the present perfect tense was assigned the configuration E_R,S, which reads ‘E precedes R and R coincides with S’. This, and all the facts that have been observed so far, strongly suggest that the R-time should play a crucial role in the account of the present perfect tense. This insight is preserved in Reinhart’s model.

The special effect of the present perfect in English is that the situation described is conceived as relevant for the present moment, as all the English grammars (or at least those for non-English speakers) say. Reinhart’s representation for present perfect seems to capture this intuition straightforwardly, on the assumption that ‘relevance for the present moment’ is captured by the relation between R and S. Since the intersection between R and S is not empty, or, informally, S is included in R, then the ‘relevance’ meaning of the present perfect tense can be attributed to the position of S, which is associated with the present, relative to R, which includes the E-time.

Thus, Reinhart describes the difference between simple past and present perfect as a difference in perspective. Reinhart’s system provides a way to relate the intuitive concept of perspective to a linguistic notion, namely, the Reference time. What determines perspective in this model is the relation between R and S, the same relation that determines morphological tense. Perspective is, therefore, associated with the view of a speaker, which is presumably ‘located’ at S. If a speaker is ‘inside’ the R-time domain, the perspective is internal. If the position of a speaker is ‘outside’ the R-time domain, the perspective is external.

I will argue in chapter V that the notion of perspective also underlies the aspectual differences in Russian. Note that Reinhart argues that the difference between present perfect and simple past in English is accounted for in terms of perspective. It suggests that there is a parallelism between the two phenomena. I postpone the discussion of this intriguing question until chapter V.

IV.3.3. Some implications of Reinhart’s system

In this section I am going to discuss three questions. The first one is how the progressive entailment, which brings out the difference between telic and atelic predicates, is derived in Reinhart’s model. Secondly, I will explain how past perfect is represented in this system. And, finally, I will show how Reinhart’s theory captures R-time movement.
IV.3.3.1. Progressive entailment

In this section I will show that the progressive entailment can be derived in Reinhart’s system on the basis of the definitions of telic/atelic predicates but independently of tense configurations.

Although a detailed study of English progressive is outside the scope of this work, let me review the issues briefly. In treating progressive, Reinhart follows the (early) DRT-type of approach to progressive: the application of the progressive operator yields the reverse relation of E and R, i.e. it turns $E \subseteq R$ into $R \subseteq E$, and the resulting predicate is always atelic (cf. especially Bach 1980,1981 as well as Hinrichs 1981, Partee 1984, Kamp & Reyle 1993 and others).

Following this tradition, Reinhart assumes a special progressive operator that yields the representation in (63):

\[(63) \quad \text{progressive: } E \subseteq R \rightarrow R \subseteq E \]

Note that there is always an E-interval which is included in R (cf. DEF.3). Thus, for the newly formed progressive predicate with $R \subseteq E$ as an invariable part of its representation, there is always at least one E'-interval inside R, at which a predicate holds. E', at the same time, is a subinterval of E. This means that progressive predicates are always atelic, since they have a subinterval property.

Let me now turn to the progressive entailment. The effect of the progressive entailment is exemplified in (64):

\[(64) \quad \begin{align*}
  &a. \text{Ann was walking } \rightarrow \text{Ann walked} \\
  &b. \text{Ann was walking a mile } /\rightarrow \text{Ann walked a mile}
\end{align*} \]

Past progressive in Reinhart’s system is represented as follows:

\[(65) \quad \exists E \exists R \exists S \left( P(x_1,x_2,\ldots,x_n, E) \& R \subseteq E \& R < S \right) \]

This reads that there is an interval E at which a predicate holds and which includes R and R precedes S.

This representation is already familiar to the reader. The last conjunct in (65), i.e., $R < S$, has been used in all representations of sentences in the past tense. The only new part is the first conjunct, $R \subseteq E$, which represents the progressive.

The question posed by (64) is under what conditions a sentence in the past progressive tense, which is defined in (65), entails a sentence in the past tense, defined in (66):

\[(66) \quad \exists E \exists R \exists S \left( P(x_1,x_2,\ldots,x_n, R) \& R \class{oe} E \& R < S \right) \]

Note that these two sentences have a different R-interval.

27 The reader should be reminded once again, that the main differences between Reinhart’s analysis and the DRT-type of approach with respect to progressive is that Reinhart assumes that R-interval is included in E-interval only for progressive, while the analyses along the lines of Hinrichs/Partee, discussed in section IV.2, also assume that this particular relation holds between states (i.e. atelic predicates) and their R-times.
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(66) \[ \exists E \exists R \exists S (P(x_1, x_2, \ldots, x_n, E) \land E \subset R \land R < S) \]

The factual answer to this question is that there is an entailment iff a predicate P in a given sentence is atelic, as in (64)a. Let us now check whether this can be derived in the present system.

Since the predicate in the entailed sentence in (64)a is atelic, the formula for the past tense in (66) should be combined with DEF.1 for atelic predicates:

(67) **DEF.1:** For all P, I, x_1, x_2, …, x_n, a predicate P(x_1, x_2, …, x_n, I) is atelic iff

\[ P(x_1, x_2, \ldots, x_n, I) \land \exists I' \subset I (P(x_1, x_2, \ldots, x_n, I')) \]

If R in (65) is the same interval as I' in (67), then it follows that predicate P holds at R. By DEF.1, it also holds for at least one subinterval of R. It means, that we can always find an interval E', which is included in R and for which predicate P holds. In the combination with R < S in (65), we get exactly the representation of the simple past in (66). Hence the entailment in ((64)a) is explained.

Now to the example (64)b, where the predicate in the entailed sentence is telic and, consequently, DEF.2 should be considered:

(68) **DEF.2:** For all P, I, x_1, x_2, …, x_n, a predicate P(x_1, x_2, …, x_n, I) is telic iff

\[ P(x_1, x_2, \ldots, x_n, I) \land \forall I' \subseteq I (P(x_1, x_2, \ldots, x_n, I') \Rightarrow I' = I) \]

Suppose, again, that R is the same as I. Then it follows from DEF.2 that a predicate P can only hold at R if it is the same as I or E in (65). However, we do not know if R equals E or not, because R is not required to be a proper subinterval of E. Consequently, we do not know whether a given predicate holds at R or not. It amounts to saying that the progressive entailment does not hold for telic predicates, i.e., the inference from past progressive to simple past may or may not go through, but it is not properly licensed. Hence the result in (64)b.

This also means that a telic predicate like walk a mile from (64)b can still hold at S. The representation for the past progressive tense in (65) states that R precedes S. If R is a proper subinterval of E, then the relation between E and S cannot be established. Thus, if it is not the case that I' = I = E = R < S, E may or may not overlap with S. Hence, the eventuality described by the sentence Ann was walking a mile can still hold at S-time. This is an intuitively correct result.

Let me, once again, point out that the representation given to the past progressive in (65) is uniform for all predicates. The difference in the licensing properties of telic vs. atelic predicates is derived from the definitions of these types of predicates.

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28 In this case the inference from past progressive to simple past is licensed.
IV.3.3.2. Past perfect

In section IV.3.2.3, where the properties of the English tense systems were discussed, the representations for four tenses were given: simple present, simple past, present perfect and simple future. These are so-called ‘deictic’ tenses, i.e., those which are evaluated with respect to the S-time. I will not discuss future tenses in this chapter, but focus on the past temporal domain.

There are also anaphoric tenses, i.e. tenses that are evaluated with respect to a temporal unit other than the S-time. Past perfect is an anaphoric past tense, and now I am going to show how it is represented in Reinhart’s system.

The configuration assigned to past perfect in the original Reichenbachian system is E_R_S. Partee (1984) and Hatav (1997) adopt basically the same configuration with minor changes. Consider (66):

(66) The secretary had already left when this letter arrived.

The common assumption would be that the temporal subordinate clause introduced by when provides the Reference time and the eventuality reported in the main clause is perceived with respect to this R-time. In Reinhart’s proposal, which I follow here, two reference times would be needed to account for the past perfect tense, since she assumes the default relation between R and E always being \([R, E]\). On this assumption, R and E cannot be disjoint. Then the sentence in (66) is analysed as describing one eventuality per clause, as it were. Consequently, the configuration assigned to the sentence in (66) should look like (67):

(67) \([E_1]_{R_1} < [E_2]_{R_2} < S\)

In this representation, \(E_1 = \text{‘the secretary had left’}\), \(E_2 = \text{‘the letter arrived’}\), and the ordering is established between the R-times of the respective predication times \(E_1\) and \(E_2\). \(R_2\) can be unspecified or understood from the discourse, this is exactly what happens when a sentence like The secretary had left, occurs alone and it requires some understood R-time to be evaluated. The common representation of past perfect is given in (68):

(68) \(E_1 \subseteq R_1 \& R_1 < R_2 \& R_2 < S\)

Now it is appropriate to make some comments concerning S-time. The notion of Speech time, in principle, can be interpreted as a ‘default’ R-time. As Hatav (1997) points out, the utterance, or an act of speech, can be viewed as a special kind of eventuality, in which case it also requires a special R-time to host it. Following the ideas of Partee (1984), Prior (1967), Mittwoch (1988) and Smith (1991), Hatav assumes that the S-time is nothing else but the default R-time, marked \(R_S\). This notation is familiar from the DRS in (16)b given in section IV.2.
In Hatav’s proposal, $R_3$ can be specified by expressions like ‘this year’ or ‘today’, which may indicate different options for analyzing simple present tense, especially some of its uses, as, for instance, historical present. The same line of reasoning is pursued in Oversteegen (1985). I will leave this type of analysis as a possibility, because the decision on this issue is not going to play any role in what will be presented later. For the sake of uniformity, I will continue using the notion of S-time, keeping in mind that it can be re-analyzed as a default R-time.

IV.3.3.3. R-time movement

As has already been mentioned in section IV.2, the basic rule for the R-time movement, proposed in Partee (1984) and Hinrichs (1986), makes a crucial difference between stative and eventive sentences, i.e., sentences with atelic and telic predicates respectively. As for the latter, the main reasoning behind the rule of narrative progression remains the same in Reinhart’s model: eventive sentences in narrative discourse move the R-time forward, creating a sequence interpretation. According to the definitions given in section IV.3.1, a telic predicate, every time it occurs, holds only at a single interval $I$. Each interval at which a predicate $P$ holds is included in its R-time. A predicate $P$ that describes a following event is included in another, its own R-time and so forth. The R-times are ordered in the narrative discourse, to capture the temporal progress of narration, and, as a result, the system creates the time movement effect for a string of eventive sentences. However, this neat sequence interpretation can be overruled by different contextual means. For instance, temporal specification like at the same time or simultaneously brings out the overlap reading:

\[(69)\]

\[
a. \text{John closed the door. He picked up the receiver and dialled the emergency number.} \\
b. \text{John closed the door. At the same time, he picked up the receiver and dialled the emergency number.}
\]

A predicate $P$ of a stative sentence, even though it is also included in its R-time, can hold ‘beyond’ its R-time, thus creating an effect of an overlap. But just as in the case of eventive sentences, this default interpretation can easily be overruled under some special circumstances. I have already mentioned adverbials like suddenly, then, which create R-time movement. At the end of section IV.2, I referred to a generalization from Hatav (1997) concerning the types of sentences that move the narration time. According to this generalization, sentences with atelic delimited predicates (e.g. (71)) behave similar to eventive sentences (e.g. (70)): they create a sequence interpretation in narrative discourse:

\[(70)\]

\[
\text{The man arranged the stiff table linen, filled the two tumblers from a huge cut-glass pitcher, and set them in their proper places.}
\]
(It was a lovely performance.) The entertainer told jokes for fifteen minutes, sang for half an hour and danced for another half an hour.

As the reader might recall from the previous section, the counterexamples to Partee/Hinrichs’ rule were delimited stative sentences like the one in (71). Hataš’s hypothesis, which Reinhart adopts, is that delimiting adverbials like for 15 minutes or from 5pm till 7pm operate on the R-time interval and not on the E-time interval. Semantically, these temporal expressions are modifiers, but the entity they modify is claimed to be the R-time. I am going to adopt this position in the present work.

Let me point out the major advantage that this view on the delimiting temporal expressions grants us. The class formed by stative sentences with delimiting adverbials has been the most problematic case due to the different properties that they exhibit on the sentential and discourse level. As I have argued in chapter III, the predicates in the sentences with delimiting adverbials do not change their basic properties and do not become telic, as proposed by, e.g., de Swart (1998) and K&R (1993). The problem, however, is that this group of sentences does not behave as expected in a narrative discourse: sentences with atelic predicates are not supposed to create a sequence interpretation unless there are different expressions (e.g., then, after that, etc.) triggering this effect. The sentences with delimiting adverbials, as has been shown above, are interpreted sequentially. This comes out unexpected if they are treated just like other sentences with atelic predicates.

Reinhart’s system provides a solution to this problem. It does not have to be assumed that in the case of a sentence with a temporal delimiter we are, in fact, dealing with a newly formed telic predicate. A delimiting adverbial operates on a different entity, namely, the R-time. If the R-time interval is temporally restricted, a new R-time is introduced in the discourse and the discourse proceeds further. The rules for the discourse interpretation do not change: as before, a sequence interpretation is obtained by a succession of temporally ordered R-times. Most importantly, the properties of a delimited predicate, in particular, its atelicity, remain the same. Once again, the examples below show that a modified predicate still has the homogeneity property ((72)a), and the entailment shows that the predicate can hold at S ((72)b):

a. Mary has lived in Amsterdam from 1994 till 1996 →
   Mary has lived in Amsterdam from 1994 till 1995
b. Mary worked for the same company for forty years. Then she reached the retirement age, but she decided to continue working.
IV.4. Conclusions

Let me now summarize the results of the present chapter. I have started out by reviewing Reichenbach (1947), who first introduced the notion of Reference time. This notion has proved its linguistic relevance mainly in two areas of research: in formalizations of tense systems and in temporal interpretation of sentences in discourse. In section IV.2, I have traced the development of this notion in both tense-oriented and discourse-oriented studies. The observations concerning the behavior of the different types of sentences in narrative discourse have led a number of researchers to postulate a rule of the narrative time progression in terms of R-time movement. Partee (1984), Hinrichs (1986), Kamp & Reyle (1993) make the basic assumption that, depending on their telicity properties, eventualities (or predicates) relate to the R-time in different ways: states include R-time, but events are included in it. K&R develop a system of tense representation, based on this assumption. I have shown that their system, although it captures a substantial body of data, requires a substantial number of tools and rules to capture all the relevant phenomena.

In section IV.3, I discussed a system which operates with fewer notions, is based on strict definitions and, at the same time, accounts for all empirical facts that K&R’s system can capture. This system is the unified theory of R-time, proposed by Reinhart (1986, 2000). It operates with Reichenbach’s notions of Speech time, Event time and Reference time and is formulated in the framework of interval semantic. The relations that Reinhart postulates for three basic notions and that have been adopted thus far are the following:

- the default R-E relation is always the same, i.e. \([R, E]\)
- the S-E relation determines the temporal interpretation
- perspective and tense morphology in English is determined by S-R.

The main advantage of Reinhart’s system is that it provides a uniform account of the tense representations, regardless of the telicity status of a predicate, and still captures the R-time movement facts. Her model allows for the possibility to strictly differentiate between the properties of a predicate, such as telicity and the facts connected to telicity (i.e. telicity entailments) on the one hand, and different phenomena that are accounted for by means of the notion of R-time (e.g., tenses and perspective). Reinhart also formalizes the notion of perspective, which I will use in the next chapter to develop an analysis of the Russian aspectual system.