

# A Theory of the Aspectual Progressive

Michael J. Almeida  
Department of Computer Science  
The Pennsylvania State University

## Abstract

The progressive construction in English has an unusually wide range of uses. In this paper, I propose a new theory of what is probably the most important use of the progressive - the *aspectual progressive*. It is the aspectual progressive which is being contrasted with the simple, i.e., nonprogressive, construction in the nonhabitual interpretation of such pairs of sentences as *John was running at three o'clock* versus *John ran at three o'clock*. The proposed theory is based on a particular analysis of the conceptualizations of events and situations commonly called the *aspectual classes*, and is able to account for the temporal properties of the progressive, for the "imperfective paradox" problem, and for the range of applicability of the aspectual progressive.

## INTRODUCTION

The progressive construction in English has an unusually wide range of uses. In this paper, I will propose a new theory of what is probably the most important use of the progressive - the *aspectual progressive*. It is the aspectual progressive which is being contrasted with the simple, i.e., nonprogressive, construction in the nonhabitual interpretation of such pairs of sentences as *John was running at three o'clock* versus *John ran at three o'clock*, and *Mary was speaking when I entered the room* versus *Mary spoke when I entered the room*.

In the first part of this paper, I present a survey and analysis of the conceptualizations of events and situations commonly called the *aspectual classes*. The precise explication of the (primarily temporal) properties of these different situation types forms a necessary background to my analysis of the progressive. In the second part of this paper, I describe and critique some previously proposed theories of the progressive, paying particular attention to the well-known theory of Vlach (1981). I then propose a new theory of the aspectual progressive which is able to account for the temporal properties of the progressive, for the full "imperfective paradox" problem, and for the range of applicability of the aspectual progressive.

## THE ASPECTUAL CLASSES

The temporal properties of the aspectual classes play a central role in our use and understanding of natural language time expressions. The most familiar of these conceptualizations - achievements, accomplishments, activities, and states - come from the work of Vendler (1967). Following what has become standard practice, I will use *situation* as a cover term for instances of all of these various classes.

The analysis of the aspectual classes presented in this section is based on three fundamental distinctions. The first is that situations in general can be divided into three major classes depending on the nature of the intervals of time at which they can hold or occur: *point-situations*, which can only hold/occur at instantaneous points of time; *point-interval-situations*, which can hold/occur at both instantaneous and noninstantaneous intervals of time; and *interval-situations*, which can only hold/occur at noninstantaneous intervals of time. The second distinction is between situations which are *homogeneous* in overall structure, i.e., the parts are of the same nature as the whole, and those which are *heterogeneous*, i.e., consisting of distinct stages, phases, or subsituations. The third distinction is the contrast between *dynamic situations* and *nondynamic (stative) situations*, where the former class is further divided into *processes* and *nonprocesses*. In the following three subsections, I will discuss first the point-situations, then the point-interval-situations, and then finally the most complex of these major classes: the interval-situations.

### Point-Situations

Point-situations can only occur at isolated points of time. The point-situations are Vendler's (1967) achievements, some examples of which are *dying* and *reaching the top*. Since achievements can only occur at points of time, they can be further specified by point-adverbials such as *at 5:00*, and they cannot directly take adverbials of duration. Achievements are dynamic situations, but, being instantaneous, they are not processes nor are they homogeneous or heterogeneous. Many

achievements are also preceded by a durative process which leads to, or results in, that achievement. (This process will be discussed in a later section.)

#### Point-Interval-Situations

Point-interval-situations can hold or occur at both points and nonpoint intervals of time. Therefore, they can take both point-adverbials and adverbials of duration. The point-interval-situations are (most) states and all progressives. All such situations are homogeneous. Two examples of states/progressives holding for nonpoint intervals are: states - *John was out of the house from 3:00 to 4:00 for an hour*; progressives (disregarding the "intentionality" reading) - *John was playing the piano from 3:00 to 4:00 for an hour (yesterday)*. (By the "intentionality" reading, I mean the sense which allows us to say *John was playing the piano for an hour, but he was interrupted so he only played for half an hour*.) Also, examples such as *John played the sonata while/when Mary was sleeping* require that the progressive hold for an interval.

A state/progressive in combination with a point-adverbial is generally taken to refer to a moment strictly during, i.e., not an end-point of, some nonpoint interval over which the state/progressive also holds (e.g., Bennett and Partee, 1972). But, there are three apparent difficulties with this analysis. The first is that there seem to be some types of potentially instantaneous states/progressives; that is, they can hold at isolated instants. Here is a typical example: imagine that the temperature is rising continuously over an interval of time which includes 4:00 pm, and that at exactly 4:00 pm the temperature is exactly 90 degrees. It would then seem that the stative sentence *The temperature is 90 degrees* is true within the relevant interval only at the point of time 4:00 pm. Similar examples can be constructed for progressives. However, this instantaneousness is more apparent than real in that such states/progressives can only occur where there is a nonpoint interval of time over which some value is changing smoothly and continuously. I believe that some notion of limits (as in the differential calculus) would reintroduce the notion of a noninstantaneous interval as a fundamental component of the representation of states/progressives. A truly isolated instantaneous state/progressive doesn't seem possible, since in what sense could it be said to exist?

The second problem concerns Vlach's (1981) discussion of examples such as Dowty's *John was watching television when he fell asleep*, which seem

to refer to a moment just after the interval occupied by the state/progressive. However, Moens and Steedman's (1988) analysis of *when* solves this problem perfectly: the problem has to do with the meaning of *when*.

The third problem arises with culminations such as *John fell asleep at 4:00 pm*. In ordinary usage, this statement seems to imply that *John was asleep at 4:00 pm* even though 4:00 pm is only the start-time of the state of John's being asleep. Although this case could be characterized as an inceptive use of the state/progressive, I see no reason to separate this use from the more standard interior-point one.

In summary, states/progressives have as one of their properties the ability to hold at each of the points of time which are during an interval over all of which the state/progressive holds. Further, although the point selected by a point-adverbial is ordinarily strictly during, i.e., not an end-point of, the interval, this is for pragmatic reasons and is not strictly required.

Both Vlach (1981) and Dowty (1986) consider progressives to actually be statives; and as near as I can tell, states and progressives have exactly the same temporal properties. However, Passonneau (1988) makes the point that lexical statives cannot be modified by rate adverbials, e.g., *quickly*, *slowly*, while many progressives can (i.e., they are dynamic). This seems to be a good reason for keeping the two classes at least partially separate. What the two classes do have in common, i.e., their temporal properties, makes them both members of the same super-class: the point-interval-situations.

#### Interval-Situations

The interval-situations are those that can only hold or occur at noninstantaneous intervals of time. There are a number of different situation types in this category; both homogeneous and heterogeneous, and both stative and dynamic situations. I will use the term *process* to cover all durative dynamic situations (that is, all dynamic situations except achievements), although this is a broader use of the term than is usual. This will allow me to distinguish within the broad class of processes between heterogeneous and homogeneous processes, and between interval and point-interval processes. In this section, I will distinguish between and discuss the following types of interval-situations: accomplishment processes, activity processes, homogeneous accomplishment processes, achievement processes (both heterogeneous and homogeneous), interval states,

and temporally measured situations.

#### *Accomplishments*

Vendler's (1967) *accomplishments* are one type of heterogeneous process. Some standard examples of accomplishments are *playing a sonata* and *building a bridge*. These situations clearly require a noninstantaneous interval of time and have distinct stages and subprocesses. In fact, all heterogeneous situations are interval-situations.

#### *Activities*

Vendler's (1967) *activities*, such as *running*, *playing the piano*, and *reading*, are one type of homogeneous process. Vlach (1981) gives the following analysis of the activity *running*: "suppose Mary starts running at instant 2:00 and continues running until 3:00, when she stops. Then tenseless *Mary run* is true at every instant between 2:00 and 3:00" (p.276). I believe that this analysis is incorrect, that in fact the simple form of activity sentences can only be true at non-point intervals. There are two arguments in favor of this analysis. One (used by Taylor, 1977) is that since running is a process, of necessity it can only occur over non-zero-length intervals; an instantaneous running-event simply makes no sense. Of course, the progressive *Mary was running* can be true at a point, but this point must always be during an actual interval of running. I'm not sure that this argument successfully differentiates activities from states, however.

A different sort of argument in favor of this analysis involves the interactions of different types of situations when they are conjoined by *while*. In the standard analysis of *while*, e.g., Bennett & Partee (1972), the event of the main clause is represented as simply being *during* the event of the subordinate clause; that is, *e1 while e2* would be represented as *during(e1, e2)*. But, as I showed in (Almeida, 1987), this analysis is not adequate. Consider the following two sentences:

- (a) We all waited while the riders changed horses and cut off again down the incline to the starting point.
- (b) He paced while the girl used the telephone.

In each of these examples, it seems that the main event, i.e., the event of the main clause, is understood as not occurring merely *during* the time occupied by the subordinate event(s) but as actually extending over the entire interval occupied by these events. But, if the effect of *while* is to cause the main event to fill up the time occupied by the subordinate event, then what happens when the

main event is an achievement? This case is illustrated by the following examples:

- (c) Mary telephoned me while I was reading.
- (d) The messenger arrived while I was playing the piano.

In each of these sentences, the event of the main clause is an achievement, that is, a point-situation, and the event of the subordinate clause is a progressive activity, that is, a point-interval-situation.

These sentences seem to have the traditional interpretation. Now, notice the effect we get if we change the subordinate events of these examples from progressives to simple activities:

- (c') ? Mary telephoned me while I read.
- (d') ? The messenger arrived while I played the piano.

The change in effect is subtle but definite: the main events are being awkwardly stretched to fit the passage of time implied by the subordinate clauses. One explanation for this effect is that the simple-form activities of the subordinate clauses must occupy noninstantaneous intervals of time and the point-situations are being forced to fill these intervals. This doesn't happen with examples (c) and (d), because in these cases the subordinate events have the ability to hold at points.

There still remains the problem of the interaction of simple-form activities with point-adverbials, e.g., *Mary ran at 2:30*. In Vlach's analysis of this example, "*Mary run* is true at 2:30, but *Mary ran at 2:30* is false, or at least an odd way to say what is usually expressed by *Mary was running at 2:30*. *Mary ran at 2:30* is more likely to mean that Mary started to run at 2:30" (Vlach, 1981, p.276). However, under the analysis that the simple form of activities can only be true at intervals, to say that *Mary ran at 2:30* means instead that Mary ran for an interval whose *initial-point* was 2:30; and in general, the meaning of *A V-ed at T o'clock* is that there is an interval of A's V-ing whose initial-point is T o'clock. In addition, there is an implicature (but only an implicature) that T o'clock is the initial-point of the entire event. Therefore, under this analysis, what is odd in the current example with saying *Mary ran at 2:30* is not that it is an odd (or false) way to say *Mary was running at 2:30*, but rather that it is odd, in this relatively neutral context, to want to talk about the initial-point of a subinterval of Mary's running given that this interval is only an internal portion of the complete running-event. However, it is not difficult to construct a context in which we might want to do just that. Imagine that Mary is on an exercise program in which she must run for half an hour every day at

2:30. Then we could truthfully report that on the day described above, *Mary ran (for half an hour) at 2:30*, as she was supposed to.

On the assumption that the speech time is a point of time, the interval nature of simple-form activities provides a neat explanation for why we do not use *John runs* to indicate that John is currently engaged in running. Under ordinary circumstances, only point-interval-situations can be used in the present tense, so that, for instance, we can use *John runs* in its habitual sense because habituals are always point-interval-situations. An interesting question is why don't we use present-tense achievements like *John leaves*? The answer seems to be purely pragmatic: in order to use the present tense, the situation we wish to describe must hold at the exact moment of speech, and it is very improbable for a point-situation to occur at exactly the moment we describe it.

#### *Homogeneous Accomplishment Processes*

One of the most important points that I wish to make in this paper is that all accomplishments have a related activity-like process that can be derived from them. This seems to be what is involved in, for example, *John played the sonata for 5 minutes*. Although accomplishments themselves are heterogeneous processes, this derived process is homogeneous. One argument for this comes from examples like *John played the sonata for 25 minutes*. The point of this example is that it is completely vague as to how many times the sonata was played: maybe only a portion of it was played, or it was played exactly once, or twice, or it was played one and a third times, etc. These possibilities rule out an analysis in which such sentences are interpreted as involving only a portion of the complete accomplishment process, since such an analysis would not allow the possibility of repetition. Instead, what we seem to need is a function which, when applied to a heterogeneous process, abstracts away its structure, its stages, etc., to produce a homogeneous process which is indifferent to such notions as completion. I will call this function *hm-int-proc*. What this function does is take as its single argument a heterogeneous interval-process and return as its value the corresponding homogeneous interval-process.

An alternative analysis of *John played the sonata for 25 minutes* would be to say that it is ambiguous between a portion-of reading and an iterative reading. Even if this analysis could account for the different possible interpretations of this sentence

(which I doubt), it misses the point. This sentence is vague (with respect to completion and repetition anyway), not ambiguous. Of course, given sufficient world knowledge concerning the lengths of various sonatas, one could possibly infer from this sentence that the particular sonata involved must have been played repeatedly (or not), but this is merely an additional inference.

Not all expressions involving what I will call *homogeneous accomplishment processes* sound as natural as the above example. For instance, *We built the bridge for an hour* sounds somewhat awkward. This contrast seems to depend on the nature of the accomplishment involved; for instance, accomplishments which involve a "performance object" (Dowty, 1979), such as *playing a sonata* or *reciting a poem*, work very well in this construction, while accomplishments which result in an actual product, such as *building a bridge* or *painting a picture*, are more awkward. I do not believe that this means that there is no homogeneous bridge-building process, however; rather, in such cases speakers simply tend to use activity expressions like *working on the bridge* instead. This idea that heterogeneous interval-processes have related homogeneous interval-processes will play a central role in my analysis of the progressive.

#### *Achievement Processes*

As I mentioned earlier, many achievements can have a preceding process which leads to that achievement. (I call the function which takes an achievement as an argument and produces this preceding process *process-to*.) This process is like an accomplishment in that it is heterogeneous, with definite stages and subprocesses. Also like accomplishments, the duration of this process can be given using an *in*-adverbial. These heterogeneous achievement processes also have related homogeneous, activity-like processes, which are produced using the function *hm-int-proc*. It can, however, be difficult to refer directly to this homogeneous process. For instance, *John died for an hour* seems to say that John was dead for an hour; that is, it refers to the consequent state of dying rather than to the homogeneous process of dying. However, by using rate adverbials, we can refer to a stretch of the homogeneous process, as in, for example, the first clause of: *For an hour John died slowly, then his condition rapidly deteriorated*.

#### *Interval Statives*

So far, all of the interval-situations I have discussed have been processes. However, Dowty (1979)

discusses a class of apparently stative predicates which can occur in the progressive, for example, one sense each of *sit*, *stand*, *lie*, and *perch*. Dowty notes that it is odd that these predicates should not give sentences that can be true at a single moment (according to his theory of the progressive they cannot), since they are nondynamic. One explanation of these examples, discussed by Dowty, is based upon the following observation:

suppose that a book is being slide (sic) across a series of carefully juxtaposed tables of absolutely equal height. If I am standing in front of one of these tables in the middle of the series, it seems that I can truthfully utter *The book is on this table* at any time that the book is wholly over the surface of the table in question ... But if my intuitions serve me correctly, I cannot truthfully say *The book is lying (sitting, ...) on this table* at any time at all as long as the book is in motion. If this distinction is a real one (and the judgement is admittedly subtle), then the truth conditions of these verbs do require that the object of which they are predicated remain stationary in over-all position for more than one moment, hence they could plausibly be supposed to be true only at intervals, not moments. (pp.176-177)

Dowty therefore calls these states, *interval states*. If we take the two properties (1) taking the progressive and (2) being nondynamic as the defining properties of interval statives, then certain other problematic predicates, such as *remain*, *stay*, *wait*, *sleep*, and *rest* may also be included in this class.

#### *Measured Situations*

The durations of homogeneous situations can be given using *for*-adverbials. Such temporally measured situations as *John was sick for a week* or *John ran for an hour* are analogous to spatial examples such as *John ran a mile*. As such, they are heterogeneous interval-situations. For instance, *John ran for an hour* is not true for any of its proper subintervals; further, such measured situations can take *in*-adverbials, e.g., *John ran for an hour in an hour*, although such examples are unusual. The representation of temporally measured situations is based on the function *for*, which takes two arguments: a homogeneous situation (either interval or point-interval) and a duration, and which has as its value a temporally measured situation.

#### THE ASPECTUAL PROGRESSIVE

In this paper, I am concerned with the analysis of the aspectual progressive only. There are several other types of progressive in English, one of which is the "metaphysical" progressive discussed in

Goldsmith & Woisetschlaeger (1982). The contrast between simple/progressive that they discuss marks a distinction that they call the "structural/phenomenal" distinction. An example is the contrast between *John walks to school* and *John is walking to school (these days)*. It is important to notice that this distinction applies only to point-interval-situations such as habituals and generics, and there is no aspectual contrast involved.

#### The Viewpoint Approach to the Progressive

Probably the standard approach to the analysis of the aspectual progressive is to see it not as a situation type itself, but instead as a configuration of an instance of a more basic situation type and a particular type of "viewpoint" into that situation. This is the approach taken in Comrie (1976), for instance. Comrie distinguishes between two major aspects: (1) the *perfective* aspect, which "looks at the situation from outside, without necessarily distinguishing any of the internal structure of the situation," (p.4) and (2) the *imperfective* aspect, which "looks at the situation from inside" (p.4). In English, the progressive is one of the major indicators of imperfective aspect.

There are two versions of this "viewpoint" approach. In the most common version, the viewpoint consists always of an instantaneous point of time (e.g., Almeida (1987), Bennett & Partee (1972), Nakhimovsky (1988), and Passonneau (1988)). This version has the serious problem that, as we have seen, the progressive can also be true at nonpoint intervals of time. Therefore, some additional mechanism would be required to make this version work in general.

The other version of this approach was developed by Taylor (1977) and has been adapted by Dowty (1979, 1986). (Dowty's adaptation consists of the addition of possible worlds notions to handle the "imperfective paradox.") In Taylor's version, "[Prog  $\phi$ ] (i.e., the progressive form of  $\phi$ ) is true at I iff there is an interval I' properly containing I such that  $\phi$  is true at I'" (Dowty, 1986, p.44). In other words, the viewpoint can be any proper subinterval and is not restricted to just points. Although this version avoids the limitations of the first, it too has some problems: (1) It doesn't in any way distinguish between a progressive holding for a nonpoint interval and the corresponding simple form when it holds at a proper nonpoint subinterval of the complete situation, which as we have seen can occur. (2) It isn't obvious that the progressive can be restricted to only proper subintervals of the

complete situation; for example, if *John played the sonata in ten minutes*, then it seems true that both *John played the sonata for ten minutes* and *John was playing the sonata for ten minutes*. While these arguments do not conclusively show that a viewpoint analysis is impossible, they do illustrate some of the problems that such an approach would have to overcome.

#### Vlach's Approach to the Progressive

In contrast to the above theories, Vlach's (1981) approach to the progressive does not depend on the use of a "viewpoint". Vlach notes that one of the historical antecedents of the progressive were stative constructions such as *John was at hunting*, where *hunting* is a gerundive nominal naming a process or activity, and the preposition *at* has an interpretation something like *engaged in* or *in the process of*. Vlach suggests that the notion *in the process of* is common to the meaning of all progressives. For Vlach, the changing of a process sentence into a stative is central to the meaning of the progressive, and so he introduces an operator *Stat* which does this. Vlach also makes use of an operator *Proc* such that if  $\phi$  is a sentence of the form NP VP, then  $\text{Proc}[\phi]$  denotes the process of NP's VP-ing. That is,  $\text{Proc}[\phi]$  denotes the process of  $\phi$ -ing.

Given these two operators, Vlach defines the progressive as follows: "Prog[ $\phi$ ] if and only if Stat[Proc[ $\phi$ ] goes on]" (p.287). It then remains to specify when "Proc[ $\phi$ ] goes on" for the different possible types of  $\phi$ . For activities, because they are already processes, this definition reduces to "Prog[ $\phi$ ] if and only if Stat[ $\phi$ ]". For accomplishments, Proc[ $\phi$ ] is "that process that leads to the truth of  $\phi$ , and such that if  $\phi$  is to become true at I, then P starts at the beginning of I and ends at the end of I" (p.288). For some achievements, such as *die*, Proc[ $\phi$ ] is "the process that characteristically leads to the truth of  $\phi$ " (p.290), while for other types of achievements, Proc[ $\phi$ ] is "the vaguely defined last part of the process that leads to the accomplishment of which  $\phi$  reports the completion" (p.289).

#### Problems with Vlach's Proposal and a New Formulation of the Progressive

Given my earlier discussion of the aspectual classes, it is clear that Vlach's notion of the process of an accomplishment is the same as my notion of the heterogeneous process that constitutes an accomplishment, and Vlach's notion of the process that leads to an achievement is essentially the same

as what I characterized as the heterogeneous process that leads to an achievement. Thus, with both accomplishments and achievements, Vlach's Proc[ $\phi$ ] is a heterogeneous process. This means that Vlach's *Stat* operator applies in some cases to homogeneous processes (e.g., activities) and in other cases to heterogeneous processes (e.g., accomplishments and achievement-processes).

In my discussion of heterogeneous processes, I suggested that for every heterogeneous process there is a corresponding homogeneous interval-process that can be derived from it. Therefore, it is possible to unify the interpretation of *Stat* by having it apply solely to homogeneous interval-processes. But, besides the unification of the interpretation of *Stat*, there is a more compelling reason why we might want *Stat* to apply only to homogeneous interval-processes. This reason comes from the "imperfective paradox". As is well-known, progressive sentences such as *John was walking to the store* do not always entail the corresponding simple form sentences. Any representation of the progressive must be able to account for this. But, this problem is not limited to progressive sentences. As I discussed previously, some simple form sentences, such as *John walked to the store for five minutes*, also do not always allow the inference to *John walked to the store* in its "completed" sense. Since we must solve a version of the "imperfective paradox" even with some simple form sentences, it seems reasonable to use the same solution for the problem with progressives as well.

The solution to the simple-form version of the "imperfective paradox" is to make use of the homogeneous interval-process derived from the corresponding heterogeneous interval-process. In other words, to use the function *hm-int-proc*. My solution to the general "imperfective paradox" problem is the same. That is, all progressives should be based on homogeneous interval-situations. This proposal is in contrast to Vlach's theory where the progressives of heterogeneous processes are based directly upon those heterogeneous processes. My proposal has the interesting result that the progressive actually has nothing directly to do with the "imperfective paradox", instead it merely inherits the problem from the homogeneous processes upon which the progressive is based.

Another problem with Vlach's proposal is that there are some progressives which are not based on processes at all, instead they are based on states.

As I discussed earlier, there is a class of interval states, such as *sitting* and *standing*, which can occur in the progressive. Thus, while the notion of *in the process of*, when applied to homogeneous processes, is adequate to account for all progressive processes, it is not sufficiently general to account for all progressives. Interval states are, of course, already states so they do not need to be stativized. However, what they do require is to be converted from situations that hold only at nonpoint intervals of time to situations that can hold at both points and intervals of time, or in other words, to point-interval-situations. Therefore, I propose to replace Vlach's *Stat* operator with the function *pt-int-sit*, which takes as its single argument a homogeneous interval-situation (process or state) and has as its value the corresponding homogeneous point-interval-situation. By defining this function such that it returns a point-interval-situation rather than a point-interval-state, we get the correct temporal properties, while leaving open the exact nature of the relationship between progressives and point-interval-states.

A final difficulty is caused by the existence of temporally measured interval states, such as *John stood in the corner for an hour*. Such measured situations are heterogeneous interval-situations, and they can be progressivized, as in *John was standing in the corner for an hour*. But, of course, measured interval-states are not processes and so the function *hm-int-proc* cannot apply to them. Therefore, I define a new function *hm-int-sit* which is simply a generalisation of *hm-int-proc*. *Hm-int-sit* takes as its argument a heterogeneous interval-situation (process or state) and has as its value the corresponding homogeneous interval-situation.

As an example of the application of these functions, consider the sentence *John was running for an hour*. This sentence is ambiguous between two readings which can be represented as follows (the *time* predicate asserts that a situation of the type named by the first argument holds or occurs at the interval or point of time named by the second argument):

- (i)  $\text{time}(\text{for}(\text{pt-int-sit}(\text{run}(\text{john})), \text{one-hour}), t1)$ , and  
 (ii)  $\text{time}(\text{pt-int-sit}(\text{hm-int-sit}(\text{for}(\text{run}(\text{john}), \text{one-hour}))), t2)$ .

The first reading is that there was an hour of *John's running*. This reading is strongly favored in the sentence *For an hour, John was running*. The second reading is that there was some period (not necessarily an hour) of *John's running for an hour*.

I call the second reading the "intentionality" reading because in such cases there is often a pragmatic implication that the agent has the actual intention of performing the action for a certain period of time. It should be noticed that reading (i) entails reading (ii), but, because of the "imperfective paradox", reading (ii) does not entail reading (i).

Although it is not as obvious, there is also an analogous simple-form version of this ambiguity. For example, *John ran for an hour* is ambiguous between the two readings:

- (i)  $\text{time}(\text{for}(\text{run}(\text{john}), \text{one-hour}), t3)$ , and  
 (ii)  $\text{time}(\text{hm-int-sit}(\text{for}(\text{run}(\text{john}), \text{one-hour}))), t4)$ .  
 In the simple-form case, reading (i) seems to be strongly preferred, and again, reading (i) entails reading (ii), but not vice versa.

It should be noted that there is an important restriction on the range of application of *hm-int-sit*. It does not apply to heterogeneous interval-situations which are themselves based on point-interval-situations. An example of such a heterogeneous situation would be a measured progressive, such as reading (i) of *John was running for an hour*. Another example would be a measured point-interval-state such as *John was busy for a week*. Among other things, this restriction disallows progressives of measured point-interval-situations.

#### Relationships Among Situation Types

The following rules express the relationships among the different types of situations.

1.  $\forall (s,t) . \text{subtype}(s, \text{heterogeneous-situation}) \ \& \ \neg \text{has-underlying-pt-int-sit}(s) \ \& \ \text{time}(s,t) \ \rightarrow \ \text{time}(\text{hm-int-sit}(s),t)$

This rule expresses the conditions under which it is permissible to apply *hm-int-sit*, that is, the conditions under which a heterogeneous situation has a corresponding homogeneous interval-situation. Naturally, because of the general "imperfective paradox" problem, the implication does not hold in the other direction. The second conjunct disallows the application of the function to heterogeneous situations based on point-interval-situations, as discussed above.

2.  $\forall (s,t) . \text{subtype}(s, \text{interval-situation}) \ \& \ \text{subtype}(s, \text{homogeneous-situation}) \ \& \ \text{time}(s,t) \ \leftrightarrow \ \text{time}(\text{pt-int-sit}(s),t) \ \& \ \text{greater-than}(\text{dur}(t),0)$

In one direction, this rule states that all homogeneous interval-situations have a corresponding point-

## ALMEIDA

interval-situation, i.e., a progressive form. In the other direction, the rule states that any progressive situation type that holds for some non-point interval of time has a corresponding homogeneous interval-situation that also holds for that interval. Thus we have *John played the piano* for some period of time iff *John was playing the piano* for that period of time.

3.  $\forall (s,t) . \text{subtype}(s, \text{homogeneous-situation}) \ \& \ \text{time}(s,t) \ \& \ \text{greater-than}(\text{dur}(t),0) \ \longleftrightarrow \ \text{time}(\text{for}(s, \text{dur}(t)),t)$

In one direction, this rule states that if a homogeneous situation holds for some nonpoint interval of time, then the corresponding measured situation also holds for that interval. In the other direction, this rule states that if a measured situation holds for some interval, then the underlying homogeneous situation also holds for that interval. For example, *John ran for an hour* holds for some interval (of the proper duration) iff *John ran* holds for the same interval.

4.  $\forall (s,t,d) . \text{time}(\text{hm-int-sit}(\text{for}(s,d)),t) \rightarrow \text{time}(s,t)$

Because of the "imperfective paradox",  $\text{time}(\text{hm-int-sit}(\text{for}(s,d)),t)$  does not entail  $\text{time}(\text{for}(s,d),t)$ , but, because measured situations are based upon homogeneous situations, it does entail  $\text{time}(s,t)$ .

### SUMMARY

In this paper, I have described an approach to the analysis of the aspectual classes. Based upon this analysis, I have proposed and argued for an approach to the analysis and representation of the aspectual progressive based on two ideas: (1) a function *pt-int-sit* which takes a homogeneous interval-situation as its argument and has as its value the corresponding point-interval-situation, and (2) a function *hm-int-sit* which takes a heterogeneous interval-situation as its argument and has as its value the corresponding homogeneous interval-situation. The first function is needed to account for the temporal properties of progressives, that is, for the aspectual effect of the progressive. The second function is needed to handle the "imperfective paradox" problem with progressives, and is, in addition, independently motivated by the need to account for the meanings of certain simple form sentences, such as *John played the sonata for twenty-five minutes*. Finally, the proposed theory is able to account for the range of applicability of the aspectual progressive.

### REFERENCES

- Almeida M.J. (1987) Reasoning about the temporal structure of narratives, TR87-10, Computer Science Department, SUNY at Buffalo, Buffalo, NY.
- Bennett M., & Partee B. (1972) *Toward the logic of tense and aspect in English*, System Development Corporation, Santa Monica, CA.
- Comrie B. (1976) *Aspect*, Cambridge University Press.
- Dowty D.R. (1979) *Word Meaning and Montague Grammar*, D. Reidel Publishing Co.
- Dowty D.R. (1986) The effects of aspectual class on the temporal structure of discourse: semantics or pragmatics?, *Linguistics & Philosophy*, Vol.9, pp.37-61.
- Goldsmith J., & Woisetschlaeger E. (1982) The logic of the English progressive, *Linguistic Inquiry*, Vol.13, No.1, pp.79-89.
- Moens M., & Steedman M. (1988) Temporal ontology and temporal reference, *Computational Linguistics*, Vol.14, No.2, pp.15-28.
- Nakhimovsky A. (1988) Aspect, aspectual class and the temporal structure of narrative, *Computational Linguistics*, Vol.14, No.2, pp.29-43.
- Passonneau R.J. (1988) A computational model of the semantics of tense and aspect, *Computational Linguistics*, Vol.14, No.2, pp.44-60.
- Taylor B. (1977) Tense and continuity, *Linguistics & Philosophy*, Vol.1, pp.199-220.
- Vendler Z. (1967) *Linguistics in Philosophy*, Cornell University Press.
- Vlach F. (1981) The semantics of the progressive, In P.J. Tedeschi & A. Zaenen (eds.), *Tense and Aspect*, Vol. 14 of *Syntax and Semantics*, Academic Press, pp.271-292.