

# The Semantics of the English Progressive and the Imperfective Paradox

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**Jae-II Yeom. 2003. The Semantics of the English Progressive and the Imperfective Paradox.** *Language and Information* 7.2, 139–161. The progressive in English is taken to be an operator which takes a non-stative predicate and returns a predicate which denotes a process with a temporal frame around some definite time or event. When it is combined with a predicate which has a culmination in the event, the sentence means that the culmination has not come yet. So the event denoted by the base predicate is not true at the current time. On the other hand, when it is combined with a predicate which has no culmination in the event, the event denoted by the base predicate is taken to be true. In this paper, this is explained by the semantics of the progressive based on the notion of contributiveness. I propose that a progressive sentence is verified by some subevents which are contributive to the current situation and the progress of the event beyond the threshold level of the event denoted by the base predicate. A sub-situation is contributive if the addition of it to the previous situation is more likely to lead to the whole situation than the previous situation. (Hongik University)

**Key words:** progressive, imperfective paradox, contributive, threshold level

## 1. Introduction

The research pursued here is to provide the semantics of the progressive in English. To do this, we need to understand the characterizations of the progressive. One of the most prominent is a problem known as the “imperfective paradox”. Vendler (1967) classified predicates into four aspectual classes: accomplishment, achievement, activity, and stative. The imperfective paradox comes from the

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distinctive semantics between accomplishments and achievements, on one hand, and activities, on the other.<sup>1</sup> Look at the following sentences.

- (1) a. John was walking.  
b. John walked.
- (2) a. John was building a house.  
b. John built a house.

In (1), the verb *walk* is an activity verb, and (1a) entails (1b). (1a) is true if John was in the activity of walking at some time in the past. This implies that John walked for some possibly longer time in the past. This makes (1b) true. On the other hand, the predicate *build a house* in (2) denotes an event of accomplishment, and (2a) does not entail (2b). (2a) is true if John is in the activity of building a house, but that does not imply that he finished building the house. (2b) is true only if the house was finished.

The following examples apparently indicate that some achievement predicates resist the progressive.

- (3) a. ? John is noticing the new dress she is wearing.  
b. ? John is recognizing the difficult position the company is in.

The progressive is used to denote an event which goes on for an extended period around some definite event or time. Noticings and recognizing are punctual, so it is difficult for them to be used to surround some definite time.<sup>2</sup>

However, other achievement verbs are used in the progressive, denoting the preparatory processes instead of the punctual moments of events themselves.

- (4) a. John was dying of cancer.  
b. The train was arriving at the platform when John got there.  
c. Mary is winning the race.

<sup>1</sup> Among these, stative predicates do not allow the progressive, with some exceptions. Here are some stative predicates that allow the progressive.

- (i) John's house stands on the top of a hill.  
(ii) Even after the forest fire, the two trees were still standing.

The progressive of a state predicate conveys that the state holds temporarily. When the implied duration is not temporary, the sentence is anomalous.

- (iii) ?? New Orleans is lying at the mouth of the Mississippi.  
(iv) ?? John's house is sitting at the top of a hill.

The semantics of the progressive is required to answer why this is so.

<sup>2</sup> Kearns (1991) claims that there are cases where an achievement verb is used in the progressive to denote an on-going event at an exact moment of utterance. Rewinding and re-viewing previously seen tape, a speaker can say, "He's touching it." Even though the event of touching is punctual, the speaker can time his or her utterance so that it can be within the event time of touching. As will be discussed, this is not quite general.

The event of dying can be regarded as punctual. But the progressive does not denote the punctual event but the processes which lead to John's death. We can say the same thing about *arrive at the platform* and *win the race*. This does not mean that the events denoted by achievement predicates include the processes as well, as Kearns (1991) shows. Consider some of her examples.

- (5) a. ? Jones is painting the fence; he will paint the fence this afternoon.  
 b. ? Mary is writing a letter and she will write it soon.
- (6) a. Jones is dying and will surely die this week.  
 b. Flight 246 is now arriving at Gate 20; it will arrive at the gate in exactly two minutes.

The predicates in (5) are accomplishment predicates. Notice that the discourses are awkward because the second mentioned predicates include the processes which lead to the culminations of the events, and the first occurrences of them are redundant.<sup>3</sup> Those in (6) are achievements, and such a redundancy does not occur here. This shows that events denoted by achievement predicates do not include the preparatory processes, that is, that there is no semantic relationship between the events and their preparatory processes. The fact that an achievement predicate can form a progressive implies that the preparatory processes of an event and the completion of the event only have pragmatic relationship. This will be clear below in the discussion of the notion of process.

Despite this difference between accomplishment and achievement predicates, achievement predicates also show the imperfective paradox, as accomplishment predicates do.<sup>4</sup> Sentence (4a) does not entail that John died of cancer. Similar observations can be made as to the other examples in (4). Considering the fact that there is no semantic relation between an achievement and its progressive, the imperfective paradox does not follow from the semantics of the predicates, but from some pragmatic facts that the events denoted by the predicates are preceded by some contextually given processes as the preludes to them. This also allows us to understand why predicates like *notice* and *recognize* do not allow the progressive: the events denoted by them are not normally preceded by some prelude processes to the ultimate events denoted by them.<sup>5</sup>

We can observe the opposite direction of entailments in both accomplishment and activity predicates. (1b) and (2b) entail (1a) and (2a) respectively. As for achievement predicates, it is not easy to say the same thing. The sentence *John*

<sup>3</sup> In this respect, Lascarides (1991) is not quite right when he claims that all atomic predicates are homogeneous including accomplishment predicates, and take accomplishment and achievement predicates to be punctual.

<sup>4</sup> In this respect, it is plausible to classify predicates into three aspectual groups: events, which corresponds to the combination of accomplishment and achievement predicates, processes, which correspond to activities, and states, following Mourelatos (1978). But considering the difference we have observed, it would be better to distinguish them.

<sup>5</sup> Lascarides (1991) assumed that all event predicates with culmination necessarily have preparatory processes which lead to the eventual result. This seems to be wrong considering these cases. Higginbotham (2003) also seems to propose that achievement predicates have a process and the culmination of an event, as accomplishment predicates do.

*died of cancer* may implicate that John was dying of cancer because when a person died of cancer it will take time for a cancer to develop and finally kill him or her. But sentences like *John died* do not necessarily mean that John was dying because there's a case where John died abruptly. Here I do not mean that the verb *die* never allows preparatory processes.

Activity predicates allow the progressive, as accomplishment and achievement predicates do. But the way they are interpreted in the progressive is not the same. The progressives of the latter two types of predicates denote the preparatory processes to the culminations of the events denoted by the predicates themselves. On the other hand, the progressives of activity predicates do not denote any preparatory processes. This is closely related to the mutual entailment relations between (1a) and (1b). In the next section, we will look at the aspectual classification of predicates. This will allow us to see why this is so.

## 2. Aspectual Classification of Predicates and the Progressive

Among the four classes of predicates, statives are homogeneous in the sense that if a state holds at an interval  $I$ , then the same state holds at all sub-intervals of  $I$ . Activity predicates are not homogeneous in the same way as statives, but they show homogeneity in a limited way: if an activity holds at an interval  $I$ , then the same activity holds at all sub-intervals which are larger than the minimal interval for the activity. For example, walking is not absolutely homogeneous because at a very short interval a simple movement of a leg may not be regarded as a walking. But in the domain of longer intervals than the minimal at which some series of action can be taken to be a walking, the activity of walking can be said to be homogeneous.

An accomplishment predicate involves the culmination of an event as a unit. So if an accomplishment holds at an interval  $I$ , then the sub-event at a smaller interval is no longer taken to be the same type of event. At least the sub-event may not include the culmination of the whole event. So an accomplishment predicate is not homogeneous. An achievement also involves the culmination of an event, but it does not include any preparatory process, as shown in (6). So it does not make sense to ask whether an achievement is homogeneous. But it can be taken to be homogeneous in the sense of Lascarides (1991). For an achievement, the only sub-interval is the interval for the achievement event itself. So for an interval at which an achievement holds, the same type of event holds at every sub-interval (actually the only sub-interval).

The classification of predicates with respect to homogeneity does not seem straightforward. We can introduce the notion of cumulativity, which is slightly different from homogeneity. I define the notion with respect to sentences.

- (7) A sentence  $p$  is cumulative  $\leftrightarrow$  if (i)  $p$  holds at intervals  $I$  and  $I'$  ( $I \neq I'$ ) and (ii)  $I \oplus I'$  is also an interval, then  $p$  holds at  $I \oplus I'$ .<sup>6</sup>

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<sup>6</sup> The sum operator  $\oplus$  between objects is defined below.

We can easily see that statives and activities are cumulative. If John is happy at  $I$  and  $I'$  ( $I \neq I'$ ) and  $I \oplus I'$  is an interval, then John is happy at  $I \oplus I'$ . So states are cumulative. Activities are cumulative, too. If John walks at  $I$  and  $I'$ , he also walks at  $I \oplus I'$ . A sentence with an accomplishment predicate is not cumulative because the event denoted by the predicate is a unit and the event at a larger interval is no longer taken to be a unit. For example, if the event of building a house holds at an interval  $I$  and  $I'$ , then at the interval  $I \oplus I'$  holds the event of building more than a house, not the event of building a house. Sentences with achievement predicates are not cumulative either. If the event of winning a race holds at  $I$  and  $I'$ , then the same event does not hold at  $I \oplus I'$ . If  $I \oplus I'$  is defined naturally as an interval for the event of winning a race (though dubious), the event of winning a race repeatedly or winning more than one race will hold at  $I \oplus I'$ . Cumulativity is a more straightforward and appropriate notion than homogeneity in distinguishing predicates.<sup>7</sup>

The progressive is an aspectual function from any sentences to cumulative sentences. Statives resist the progressive. The progressive with an activity predicate is cumulative over the domain of all intervals. If John is walking at  $I$  and  $I'$  and  $I \oplus I'$  is an interval, then John is walking at  $I \oplus I'$  too. Accomplishments and achievements are not cumulative, but their progressives are cumulative in a limited domain of intervals. If a sentence with an accomplishment predicate holds at  $I$ , then the progressive of the accomplishment predicate is cumulative over the domain of sub-intervals of  $I$ . If John builds a house at  $I$ , then John is building a house at a subinterval  $I'$ . If John is building a house at  $I$  and  $I'$  and  $I \oplus I'$  is an interval, then John is building a house at  $I \oplus I'$ . If an achievement holds at  $I$ , the progressive of the achievement predicate is cumulative over some domain of intervals before  $I$ . If John wins a certain race at  $I$ , he is winning the race at some interval before  $I$ . If John is winning a certain race at  $I$  and  $I'$  and  $I \oplus I'$  is an interval, then he is winning the race at  $I \oplus I'$  too.

### 3. Review of the Previous Studies

As attempts to account for the imperfective paradox, there are two directions of analyzing the English progressive. Dowty (1977, 1979) resorts to the notion of inertia world claiming that the progressive introduces an intensional context. This approach is based on the assumption that a predicate used in the progressive is not ambiguous. Researchers like Landman (1992) follow this line of approach. The other approach is that the progressive takes a predicate of process as its complement invariantly. In this analysis, a predicate used in the progressive is not simply an inflected form of the base form, but is in fact a distinct predicate true of processes rather than events with culmination. This view is supported by Vlach (1981), Parsons (1989, 1991) and Higginbotham (1990). Lascarides (1991)

<sup>7</sup> The two notions are similar and are expected to capture the same property of stativity and activity, but they are not the same. Strictly speaking, activity is not homogeneous while stativity is. But both are cumulative. One referee claims that both notions are interdefinable. He or she must explain why an activity predicate is cumulative, but not homogeneous.

basically follows this line of approach even though she does not assume that a non-process predicate used in the progressive is ambiguous. Instead she assumes that the progressive introduces the operator *Pr* which takes a non-process predicate and changes it into a process predicate. I will briefly discuss the latter view briefly first, and then continue to discuss the intentional analysis of the progressive.

### 3.1 Aspectual ambiguity view of predicates

The ambiguity view that the base predicate of a progressive is invariably a process predicate regardless of whether it can be used originally as an accomplishment or achievement predicate.<sup>8</sup> On this view, the imperfective paradox does not occur. Instead other problems arise.

First, this analysis does not assume an intensional context. So they argue that the indefinite in the following example can denote an incomplete object.

- (8) John is building a house.

The indefinite *a house* is claimed to denote an incomplete house. But this claim cannot apply to other examples. Consider the following examples.

- (9) a. John was making an apple pie.  
b. We are hiring a graphic designer.

The first sentence includes a creation verb, just like the verb *build*. But in this case the sentence can be true when John had done no more than got out the apples, flour and so on and there is no (incomplete) apple pie at all later on. In the second example, we cannot assume that there is an incomplete graphic designer because the verb is not a creation verb. And we cannot say that the indefinite *a graphic designer* refers to an actual individual. In this respect, we need to assume that a progressive introduces an intensional context.

Second, if a predicate is really ambiguous, the second sentence in the following example is expected to entail the first sentence.

- (10) a. John was drawing a circle.  
b. John was drawing an arc.

If the first sentence denotes a process, the process is the event of drawing an incomplete circle, that is, an arc. So it would simply mean that John was drawing an arc. But the second sentence does not entail the first. The reason is that the progressive of a telic predicate does not simply denote the process for the telic event, but the process event with respect to the telic event; the semantics of the

<sup>8</sup> Lascarides's (1991) analysis is not an ambiguity analysis, but shares the same assumption that the progressive morpheme selects process predicates as its complement invariably. In her analysis, when an accomplishment verb is used in the progressive, an operator is assumed to convert it into a process predicate. The process is derived from the necessity relation of the processes to the culmination of the telic event. But the relation cannot be applied to achievement predicates. The meanings of certain achievement predicates don't include any necessary processes. Processes for the event denoted by an achievement predicate are determined in pragmatic considerations.

progressive must be defined with respect to the culmination or the whole event of the telic event. I suppose that the only difference between the two examples here is whether John has the intention to draw a circle or an arc. Having an intention is not a process but a state.

Third, if a predicate is really ambiguous between an accomplishment reading and a process reading, then it is expected that the process reading is observed other than in the progressive. But process readings arise only when they are forced/coerced aspectually, as in progressives. This makes the ambiguity view dubious. The process reading seems to come from the semantics of the progressive.

Finally, in the ambiguity view of base predicates in the progressive, there is no explanation of why the progressive of an impossible accomplishment or achievement is false. Consider the following example.

- (11) Rebecca is crossing the Atlantic Ocean.

When Rebecca has just started to swim and she is not good at swimming, this sentence is taken to be false. But she is in the process of crossing the Atlantic Ocean. The ambiguity view needs to give some explanation to this kind of examples.

### 3.2 Intensional analyses of the progressive

Dowty's (1977, 1979) proposal has been criticized in various studies. His proposal of the interpretation of a progressive sentence is the following.

- (12) Dowty's (1979) Normality Approach

$Prog(\alpha)$  is true at  $\langle I, w \rangle$  iff for some interval  $I'$  such that  $I$  is properly included in  $I'$  and  $I$  is not a final subinterval for  $I'$ , and for all  $w'$  such that  $w' \in Inr(\langle I, w \rangle)$ ,  $\alpha$  is true at  $\langle I', w' \rangle$ .

An inertia world  $w' \in Inr(\langle I, w \rangle)$  is one which is identical to the actual world  $w$  up to and including  $I$ , and thereafter meets certain conditions: in Dowty's words, "in which the future course of events after this time develops in ways most compatible with the past course of events", or in which events transpire as expected without any interference, or in which the "natural course of events" takes place.

The original idea of Dowty's analysis has been criticized in various aspects, and new proposals have been proposed. Below I will discuss problems with Dowty's analysis, and other proposal within the scope of intensional analyses.

**Complex event problem:** As Vlach (1981) points out, the interval semantics Dowty proposed did not capture the fact that for a progressive to be true at a time, there must at that time be an ongoing process relevant to the ultimate event: we cannot say that John is dying simply because his death is inevitable, or that Mary is going to work at the very moment when she retires for the night, even if she will go to work in some hours. A more complex case is like the following.

- (13) John was winning the race.

This sentence is construed as true only when John was leading the race even if he sometimes was fell behind in the race. Dowty's analysis has this problem

because the truth value of a progressive sentence is determined only by what happens at the endpoints of an interval with no restriction on the interval. This suggests that the truth value of a progressive sentence be defined with respect to the event denoted by the base predicate of the progressive and whatever processes constitute, or give rise to, the event. The interval is simply the location of the event and processes on the time.<sup>9</sup> Other proposals try to solve this problem by relating the current processes so far to its culmination. At the bottom of this lies the relation of 'part-of'. But 'part-of' relation only applies to accomplishments and activities, not to achievements.

**Problem with achievement predicates:** It is well known that achievement predicates denote punctual events, as shown above. But the truth of a progressive must be defined with respect to the processes which lead to the culmination of the whole event, as shown in the discussion of the complex event problem. In the case of achievement predicates, since the processes are not part of the basic meaning of the base predicate, there is no direct semantic relation between the whole event and the processes. Consider the following example.

(14) John was dying of cancer. (=4a)

In this example, the progressive must be evaluated with respect to the process(es) at some interval  $I$  in the past, but it is interpreted as true when John dies of cancer at some interval  $I'$  including  $I$  in inertia worlds. But the event denoted by the achievement predicate holds only at the endpoint of  $I'$ . This shows that the relation of the processes to John's dying of cancer must not be based on the semantics of the predicate itself. So neither Lascarides's (1991) necessity relation or Higginbotham's (2003) complex event structure does not solve this problem.<sup>10</sup>

<sup>9</sup> To avoid this problem, Higginbotham (2003) adopts a way of expressing a more complex event structure like 'go to work( $x, (e, e')$ )', where  $e$  is a process and  $e'$  is the telos (termination/culmination) of the whole event. A progressive is evaluated with respect to the interval in which part of the process  $e$  holds in the actual world. In this analysis 'event' is the fundamental notion, and an interval is derived from the event which holds at that interval, so the truth value depends on whether part of the relevant processes hold at the relevant interval.

Lascarides (1991) proposes a necessity relation between a process which makes the progressive true and the culmination of the event denoted by the base predicate: the culmination of a telic event has necessary processes for it. This will ensure that the truth condition for a progressive sentence requires the relevant process for the culmination of the ultimate event.

Landman (1992) also tried to explain the necessity of current relevant processes by proposing that a progressive  $Prog(\alpha)$  is true iff there is an event/process  $e$  which can be extended to  $e'$  such that  $e''' = e' \oplus e''$  is an instance event which has a reasonable chance to occur and which has the same property as  $\alpha$ . Here  $e$  is necessarily a relevant event to the culmination of  $\alpha$ .

<sup>10</sup> Higginbotham (2003) proposes the following truth-condition of the progressive.

- i.  $Prog_w(e, P) \leftarrow$  the world  $w'$  that is inertial with respect to  $(w, e, P)$  is such that  $(\exists(e', e''))[e$  is an initial segment $_{(w', e)}$  of  $e'$  &  $P_{w'}((e', e''))]$

Here the pair of variables includes  $e'$  for the processes and  $e''$  for the culmination. This implies that the processes are part of the meaning of an achievement predicate. But I have shown that it is not the case. For achievement predicates, the processes are just



**Interruption/continuity problem:** Vlach (1981) pointed out that Dowty's analysis always falsifies the following sentences:

- (15) Rebecca was crossing the street when she was hit by a bus driven by a very inattentive driver. (Vlach 1981)

In this sentence, the event of Rebecca crossing the street is interrupted by the bus driven by an inattentive driver. But the sentence can be taken to be true.

Consider one more example.

- (16) a. Max is winning the race.  
b. John is sabotaging the race.

Both sentences can be true, but according to Dowty's analysis the two sentences cannot be both true. If the second sentence is to be true, in normal courses of events the race will never be completed. Then Max will never win the race. If the first sentence is to be true, Max has to win the race in normal course of events. But then John will fail to sabotage the race, which will make the second sentence false. This shows that normal courses of events must be relativized with respect to events as well, rather than simply relativized with respect to intervals and worlds.<sup>11</sup>

Landman (1992) suggests that a progressive is evaluated with respect to a continuation of the current event ignoring *external* interruption. A problem with this idea is that he does not define exactly what is internal/external to an event. Consider the following example.

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pragmatically implied part of the event. I want to note in passing that inertial worlds are defined with respect to the property  $P$  as well as a world  $w$  and an event  $e$ . This idea will be adopted in this paper below.

<sup>11</sup> Vlach (1981) proposed a way of avoiding this problem.

- i.  $Prog(p)$  is true iff in those worlds where the event  $e$  described by  $Prog(p)$  continues after the reference time of  $Prog(p)$   $e$  is a part of an event  $e'$  described by  $p$ .

By this Vlach suggests that an interruption coming from outside the event we are referring to does not affect the truth of the progressive sentence. Landman (1992) pointed out a problem with this suggestion. This leads to the problem of impossibility.

**The impossibility problem:**

If the event in question gets completed against all odds, it is difficult to explain why the following sentence is normally taken to be false.

- (11) Rebecca was crossing the Atlantic Ocean.

For this problem, Landman (1992) proposes the concept of "a reasonable chance on the basis of what is internal to  $e$  in  $w$ ".

- i.  $Prog(p)$  is true iff in those worlds where there are no event-external interruptions the event  $e$  described by  $Prog(p)$  has a reasonable chance to be part of an event  $e'$  described by  $p$ .

Dowty's analysis also can have a problem with the example (11). Suppose that later Rebecca miraculously crossed the Pacific. Even in this case, Dowty's analysis predicts that the sentence is false, contrary to our intuition.

- (17) John is writing two programs at the moment, but he is going to finish only one.

In this example, there is no external interruption which forces John to stop writing the two programs, but he is expected to finish writing only one program under the assumption of the truth of the sentence. The progressive must be evaluated with respect to the current events which may be interrupted later and which are part of the whole event of the base predicate.

**Culmination problem:.** Dowty (1977, 1979) (and Landman (1992) also) fails to explain why the following progressive is awkward, as pointed out by Mittwoch (1988).

- (18) # The level of the lake was rising ten feet when Mary arrived.

When the level of the lake rose one foot and it was expected to rise continuously, the level of the lake could rise ten feet and more. In this case, the event of the level of the lake's rising ten feet would happen at an extended interval in all inertia worlds. But the progressive is awkward. The reason is that there is no culmination, or *telos* in terms of Higginbotham (2003), of the event. The level of the lake can rise more than ten feet, or less than ten feet.

Sentence (18) is contrasted with the following.

- (19) John was running ten miles.

This sentence is not acceptable in its ordinary interpretation. But if John was doing his usual project of running ten miles, then this sentence can be accepted. The event of running ten miles as one's usual project constitutes a unit of event and the completion of it is the culmination of the event. When the event is not regarded as a *ur.it*, the progressive is awkward.

A progressive with a numeral expression can have a different reading. Consider the following example.

- (20) John is building three houses.

This sentence can be interpreted in two ways. One is that John is building three houses one after another, and the other is that John is building the three houses simultaneously. But the sentence has only the reading of simultaneous building. The analysis of the progressive must explain these facts.

**Perspective problem:.** This was brought up by Landman (1992) borrowing a term from ter Meulen (1987). Suppose that a plane just left for London, but that a team of hijackers were aboard to take it to Havana. In this context, the following two sentences can be true.

- (21) Rebecca was flying to London when the plane was hijacked.  
(22) Rebecca was flying to London; well, in fact she was't, she was flying to Havana, but she didn't know at that time.

These two sentences can be true, but we do not think that they are contradictory. On one perspective, the event of flying to London starts when the plane takes off and continues until it is hijacked. On this perspective the first sentence is true. On the other perspective, the event of flying to Havana starts with the take-off of the plane with the hijackers aboard and continues until it lands at Havana. In this case, the hijacking is part of the process. Even if both sentences are true, the following sentence cannot be true.

(23) Rebecca was flying to London and to Havana.

There is no perspective on which both progressives are true. The semantics of the progressive should be able to explain this problem.<sup>12</sup>

#### 4. The semantics of the progressive

##### 4.1 So-called processes in the progressive

If the progressive is to be interpreted compositionally, it should be determined what the denotation of the base predicate is. Higginbotham (2003) and Zucchi (1997) show that the base form of a telic predicate used in the progressive is telic.<sup>13</sup>

One question to ask is whether the progressive morpheme selects only process predicates. If it does, the process counterpart of an accomplishment or achievement predicate should be defined as a predicate which denotes processes. But it is not plausible. Suppose that John is drawing a rectangle. The process of drawing a rectangle consists of four events of drawing an edge. When John has drawn two edges and stopped to drink coffee, we still say that John is drawing a rectangle. If the truth value of a progressive sentence is determined by the process at the moment, what process makes the sentence true? Probably the state of John's intending to continue drawing two more edges to finish a rectangle. In this case there is no actual process of drawing edges at the moment that makes the sentence true. This shows that the progressive morpheme does not necessarily select process predicates. The events of drawing the first two edges are not processes themselves,

<sup>12</sup> Higginbotham (2003) proposes that inertia worlds are selected with respect to the property of the event denoted by the base form of the progressive as well as to an interval and the world. In the example above, the closest world with respect to the property of going to London is the one in which there was no hijacking. On the other hand, the closest world with respect to the property of going to Havana is the one in which there is an event of hijacking.

<sup>13</sup> Consider the following examples.

- i. a. I saw John cross the street.  
b. I saw John crossing the street.
- ii. a. For Mary to cross the street would be a mistake.  
b. Mary quickly crossing the street is a welcome sight.

If sentence (i<sub>a</sub>) is true, John must have reached the other side of the street. But not so with (i<sub>b</sub>). Sentence (ii<sub>a</sub>) makes sense when a terrible danger awaits Mary on the other side of the street. On the other hand, (ii<sub>b</sub>) can be true even if it is uttered in the middle of crossing.

but they can be regarded as processes only with respect to drawing a rectangle. In this example, the intention to continue drawing two more edges makes the progressive true. At the moment John has drawn only two edges, he might draw only one more edge to draw a triangle. Then can we say that the intention to draw two more edges to finish a rectangle is a process to drawing a rectangle? Probably not. It is implausible that a state is a process.

Even if we assume that the progressive morpheme selects a process predicate, the meaning of the process predicate from a non-process predicate is not semantically specified, as Lascarides (1991) claims. As pointed out above, achievement predicates denote only the culminations of the events: they do not include processes to the culminations semantically. So it is impossible to define a process predicate from an achievement predicate semantically. The meaning of the derived process predicate is determined pragmatically. This weakens the argument that the progressive morpheme selects process predicates.

For these reasons, we should give up the idea that a progressive selects a process predicate. And the truth value of a progressive must be defined in terms of the meaning of the base predicate of the progressive. One difficulty with this type of analysis is how to specify the current state of affairs which makes a progressive true with respect to the event denoted by the base predicate. I suppose that an event denoted by the base predicate of a progressive consists of sub-events which are taken to be the so-called "processes" to that event. But what makes a progressive true are not so-called processes, but events or states which are contributive to the event denoted by the base predicate. I will discuss this in detail below.

I do not distinguish events, processes or states. I would rather use the term 'situation', which is expressed by the variable  $s$ . Situations constitute a part structure defined as follows:

(24)  $P = \langle U, \oplus, \sqsubseteq, \otimes \rangle$  is a part structure iff

- a.  $U$  is a set of entities;
- b.  $\oplus$ , the sum operation, is a function from  $U \times U$  to  $U$  that is idempotent ( $x \oplus x = x$ ), commutative ( $x \oplus y = y \oplus x$ ), and associative ( $x \oplus (y \oplus z) = (x \oplus y) \oplus z$ );
- c.  $\sqsubseteq$ , the part relation, defined as:  $[x \sqsubseteq y \leftrightarrow x \oplus y = y]$ ;
- d.  $\otimes$ , the overlap relation, defined as:  $[x \otimes y \leftrightarrow \exists z \in U [z \sqsubseteq x \wedge z \sqsubseteq y]]$

A situation  $s_i$ , which can be an event or a state, is regarded as a process because it is part of the situation  $s$ , not because it is a process itself. We assume a function  $\tau$  from the set of situations to the set of intervals at which the situations are located. Then the order of situations can be fixed from the order of intervals. The notion of process is defined with respect to a more extensive situation:

(25) A situation  $s$  is a process to a situation  $s'$  iff  $s \sqsubseteq s'$  and there is a sub-situation  $s''$  of  $s'$  such that  $\tau(s) \preceq \tau(s'')$ , where  $\alpha \preceq \beta$  means ' $\alpha$  precedes  $\beta$ .'

A situation is a process to a larger situation iff it is a proper part of the larger situation.

Under this assumption, we can express a situation denoted by an accomplishment or achievement predicate as a composite of various sub-events/states. The meanings of *build a house* and *die* are illustrated in the following.

- (26) a.  $\lambda s \exists x, y [house(y) \wedge build(x, y, s) \leftrightarrow \exists \dots s_i P_i(x, \dots, s_i) \wedge \dots \wedge \exists \dots s_j P_j(x, \dots, s_j) \wedge \tau(s_i) \oplus \dots \oplus \tau(s_j) = \tau(s)]$   
 b.  $\lambda s \exists x [die(x, s) \leftrightarrow \exists \dots s_k P_k(x, \dots, s_k) \wedge \dots \wedge \exists \dots s_l P_l(x, \dots, s_l) \wedge \tau(s_k) = \dots = \tau(s_l) = \tau(s)]$

Here a situation  $s$  of building a house may consist of a series of events/states  $s_i, \dots, s_j$ :  $s = s_i \oplus \dots \oplus s_j$ . When  $s_j$  is finished,  $s$  is finished too. If  $s_n$  ( $i \leq n \leq j$ ) is finished at the moment and the agent  $x$  intends to finish  $s$ , then  $x$  is building a house. But I am not claiming that intention is an essential part of the truth-condition of a progressive. It is one of the factors that could lead to the culmination of the event denoted by the base predicate. In a sentence like *An apple is falling to the ground*, there is no agent who intends to finish the event of falling to the ground. The relation of  $s$  to the sum of the situations  $s_i, \dots, s_j$  is not a necessity, as I said above. The sum of the intervals for the sub-situations is the same as the interval for the whole situation. This means that the interval of each sub-situation is part of the interval for the whole situation. On the other hand, the meaning of *die* given in (26ii) does not include any processes before the moment of dying. All sub-situations are part of the whole situation, but I assume they are simultaneous. That is, they all hold at the moment of dying. But there are cases where pragmatically some events/states can be conceived as preparatory processes to the situation of dying. These are not part of the situation denoted by the base predicate itself. The progressive of *die* refers to these processes. So we need a different notion than ‘part-of’ for the progressive of an achievement predicate.

#### 4.2 Threshold levels of situations

In the progressive, the processes must be related to the culmination of the event somehow. The relation cannot be any type of necessity because the processes can be stopped in the middle of it. The progressive was analyzed as a counterfactual by Dowty (1977, 1979), Vlach (1981), etc. A simple subjunctive analysis is rejected by Landman (1992). Considering the example of *The coin is coming up tails*, it is not a matter of probability either. Suppose that the probability that the coin is coming up tails is 0.95. Even in this case, when you toss the coin, it is not true that the coin is coming up tails.

Normality is the idea Dowty (1977, 1979) and Landman (1992) proposed for the truth condition of the progressive. But as I mentioned, Dowty related it to intervals, not to events. This gives rise to various problems, as mentioned in the previous section. Landman (1992) also uses the idea of normality in the notion of reasonable option. Roughly, in his analysis, a progressive sentence *Prog(e, P)* is true iff there is an *reasonable/normal* extended event  $f$  from  $e$  such that  $f$  is

of the event-type  $P$  denoted by the base predicate of the progressive. From the notion of reasonable option, he can explain the falsity of the following sentence.

(11) Rebecca is crossing the Atlantic Ocean.<sup>14</sup>

Under the assumption that Rebecca is not a good swimmer and that the sentence is uttered when she has just started, normally Rebecca is not expected to cross the Ocean, which makes the sentence false. The simple notion of normality, however, is not the factor which determines the truth value of a progressive. Consider the following example.

(27) Rebecca is running across the minefield.

In a normal situation, no one is likely to run across the minefield, and nor is Rebecca. Then Landman would predict that the sentence is false, against our intuition. I suppose that neither of the two sentences has a reasonable chance that the relevant situations are accomplished, and that the difference between the two examples is that one is about a matter of ability and the other is not. Swimming across the Atlantic Ocean is impossible for ordinary people. In this case, the sentence can be verified only if the evidence for the ability is observed. So the progressive can be verified only if the distance she swam is long enough to show this. The sentence is taken to be false because the sentence is uttered when the distance she swam is very short. If the same sentence is uttered when she swam more than half the full distance, beyond her usual ability, with some divine intervention, then the sentence can be taken to be true. Or, suppose that Rebecca is a good swimmer, and that her ability is already proved. In this case the sentence can be verified when she has just started to swim across the Ocean.<sup>15</sup> On the other hand, when Rebecca has just started to run toward the other side of the minefield, the sentence *Rebecca is running across the minefield* can be true because it is not a matter of ability, but a matter of intention. For the sentence to be verified, the actual state of affairs has only to show that she has started running toward the other side of the minefield and she has the intention to reach the other side. This shows that different progressives require different levels of progresses of the situations.

<sup>14</sup> This is an example by which Landman (1992) rejects the simple subjunctive analysis of the progressive. There is a possibility that Rebecca crosses the Atlantic Ocean, regardless of how unlikely she is to do so. This may make the sentence true. Landman assumes that Rebecca is a poor swimmer, and supposes two scenarios which give different truth-values to this sentence. A more precise truth condition is necessary to distinguish them. In a scenario in which Mary actually crossed the Atlantic Ocean through divine intervention, the sentence can be taken to be true, even if it is normally expected for her to fail to cross the Ocean. A continuation stretch is searched from the same world as the actual world or the world in which a normal extension is found. Without such divine intervention, she normally fails to cross the Ocean, and the sentence is taken to be false.

<sup>15</sup> Naumann and Piñón (1997) claim that even when the agent has just started to swim, the sentence can be true if the agent has the intention to cross the Ocean. This indicates that there are two perspectives from which the progressive can be evaluated. It is easily observed that for the progressives of agentive predicates, intention is one of the major factors which verify them.

In some cases, the event must be finished in order for the progressive to be true. Consider the following examples, which are from Engelberg (2001).

- (28) a. At five, Linda was drying her hair but in the end, it wasn't completely dry.  
 b. ?? At five, Rebecca was killing John but in the end, he wasn't dead.  
 c. ?? At five, she was burning down the house, but in the end she hadn't burnt it down.

The first example shows that when the sentence is true, the process of drying one's hair can be stopped in the middle. But for the progressives of *kill somebody* or *burn down a house*, the denial of the event's culmination is nearly impossible. These differences between sentences cannot be explained simply in terms of the culmination of the event denoted by the base predicate of the progressive. There seems to be some threshold level of progress of a situation that verifies each progressive sentence. I suppose that it is determined pragmatically by the context of utterance.

Let  $c$  be a context and  $\theta$  be a function from the set of the whole situations denoted by the base predicate to the set of the threshold levels of the situations in a context.

- (29) a. The set of the threshold levels of the property  $P$  in a context  $c$  (i.e.,  $\theta_c(P) = \lambda s \forall w \in c \forall w' \exists s' [w' \in \mathcal{INR}(w, s, P) \rightarrow P_{w'}(s')]$ )  
 b. A situation  $s'$  is over the threshold level of the property  $P$  in the context  $c$  iff  $\neg \exists s [\theta_c(P)(s) \wedge s' \sqsubseteq s]$ .

$P$  is a predicate which holds of the whole situations as its arguments. And  $c$  is assumed to be a set of possible worlds which are compatible with the context. The function  $\theta_c$  takes a predicate  $P$  in  $c$  and yields a set of threshold levels of the situations. The function  $\mathcal{INR}$  takes a triple of a possible world, a threshold level  $s'$  of a situation  $s$ , and the property  $P$  and gives rise to a set of inertial worlds in all of which the situation  $s$  holds. Note here that  $\mathcal{INR}$  is defined with respect to  $P$ . This plays the role of determining whether the situation  $s$  can be regarded as part of any event  $f$  which has the property of  $P$ . When there is a situation  $s$  in  $w$ , it makes the progressive true only when it is regarded as part of any complete situation  $f$  of property  $P$ . In other words, if  $s$  is regarded as part of any complete situation  $f$  of property  $P$ , then it is true that there is a set of possible worlds in which  $s$  has been extended into  $f$ . This relation is captured by the function  $\mathcal{INR}$ . A threshold level of a situation is the level of situation which begins to be regarded as part of its complete situation, and it must guarantee that in the set of inertial worlds from that threshold level the the complete situation holds.<sup>16</sup> A situation  $s'$  is beyond the threshold levels of  $P$  iff  $s'$  is larger than all threshold levels of situations which are true of  $P$ . There may be some threshold

<sup>16</sup> Inertial worlds are originally defined only with respect to a possible world and an interval in Dowty (1977, 1979), but the function  $\mathcal{INR}$  defined with respect to a property  $P$  as well as a possible world and a situation  $s$  basically follows Higginbotham (2003), though the analysis of the progressive here is quite different from his.

levels of situations which only partially overlap with  $s'$ : that is, some threshold levels which do not have 'part-of' relations with  $s'$ . They do not play any role in the condition. So I state that if a situation  $s'$  is beyond the threshold levels of a predicate  $P$  if there is no larger threshold level than  $s'$ .

In the example of crossing the Atlantic Ocean, if Rebecca is not good at swimming and has started to swim, it is not regarded as part of crossing the Atlantic Ocean. So the progressive is taken to be false. But if Rebecca has swum beyond the threshold level of swimming across the Atlantic Ocean, it begins to be regarded as part of crossing the Atlantic Ocean. In the case of running across the minefield, the threshold level is low, and when Rebecca has started to run, it is regarded as part of running across the minefield. I want to point out that Rebecca's intention is only part of, but not essential part of, the threshold level of situation. Even if Rebecca has the intention of crossing across the Atlantic Ocean, it is not beyond the threshold level of the complete situation. Again there are also progressives where intention is not involved at all.<sup>17</sup>

### 4.3 Contributive situations

For an accomplishment predicate, the progressive has to be related to some sub-situations of the whole situation from the predicate. Consider the following sentence.

(30) John was killing Rebecca.

This is true when John stabbed Rebecca a couple of times, but not when Rebecca collapsed lying on the floor. This can be accounted for by the notion of 'part-of'. The event of stabbing is part of the event of killing, but the event of collapsing is not. The event of John's killing Rebecca only consists of John's actions which lead Rebecca to death, not of Rebecca's actions. An accomplishment predicate denotes a situation which consists of heterogeneous sub-situations each of which contributes to the culmination of the whole situation.

The activity predicates also denote some sub-situations which are part of the whole situations.

(31) John was walking.

The progressive denotes some part of the whole situation of walking.<sup>18</sup>

<sup>17</sup> One referee points out that the notion of threshold level of situation depends on contexts. It should be the case considering the example of Rebecca's crossing the Atlantic Ocean. I showed that the threshold level changes depending on the contexts in which the progressive is evaluated. One more point he or she made is that the speaker's point of view is important in determining the threshold level of a situation. In reality, it may be the case, so it may lead to an argument between speakers. But linguistically, the truth-condition may not be defined with respect to the speaker's point of view. We cannot say that Rebecca is crossing the Atlantic from A's point of view and that Rebecca is not crossing the Atlantic from B's point of view. Otherwise there would be no argument between A and B. They can argue about the truth of what they say because they claim that what they say is true irrespective of their personal perspective.

<sup>18</sup> In some cases the progressive does not denote part of the whole situation. Consider the following example.



On the other hand, an achievement predicate does not denote part of the whole situation because the predicate itself does not include the processes to the culmination of the situation. Consider the following example.

(32) John was winning the race.

When a person wins a race, he sometimes leads the race and sometimes falls behind the race. But the sentence is taken to be true only when John was leading the race even if he sometimes fell behind in the race. And it is difficult to say that the situation of falling behind the race is not part of the situation of winning the race. This suggests that a progressive is interpreted with respect to the situations at the interval in question and that the current situation must be contributive to the culmination of the final situation denoted by the base predicate of the progressive. This is not a relation of necessity. The event of winning a race needs the event of starting the race, but we cannot say that a runner is winning a race when he has just started the race. The reason that leading the race verifies the progressive is that the situation is contributive to winning the race, not that it is necessary for winning the race. Once he is falling behind, he is not winning the race any more.

This shows that what verifies a progressive sentence are contributive sub-situations, not simply part of the situation. Let  $s''$  be the previous situation and  $s'$  be a situation which holds at the current time. Then we can define the notion of contributiveness as follows:

- (33) a. A situation  $s'$  is contributive to  $P$  at a situation  $s''$  in  $w$  (formally,  $s' \triangleright_{s'', w} P$ ) iff  $s'' \oplus s'$  is closer to  $P$  than  $s''$  in  $w$ , but not to  $\neg P$ .
- b. A situation  $s \oplus s'$  is closer to  $P$  than  $s$  in  $w$  iff  $\{w' | w' \in \mathcal{INR}(w, s \oplus s', P) \wedge \exists s'' P_{w'}(s'')\} \preceq_w \{w' | w' \in \mathcal{INR}(w, s, P) \wedge \exists s'' P_{w'}(s'')\}$ <sup>19</sup>

In one possible world, a situation  $s$  is contributive to a property if and only if the addition of that situation to the current (or more precisely, the previous) situation will make the completion of the whole situation expressed by the property  $P$  more likely than the previous situation. This is expressed by the notion of closeness. If the inertia worlds which are derived from the actual world with respect to the extension  $s \oplus s'$  and the property  $P$  and in which  $s \oplus s'$  is completed is closer to the actual world than the inertia worlds which are derived from the actual world with respect to the previous situation  $s$  and the property  $P$  and in which  $s$  is completed, then it implies that the actual world with the extended situation  $s \oplus s'$

- i. Do you think he was telling the truth?

In this case there is no implication of incompleteness, but simply implicates that there is an interrelationship with another simultaneous event. So the progressive can be said to denote part or the whole of the situation denoted by the base predicate.

<sup>19</sup> The notion of closeness is defined between possible worlds. In the formulation here, it is defined between sets of possible worlds. I assume that it is understood as follows:

- i.  $A \preceq_w B$  iff for all  $w' \in A$  and  $w'' \in B$ ,  $w' \preceq_w w''$

is more likely to lead to the completion of the situation which has the property of  $P$ .

I will make three points about the notion of contributiveness, which make my analysis different from previous ones based on the notion of normality or reasonability.<sup>20</sup> Notice that the notion of contributiveness is defined with respect to the previous situation and the property of the whole situation. Someone might claim that the condition should be simply that the situation newly added is more likely to lead to  $P$  than  $\neg P$ . But this is not correct because there is a case where the same situation may, or may not, be contributive to  $P$ , depending on the previous situation. This is partly because there is no semantic relation between the whole situation and its sub-situations. Suppose that John was feeding his son too much food. One of the sub-situations can be feeding him a piece of cake with some cream on it, and we cannot decide whether he was feeding his son too much food only from seeing him feeding a piece of cake. We have to consider what he has fed him so far. Another case is the one where a sub-situation which could be contributive to the whole situation is not actually so because it occurs in the second time. A contributive situation  $s$  must be something new to the previous situation. If the previous situation already includes  $s$ , then  $s$  does not contribute to the culmination of the whole situation.

Second, the new situation must make the current situation closer to the culmination of the whole situation but not to the situation of the negative predicate. For accomplishment or activity predicates, part of the sub-situations are contributive to the whole situations: buying materials for building a house is part of the situation of building a house and contributive to it as well. Walking for a minute is part of, and contributive to, the situation of walking longer. I cannot think of cases where part of the situations from accomplishment or activity predicates are not contributive to the whole situations. For achievement predicates, the progressive refers to some events which are not part of, but contributive to, the situations denoted by the base predicate. So contributiveness is a broader notion than 'part-of'.

Third, the main difference of my analysis from previous analyses is that the analysis here uses the notion of marginality. Previous analyses which use the

<sup>20</sup> One referee claims that there seems to be no difference between the notion of contributiveness and Landman's (1992) reasonable extension. One reason is that the truth-condition of the progressive is tricky and a slight change of the truth-condition does not seem to be significant, but the predictions they make are quite significant. Landman's analysis defines the truth-condition of the progressive with respect to a situation which can be extended to the culmination of the whole event. In my analysis, the truth-condition of the progressive is defined with respect to an *additional* event or a state, which may be part of, but is not itself extended to, the whole event. This captures the generalization that the current situation is not normally the beginning of the whole situation. Moreover, part of an event may not be extended to the completion of the whole event. Buying a building material is not itself extended to the event of building a house. Landman's analysis predicts that when a coin is tossed, it can be true that the coin is coming up heads and that the coin is coming up tails. Intuitively, neither is true. This is what my analysis predicts. Tossing a coin is part of coming up heads or tails, but it is contributive neither to coming up heads nor to coming up tails. Landman's analysis causes a similar problem in analysing achievement predicates. Higginbotham (2003) fixes Landman's (1992) problems by defining inertial worlds with respect to the property of the basic predicate as well as a world and an event.

notion of normality, such as Dowty (1977, 1979) and Landman (1993), propose that the progressive is verified by the extension/continuation of the situation up to now (or up to the interval in question). This can cause a problem in dealing with the examples in (11) and (27). In both examples, the culminations of the two situations are not likely to obtain in normal contexts. But the two sentences can have different truth values. It should be explained why the example in (27) can be taken to be true. In my analysis, the sentence is analyzed as a true one because there is at least some situation the addition of which to the current context makes the culmination of the whole situation more likely to obtain: normality is considered in relation to the addition of some situation to the current context, rather than the entire situation so far.

In the discussion so far, I suggested two notions for the truth condition of the progressive. One is the threshold level of processes for the culmination of the situation, and the other is contributiveness. Now the truth condition of the progressive can be given as follows:

- (34) A progressive  $\mathcal{PROG}(P)$  is true with respect to  $\langle s'', I, w \rangle$  iff there is at least a situation  $s'$  in  $w$  such that (i)  $\tau(s') \sqsubseteq I$ , (ii)  $s' \triangleright_{s'', w} P$ , and (iii)  $s'' \oplus s'$  is beyond the threshold level of  $P$  at the current context  $c$  ( $\neg \exists s''' [\theta_c(P)(s''') \wedge s'' \oplus s' \sqsubseteq s''']$ ).

For a progressive  $\mathcal{PROG}(P)$  to be true with respect to  $\langle s'', I, w \rangle$ , there must be at least one situation  $s'$  in  $w$  such that  $s'$  holds at  $I$  and the addition of  $s'$  to the previous situation is more likely to lead to  $P$  but not to  $\neg P$  than the previous situation without  $s'$ .

As I pointed out, the progressive is cumulative. This can be shown easily from the truth condition of the progressive. Suppose that a progressive is true at  $I$  and  $I'$ , and that at the two intervals there are two subsituations  $s'$  and  $s'''$  at the previous situations  $s''$  and  $s''''$  respectively. Then the following holds:

- (35) i. there is at least a situation  $s'$  in  $w$  such that (i)  $\tau(s') \sqsubseteq I$ , (ii)  $s' \triangleright_{s'', w} P$ , and (iii)  $s'' \oplus s'$  is beyond the threshold of  $P$  at the current context;
- ii. there is at least a situation  $s'''$  in  $w$  such that (i)  $\tau(s''') \sqsubseteq I'$ , (ii)  $s''' \triangleright_{s''', w} P$ , and (iii)  $s'''' \oplus s'''$  is beyond the threshold of  $P$  at the current context.

Now assume that  $I \oplus I'$  is also an interval and that  $s'' \sqsubseteq s''''$ . Then from the two conditions we can get the following condition:

- (36) There is at least a situation  $s' \oplus s'''$  in  $w$  such that (i)  $\tau(s' \oplus s''') \sqsubseteq I \oplus I'$ , (ii)  $s' \oplus s''' \triangleright_{s'', w} P$ , and (iii)  $s' \oplus s'''$  is beyond the threshold level of  $P$  at the current context.

From the assumption that  $s'' \sqsubseteq s''''$ ,  $s''$  is the previous situation for the addition of  $s' \oplus s'''$ . Since both  $s'$  and  $s'''$  are contributive to  $P$ ,  $s' \oplus s'''$  is also contributive to  $P$ . And if  $s'' \oplus s'$  is beyond the threshold level of  $P$ , then  $s'' \oplus s' \oplus s'''$  is too. Thus what we have in (36) is the truth condition of the progressive at the interval  $I \oplus I'$  in  $w$ .

## 5. Imperfective paradox

Let's go back to the problem of the imperfective paradox.

- (1) a. John was walking.  
b. John walked.
- (2) a. John was building a house.  
b. John built a house.

To account for these observations, we have to consider the truth-condition of the progressive and aspectual differences between activity predicates and accomplishment predicates (or achievement predicates). Let  $I$  be the relevant interval and  $s''$  be the previous situation of walking.

- (1') a  $\exists s'[(i)\tau(s') \sqsubseteq I \wedge (ii) s' \triangleright_{s'',w} \lambda s[walk(s) \wedge A(s, john)] \wedge (iii) \neg \exists s''' [\theta_c(\lambda s[walk(s) \wedge A(s, john)])(s''') \wedge s' \oplus s'' \sqsubseteq s''']$
- (2') a  $\exists s'[(i)\tau(s') \sqsubseteq I \wedge (ii) s' \triangleright_{s'',w} \lambda s \exists x[house(x) \wedge build(s) \wedge A(s, john) \wedge Th(s, x)] \wedge (iii) \neg \exists s'''[\theta_c(\lambda s \exists x[house(x) \wedge build(s) \wedge A(s', john) \wedge Th(s', x)])(s''') \wedge s' \oplus s'' \sqsubseteq s''']$

For sentence (1a) to be true with respect to  $\langle s'', I, w \rangle$ , there is at least one sub-situation  $s'$  at  $I$  in  $w$  such that  $s'$  is contributive to the property of John's walking and the addition of  $s'$  to the previous situation  $s''$  must be beyond the threshold level of the property of John's walking. As I pointed out, activity predicates are homogeneous in a limited way. So even if there is a sub-situation which is contributive to John's walking, it is not guaranteed *a priori* that it is walking. But the sum of it with the previous situation, which is  $s'' \oplus s'$ , must be beyond the threshold level of the property of John's walking. If the sub-situation  $s'' \oplus s'$  were not taken to be walking, it would seem to be like taking the predicate to be an accomplishment, denoting a sub-event which is not yet walking but which is expected to lead to walking. As an activity predicate, the threshold level of walking must be at least walking.  $s'' \oplus s'$  is walking and is more likely to be continued. Since a sentence with an activity predicate is cumulative, a more extensive situation than  $s'' \oplus s'$  is likely to hold. So we can conclude from (1') that there was a situation of John's walking in the past. For sentence (2a), the accomplishment predicate is heterogeneous and non-cumulative. The sub-situation contributive to the property of John's building a house cannot be the situation of John's building a house itself because, if the previous situation  $s''$  is John's building a house, the sub-situation  $s'$  is not contributive to John's building a house. And  $s'' \oplus s'$  must be beyond the threshold level of John's building a house. This does not guarantee that John has, or has not, built a house. In most cases, the threshold level of a situation does not go as far as the whole situation. Sometimes, however, it is possible that the relevant situation is finished, which is illustrated in (28b,c). This shows that incompleteness of the progressive from an accomplishment predicate is simply an implication.

## 6. Other Problems Revisited

The problem with achievements and the complex event problem are fixed with the notion of contributiveness. The notion is focused on the solution of these two problems. Now we need to see if my proposal can provide some solutions to other problems as well.

Landman (1992) discusses the following example, and say that the sentence can be true or false depending on what perspective you adopt. Consider the following example again.

- (11) Rebecca was crossing the Atlantic Ocean.

In my analysis, this example can be seen as a case where different threshold levels of processes are required depending on perspectives. On one perspective the statement is a matter of Rebecca's ability. So the sentence is taken to be false, uttered when she had not swum long enough. But once divine intervention could make it possible for her to cross the Ocean, it is not a matter of ability but a matter of wish. So the threshold level goes down. If Rebecca is known to have the ability to cross the Ocean, then the statement is a matter of intention. This requires a low threshold level of process.

Another example is the following.

- (21) Rebecca was flying to London when the plane was hijacked.  
 (22) Rebecca was flying to London; well, in fact she was't, she was flying to Havana, but she didn't know at that time.

These two sentences seem to apparently be inconsistent, but as Landman (1992) pointed out, both can be true. I claim that both sentences are true because there are a lot of situations going on at the same interval, that there are some which are contributive to the situation of Rebecca's going to London, and that there are some other which are contributive to the situation of her going to Havana. Suppose that the plane stopped by another city before the hijackers got on the plane. Then until the plane got to the city, the second sentence cannot be true. The perspective problem is not a matter of the perspective on the same situation, but a matter of different sub-situations contributive to different whole situations.<sup>21</sup> This allows us to explain why the following sentence is false in the same context.

<sup>21</sup> One anonymous referee points out a problem with the explanation here. In a situation where the hijackers failed to hijack the plane or a situation where more than one group of hijackers tries to take the plane to different cities, sentence (22) is not true. This seems to be related to the fact that the sentence can be taken to be true only when it has turned out that the plane was hijacked to Havana. The only possible explanation I can give is that the threshold level of going to London is already satisfied at the past moment in question, but the threshold level of going to Havana is not. We can suggest that when a situation is not yet beyond the threshold level of progress at the relevant moment, the threshold level becomes the completion of the situation. This seems to be a stipulation, but it is not particularly problematic because the phenomenon observed in (22) is taken to be exceptional too. For cases like this, I could revise the truth-condition of the progressive, but I would not do it now. I would rather find a more elegant and pervasive suggestion later.

(23) Rebecca was flying to London and to Havana.

Even if some sub-situations are contributive to going to London and others are to going to Havana, there is no sub-situation that is contributive both to going to London and to going to Havana. So this sentence cannot be true.

This analysis does not have the interruption or continuity problem because the truth condition is defined in terms of the sub-situations which are contributive to the situation denoted by the base predicate, regardless of whether the situation can be interrupted later by other situations. Therefore the interruption/continuity problem does not arise in my analysis.

Finally, look at the culmination problem. The observations in (18–20) can be explained by the Maxim of Quantity in terms of Grice (1975). Consider the following example again.

(19) John was running ten miles.

This cannot be construed as running the ten miles simultaneously. The sequential reading is the only possible one. When the sentence is simply one in which the numeral expression is not considered as a unit, the sentence can be thought to assert that he was running ten miles, not one of {John was running one mile. John was running two miles, John was three miles, ... }. When John was running only the first two miles of the ten, it is more informative to say that he was running two miles, rather than that he was running ten miles. So the utterance of the latter statement violates the Maxim of Quantity. When the ten miles is taken to be a unit, as in the reading that he is running ten miles as he usually does, then the sentence is taken to assert one of the members in {John was running ten miles, John was not running ten miles}. In this context, the statement does not violate the Maxim of Quality.

Consider the simultaneous reading in (20).

(20) John is building three houses.

Even though the sentence may have the same set of alternatives as the sequential reading of (19), the uttered sentence is the only one that satisfies the Maxim of Quantity. Until the situation gets finished, there is no interval in which the sentence *John is building two houses* is verified. So when a sentence has a numeral expression as an argument, there are two possible readings. One is the simultaneous reading, and the other is one in which the quantity meant by the numeral expression is taken to be a unit.

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