The Semantics of the Progressive in English*

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Song, Mean-Young. (2012). The Semantics of the Progressive in English. ***Language Research*** **48.3, 533-572.**

This paper presents a modal-based semantic treatment of the progressive in which phenomena such as the imperfective paradox, the interruption problem, and the multiple choice paradox that have been noted in the semantic literature of the progressive can be accounted for in a unified way. Unlike the present study, the previous analyses propose their own solutions to each one of the phenomena, not all of them simultaneously. In this respect, the proposal made in this paper can be viewed as handling the semantics of the progressive in a more rigorous and elegant way.

Keywords: imperfect paradox, interruption problem, modal base, multiple choice paradox, ordering source, progressive

1. Introduction

The progressive aspect serves primarily to assert that the event designated by the verb in a progressive sentence is an ongoing or incomplete event, as exemplified in (1a-b):

(1) a. John was painting a picture.
b. Jane was walking on the street for an hour.

Despite this, the semantic theory which is concerned merely with how to represent the interpretation of the imperfectiveness of the pro-

* I have received various inputs at several different stages of the development of this paper. The first draft of this paper was presented at the 2011 KSLI Fall Conference held in Gongju National University of Education. The second draft, a revised version of the first draft, was presented at the 2012 LSK Fall Conference held in Seoul National University. I'd like to thank the audience for their comments. I also grateful to three anonymous reviewers for their valuable comments and suggestions. All remaining errors are, of course, my own.

gressive has turned out to be insufficient for the understanding of the semantics of the progressive (cf. Scott 1970; Bennett & Partee 1972; Montague 1968; among others). This indicates that there must be something more than this that should be considered for the interpretation of the progressive. Besides the semantic representation of incomplete events, several issues regarding the semantic interpretation of the progressive have been raised in the literature of the progressive; the imperfective paradox (Dowty 1979), the problem of interruption (Landman 1992; Vlach 1981), and the multiple choice paradox (Bonomi 1997). They definitely make the progressive difficult to deal with in the area of formal semantics.

The imperfective paradox, which refers to a phenomenon in which entailment is not valid for the progressive with accomplishments, motivates some semanticists to analyze the progressive within the modality. For example, Dowty (1979) solves the imperfective paradox by introducing modality into the semantics of the progressive, but his solution ends up bringing about the problem of interruption first noted by Vlach (1981) which is the case where the event described by the verb in the progressive is interrupted in a normal situation. Landman (1992) successfully resolves the problem of interruption by introducing the notion of continuation branch which is a metaphor for counterfactual account of the semantics of the progressive, but his treatment not merely raises some problems from 'reasonableness', one of the important notions he uses to define the continuation branch, but also fails to take account of the multiple choice paradox first mentioned by Bonomi (1997), a term according to which the progressive event in question can be realized as a part of its several possible developments. The purpose of the present study is to present a semantic framework of the progressive which can handle such issues as have been addressed above in a unified way by introducing into Kratzer's (1991) modal semantics the principal filters which are intended to capture the mereological relations among eventualities.

This paper is structured as follows: section 2 is devoted to reviewing the previous studies on the semantics of the progressive and pointing out their difficulties. Section 3 presents a detailed discussion of some important notions that will be employed in the present paper. A brief introduction of Kratzer's theory of modality is discussed in section 4. Finally, section 5 is mainly concerned with coming up with the se-

mantic treatment of the progressive as well as with demonstrating how the issues regarding the progressive that were mentioned above can be resolved in the terms of the proposal in this paper.

2. Reviews of the Previous Studies

The semantics of the progressive has been classified into two category; the modal approach and the non modal approach. The modal approach asserts that the progressive should be semantically dealt with in terms of modal semantics (Dowty 1979; Bonomi 1997; Landman 1992; Naumann & Piñon 1997; among others). The non-modal approach, on the other hand, claims that instead of being involved in modal interpretation, the progressive needs to be treated as being interpreted in an extensional context (Bach 1986; Bennett & Partee 1972; ter Meulen 1985; Parsons 1990; Varasdi 2010; Vlach 1981; among others). In this section, I will review both of the approaches, along with their problems, focusing on the major works due to the space limit.

2.1. Bennett and Partee (1972): An Extensional Interval Approach

Criticizing Montague's (1968) moment-based analysis of tense, Bennett and Partee (1972) present the truth conditions for the progressive, as in (2), under the assumption that the progressive is taken to be a sentential operator:

(2) $[\![\text{PROG}\phi]\!]$ is true at an interval I iff I is a moment of time, and there exits an interval I′ such that $I \subset I'$, I is not a final subinterval of I′, and ϕ is true at I′.[1)]

According to (2), a progressive sentence like *Mary was talking to the man* is true just in case there is a non-final sub-interval I of I′ such that *Mary talks to the man* is true at I′. This kind of treatment seems to be appropriate for the progressive with activity predicates, as in a sen-

1) Bennett and Partee's (1972) semantic definition of the progressive is similar to Montague's (1968) and Scott's (1970) except for judging the truth of the progressive relative to an interval as primitive. For this reason, I will not discuss Montague's and Scott's analysis.

tence like *Mary was sleeping for five hours*, which are subject to sub-interval properties.

However, Bennett and Partee's (1972) approach does not work for the progressive with accomplishments, as noted by Dowty (1979). Consider the following accomplishment sentence:

(3) John was building a house.

Suppose that John was building a house for five months. Obviously, there is a gap or temporary interruption in an accomplishment sentence like (3). Despite this, (2) would have to predict wrongly that (3) is true during the gap since John should build a house at every sub-interval of five months in order to make (3) be true, which is improbable in a real world.

In addition to this, Bennett and Partee's treatment of the progressive fails to deal with the imperfective paradox which refers to the phenomenon in which the progressive of an activity sentence entails its non-progressive form, whereas this is not the case with the progressive of an accomplishment sentence. For example, an activity sentence like *Mary was sleeping* entails that Mary slept, and an accomplishment sentence like (3), on the other hand, does not entail that John built a house. To see that the Bennett-and-Partee treatment leaves us unequipped to deal with the imperfective paradox, consider the following accomplishment sentence:

(4) Mary was crossing the street.

Suppose that Mary was run over by a bus when she was crossing the street. A sentence like (4) is definitely true in this situation. Bennett's and Partee's analysis predicts that in order to make the progressive sentence in (4) true, there should be an interval at which the event described by the non-progressive form of (4) is completed (i.e. there is an interval at which the non-progressive sentence *Mary crosses the street* is true). This indicates that (4) entails that Mary crossed the street, which is obviously an invalid inference, as was shown in the imperfective paradox. Notice the event in question does not culminate at all since it is interrupted as a result of Mary being hit by a bus.

2.2. Dowty (1979): A Normality Approach

Dowty (1979) treats the progressive as the combination of modal and temporal component. His analysis is a first attempt to present a modal-based treatment of the progressive. Accepting the natural course of events proposed by Lewis (1973), he argues that the semantics of the progressive requires the truth of the proposition under the scope of the progressive operator in all of some set of worlds that meet certain conditions. This set should be the set of worlds in which the natural course of events takes place. According to Dowty (1979), in other words, the following progressive sentence

(5) John was building a house.

is understood to mean that in all worlds like the actual one at that time in which nothing unexpected happened, John eventually brought a house into existence. To put it differently, there would have been a house completed by John if nothing unexpected had happened. This kind of interpretation of the progressive motivates Dowty (1979) to treat the semantics of the progressive as conveying a modal interpretation.

Here are some basic notions which Dowty proposes to analyze the progressive semantically. First, he accepts the natural course of events proposed by Lewis (1973). PROG ϕ requires the truth of ϕ in all of some set of worlds that meet certain conditions. This set should be the set of worlds in which the natural course of events takes place. In other words, to say that John was building a house when such-and-such happened is to say that in all worlds like the actual one at that time in which nothing unexpected happened, he eventually brought a house into existence. Second, Dowty (1979) introduces what he calls inertia worlds. Inertia Worlds are to be considered as worlds which are exactly like the given world up to the time in question and in which the future course of event after this time develops in ways most compatible with the past course of events.

Based on his basic assumptions, Dowty treats the progressive as a modal operator in the sense that the existence of a house in a sentence like (5) is a possible outcome of John's activity if it proceeds normally. Thus, the progressive sentence in (5) is true iff something

was going on that would have been a complete house-building by John, if it had proceeded normally. Dowty (1979) presents the semantics of the progressive, as in (6):

(6) PROG(ϕ) is true at an interval i and in a world w iff for some interval i′ which includes i as a non-final subinterval and for all inertia worlds w′ $\in$ INR (< i, w>), ϕ is true at i′ and in w′.

Here INR is the accessibility relation for the progressive, so that INR (<i, w>) is the set of inertia worlds for an interval i and a world w. (6) canbe stated formally in the following way: the inertia world w′, with respect to <i, w>, are those in which what is going on in w during i continues as one would expect it normally to; nothing unexpected happens in these w′, PROG(ϕ) is then true at <i, w> iff in all the inertia worlds, i extends into an interval in which ϕ is true.

As Vlach (1981) notes, the difficulty Dowty's framework of the progressive may run into arises from the notion of normality. There are many cases where what counts as inertia worlds on the basis of normality turns out to be inadequate for the semantic analysis of the progressive. To see this, consider the following sentence:

(7) Mary was crossing the street.

Dowty (1979)'s framework would have to say that (7) is true at <i, w> iff Mary crosses the street at a continuation interval beyond i in every inertia world accessible from <i, w>. However, suppose that Mary does not, in fact, cross the street because she is hit by a bus which is running along the crowded street at the speed of 80 km per hour. In this situation, the normal course of events would be for Mary to be hit by a bus and not to cross the street. In other worlds, no possible world where Mary successfully crosses the street is a member of a set of inertia worlds. Thus, Dowty's analysis of the progress would have to predict that (7) should be false in the situation mentioned above.

2.3. Vlach (1981): A Continuity Approach

As Vlach (1981) notes, the difficulty Dowty's framework of the pro-

gressive may run into arises from the notion of normality. There are many cases where what counts as inertia worlds on the basis of normality turns out to be inadequate for the semantic analysis of the progressive. To see this, consider the following scenario:

(8) Scenario
Max was hit by a bus which is running toward him along the crowded street at the speed of 80 km per hour when he was crossing the street.

Dowty's analysis of the progress would have to predict wrongly that (6) should be false in this scenario, because no possible world where Mary successfully crosses the street is a member of a set of inertia worlds. To overcome the interruption problem, Vlach (1981) proposes the semantics of the progressive on the basis of the notion of continuity:

(9) PROG(ϕ) is true at i iff there is a process that leads to the truth of ϕ such that i $\bar{\text{I}}$ and the process continues until ϕ is completed at the end of an interval I during which ϕ is true.[2)]

According to (9), a progressive sentence is true just in case the process that is associated with the event picked by the progressive, if continued, leads to the truth of the sentence. Vlach's analysis in (9) removes the bus from the scenario and only considers the interval during which the process of Max walking continues beyond the point where it got interrupted. As noted by Landman (1992), the interruption problem is not resolved in Vlach's framework in the situation where two buses are running toward Max.

2.4. Parson (1990): An Event-based Extensional Approach

According to Parsons (1990), which adopts the eventive semantics, the difference between the progressive and the non-progressive is ac-

2) Notice that what Vlach (1981) calls the process amounts to a sub-event of the eventive semantics. In fact, Vlach proposes different semantic analyses for different aspectual classes. The semantic definition I put here is that for telic sentences such as accomplishments and achievements.

counted for in terms of the aspectual relations between events and intervals; the non-progressive is expressed in terms of the predicate *culminate*, which means that the event in question gets completed at an interval, while the progressive the predicate *hold*, which means that the event in question does not necessarily get completed at an interval. Consider the following sentences:

(10) a. Mary crossed the street.
b. Mary was crossing the street.

A non-progressive (i.e. the simple past here) sentence like (10a) which is an accomplishment sentence and a progressive sentence like (10b) can be represented semantically as (11a) and (11b), respectively:

(11) a. $\exists$t[t < now & $\exists$e[crossing(e) & Subject(e, mary) & Object (e, the-street) & CUL(e, t)]].
b. $\exists$t[t < now & $\exists$e[crossing(e) & Subject(e, mary) & Object (e, the-street) & HOLD(e, t)]].

(11a) says that a crossing event culminates at an interval, as in (CUL (e, t)), which implies that Mary finished crossing the street at an interval t. On the contrary, (11b) says that the event hold at an interval, as in (HOLD(e, t)), which implies that the event of Mary's crossing the street is not completed at an interval. She may have eventually crossed the street at a later interval, but the event holds at that interval.

Parsons' theory successfully deals with the imperfective paradox.[3] According to Parsons, an activity sentence like *John was pushing a cart* entails that *John pushed a cart* since activity predicates like *push a cart* are represented with HOLD. In contrast, a sentence like *John was building a house* does not entail that John built a house since accomplishments like *build a house* are represented with CULMINATE. Parsons' theory claims that the primary function of the progressive to change the Culminate relation into the Hold relation. Thus, the progressive sentence with accomplishments, according to Parsons, is interpreted to mean the accomplishment event (i.e. a building-a-house event) in question holds at some interval. This suggests that the progressive does not

3) The account of the imperfective paradox has already provided in sub-section 2.2.

create an intensional context.

However, Landman (1992) points out that this kind of explanation is not on the right track, arguing that the progressive is involved in modal interpretation. To see this, consider the following sentence and its semantic representation which can be given in terms of Parsons' framework:

(12) a. John was building a house.
b. $\exists t \exists e \exists x[t < \text{now} \ \& \ \text{building}(e) \ \& \ \text{Agent}(e, \text{John}) \ \& \ \text{house}(x) \ \& \ \text{Theme}(e, x) \ \& \ \text{Hold}(e, t)]$

Notice that Dowty's (1979) explanation would predict that in a sentence like (12a), a house does not exist. This is because the PROG operator takes scope over the existential quantifier associated with *a house*, according to Dowty's theory. In contrast, Parson's theory would have to predict the existence of a house because *house(x)* in (12b) which is not placed under the PROG operator means x is a house. This contradicts what is expressed by Hold(e, t). To get out of this difficulty, Parsons claims that this is not problematic, if we allow incomplete objects in our real world. In other words, he argues that whatever house comes to exist should be count as a house for the meaning of *house(x)*, even if it is not a fully complete house. He takes Jack London's house for instance. So a sentence like (12a) implies that there exists a house, but only an incomplete one.

Parsons (1990) comes up with the following sentences which not merely show the semantics of the progressive may be associated with the existence of incomplete event or object, but also argue against the modal treatment of the progressive:

(13) a. Mary was building a house.
b. Mary was building a house that she would finish.

In the modal approach to the progressive, the progressive or PROG is a modal operator which takes scope over the tenseless sentence *Mary builds a house* in a sentence like (13a). In consequence, the NP *a house* is located under the scope of the progressive. This implies that a house-building event is possibly finished (in every inertia worlds) and as a result, there exists a complete house. Thus, in the modal approach, (13a)

asserts that there is a complete house under the scope of the progressive. By the same reasoning, (13b) also asserts the existence of a complete house since the NP *a house that she would finish* is under the scope of the progressive modal operator. Hence, the modal approach would have to predict that (13a) should be synonymous with (13b). However, Parsons claims that this is incorrect since (13b) has no such reading (i.e. they are not synonymous). Instead, both (13a) and (13b) are interpreted to mean that a house-building event is not complete. What (13a) differs from (13b) is that the former involves a building of house which always remains incomplete, while in the latter, a house-building event may be completed, causing a complete house to come into existence.

Landman (1992) points out some problems with Parsons' arguments about (13a) and (13b) by mentioning the following examples (Landman 1992:8):

(14) a. Mary tries to find a unicorn.
b. Mary tries to find a unicorn that she would find.

Notice that *try* in non-progressive sentences like (14a-b) creates an intensional context. Under the assumption that the NPs a *unicorn* in (14a) and the NP in the relative clause *a unicorn that she would find* are under the scope of an intensional verb like *try*, just as we saw in (13a-b), it would be predict that (14a) should be synonymous with (14b), which is contrary to fact. (14a) cannot have a reading synonymous with (14b)-i.e. (14b) has no such reading. Thus, Landman claims that it is problematic to argue that the progressive cannot be treated as a modal meaning even when such a kind of reading is not available in (14b) in the first place.

2.5. Landman (1992): An Reasonalbleness Approach

Criticizing Parsons' (1990) extensional treatment of the progressive, as was discussed in the previous section (see (14a) and (14b)), Landman (1992) also presents a piece of evidence that shows the progressive is a modal operator. Consider the following sentence:

(15) God was creating a unicorn, when He changed his mind. (Landman 1992:8)

It is generally said that the creation of something requires several stages that are necessary for its existence which results from creation, but an object does not come to an existence until the last moment. Likewise, the process of God creating a unicorn in (15) goes through the same procedures. No unicorn was created since the process was interrupted before God finished creating a unicorn. A sentence like (15) could be true in this situation. This suggests that the progressive should be taken to create an intensional context.

Another piece of evidence that shows that the progressive is a modal operator comes from the following examples which behave like the ones in modal subordination first noted by Roberts (1987). To see this, consider the following sentences:

(16) John tried to find a unicorn (Landman 1992:9)
  a. No unicorn was found.
  b. She would sell it to Sue.
  c. #It was not found.

The occurrence of the pronominal anaphora in the discourse is appropriate in an intensional context like (16b), but not in an extensional context like (16c). The same comments go for the progressive sentence:

(17) God was creating a unicorn. (Landman 1992:9):
  a. No unicorn was created.
  b. He would give it Eve.
  c. #It was not created.

Obviously, the example in (17) strongly suggests that the progressive establishes an intensional context.

Landman (1992) presents a semantic analysis of the progressive in terms of the semantics of modals. Although the modal approach to the progressive is something his and Dowty's (1979) proposal have in common, there are differences between the two, which I will get back to later in this section. To see how Landman's treatment of the progressive works, consider the following pair of sentences which cannot

be dealt with successfully in Dowty's system:

(18) a. Max was crossing the street.
b. Mary was wiping out the Roman army.

Regarding (18a), as was noted by Vlach (1981), several trucks which were running at the speed of 80 km per hour were two seconds away from Max. When nothing unexpected happened, it was normal that Max was hit by one of the trucks, and hence Max never crossed the street. This is a normal course of event. As was mentioned above, Dowty's framework incorrectly says that (18a) should be false in this situation, which is contrary to fact. A sentence like (18a) is an example of what Landman calls the problem of interruption in the sense that the event of Max crossing the street is interrupted when the truck hits him.

Regarding (18b), we consider the two scenarios. In scenario #1, suppose Mary, who is a normal person, is battling the Roman army who killed her parents. Normally, there is no chance that Mary wipes out the whole Roman army. In this scenario, (18b) is definitely false. In scenario #2, suppose that Mary is a normal person, but the miracle happens. Mary has finally wiped out the Roman army through divine intervention. In this scenario, (18b) is true. The normality approach proposed by Dowty runs into difficulty with dealing with a sentence like (18b) since from the normal point of view, there is no inertia world where Mary wipes out the Roman army. So Dowty's account predicts that (18b) is false in scenario #1 and scenario #2. If the wiping out of the Roman army by Mary really happens in our world, it ought to be abnormal. (18b), if used in scenario #2, is the example of what Landman (1992) calls the problem of non-interruption. The problem of non-interruption in Landman's sense refers to a phenomenon in which the proposition under the scope of the progressive is true even in the situation where impossible or abnormal things takes place. In other worlds, the progressive is true even if the event picked by the progressive gets completed against all odds.

The eventive semantics (similar to Parsons 1990) and the modal approach like Dowty's are incorporated into Landman's (1992) semantic account of the progressive. He also introduces event stages in the sense of Carlson (1977). Let's get back to (18a) which an example of the problem of interruption and see how Landman's basic ideas work.

Recall that Max did not cross the street because the truck hit him. However, (18a) is true within Landman's account. The reasoning is as follows: Max would have crossed the street if the first truck did not hit him. Suppose there are other trucks behind Max. In this situation (18a) is still true because Max would have crossed the street if the second truck did not hit him. This kind of subsequent reasoning continues until other dangers which may prevents Max from crossing the street had been removed, and consequently, Max reached the other side of the street. These kinds of counterfactual shifts according to which the stage of an event under the scope of the progressive continues or moves on other branches of a set of possible worlds when it is interrupted constitute what Landman calls the continuation branch. The event of Max's crossing the street stops in a certain world, and it grows into a branch of a possible world and it continues on that branch until it stops in that world. This kind of continuation goes on as far as reasonable thinking works. According to Landman (1992), the continuation branch of an event e in a world w is a set of event-world pairs. He also defines the notion of the stage of events as follows: an event e is a stage of e′ iff e′ contains e as a part and e′ is a further development of e. On the assumption that if event e stops in w, there is a closest world where e does not stop, Landman (1992) defines the continuation branch C(e, w) of e in w as follows:

(19) The continuation branch C(e, w) for e in w is the smallest set of pairs of events and worlds such that
1. For every event e′ in w such that e is a stage of e′, $<e' w> \in C(e, w)$
2. If the maximal event e_{max} such that $e_{max} \in C(e, w)$ stops in w, then consider the closest world w′ where e_{max} does not stop:
   (a) If w′ is not in a set of reasonable worlds for <e, w> (i.e. R(e, w)), the continuation branch stops.
   (b) If w′ is in a set of reasonable world for <e, w>, then $<e_{max}, w'> \in C(e,w)$.
   In this case, we repeat construction.
3. For every e″ in w′ such that e_{max} is a stage of e″, $<e'' , w'> \in C(e, w)$.
4. If the maximal event e_{max}' such that $e_{max}' \in C(e, w)$ stops in

w′, then we look at the closest world w″ where e_{max}' does not stop:

(a) If w″ is not in a set of reasonable worlds for <e, w>, the continuation branch stops.

(b) If w″ is in a set of reasonable worlds for <e, w>, then we continue as above, etc.

Given the definition of the continuation branch in (19), the semantics of the progressive can be defined as follows:

(20) $[\![\text{PROG}(e, P)]\!]^{w,g} = 1$ iff $\exists e' \exists w'$: $\langle e', w' \rangle \in C(g(e), w)$ and $[\![P(e')]\!]^{w',g} = 1$, where C(g(e), w) is the continuation branch of g(e) in w.

In (20), PROG denotes a relation between events and properties of events. (20) says that PROG(e, P) is true in w iff for some event e′ and some world w′, <e′, w′> is a part of the continuation branch of e in w and the property of an event is true in w′. To see how Landman's semantics of the progressive works, consider (18a) and (18b) once again, which is repeated below as (21a) and (21b), respectively:

(21) a. Max was crossing the street.
b. Mary was wiping out the Roman army.

(21a) can be semantically represented as (22) in terms of Landman's framework:

(22) ∃e′[e′ < now & PROG(e′, ^λe[cross(e) & Agent(mary, e) & Theme(the-street, e)]

According to (20), (22) is true in w iff for some past event e′ and some w′ such that <e′, w′> is on the continuation branch of e in w and e′ is the event of Max crossing the street in w′. In plain English, (22) is true in w just in case there is a past event such that the event of Max crossing the street is on its continuation branch. Recall that PROG denotes a relation between an event and the property of the event of Max crossing the street.

There is one thing I'd like to mention before addressing how the

truth conditions for (22) work. Landman (1992) assumes that we need to consider what is internal or inherent to a stage of an event when determining whether that stage is likely to continue or stop at a certain interval. So we don't have to worry about the external or outer dangers or outer facts that may possibly interrupt the event described by the progressive. In case of Max crossing the street, the truck is not our concern because it is irrelevant to the event picked by the proposition under the scope of the progressive. Outer facts such as a truck should be removed, and it cannot count as something dangerous that may be a threat to the completion of Max crossing the street. However, what counts is whether Max has an ability to perform the event of crossing the street normally and reasonably. Since Max is a normal person who can carry out the activity of crossing the street in a reasonable way, the event of his crossing the street is on the continuation branch until he gets to the other side of the street. This indicates that as long as reasonableness is assured or guaranteed, the event described by the progressive does not stop but continue on the continuation branch. In contrast, if this were not the case, the event would stop in a word on the continuation branch. The same explanation goes for a sentence like (21b). We only focus on Mary's capacity of wiping out the Roman army without considering external facts such as giant Roman soldiers who killed Mary.

A sentence like (21a) is true in the situation where Max was crossing the street when he was hit by the truck. We follow Max's crossing in w until it stops because he is hit by the truck. We move on the closest world where his crossing continues. The truck does not hit Max in that world. Max has a capacity of crossing the street by himself (this is an internal fact). So he has a reasonable chance of crossing the street in the real world as far as he crosses the street in this world (which is on the continuation branch). Thus, (81a) is true in this circumstance.

Let's get back to (81b). Its semantics can be represented as (23):

(23) $\exists e'[e' < \text{now} \ \& \ \text{PROG}(e', {}^\wedge\lambda e[\text{wipe-out}(e) \ \& \ \text{Agent}(\text{mary}, e) \ \& \ \text{Theme}(\text{the-RA}, e)]$

The same comments as I mentioned above in (22) hold for (23). So I will not get into the detail of it. Remember that we have considered

two scenarios about (22). Scenario #1 is about the problem of interruption, and scenario #2 the problem of non-interruption. Look at scenario #1. We follow Mary's wiping out until she gets killed. We consider the closest world where she continues wiping out the Roman army. Considering Mary' capacity, it may be reasonable to think that Mary might able to kill three more Roman soldiers. We follow her on the continuation branch where Mary's more killing is carried out. Mary gets killed by a Roman soldier after killing three more. On the basis of her capacity and power, it is unreasonable to think that Mary would have had a chance of wiping out the whole Roman army in the real world. At this moment, the continuation branch stops long before she wipes out the Roman army. The wiping-out event does not get realized on the continuation branch, and thus (22) is false in scenario #1. In scenario #2, divine intervention makes it successful for Mary to wipe out the Roman army. We follow her in the real world until the event stops. Due to the divine intervention, it stops on the continuation branch on which Mary's wiping-out event gets realized. Thus, (22) is true in scenario #2. Landman's theory of the progressive successfully accounts for the problem of interruption and non-interruption, while Dowty's does not. However, he does not present precise and rigorous definition of reasonableness. This is the weakness Landman's theory may have as far as the overall theory goes.

There is another thing that has not been made clear in Landman's theory. Landman basically assumes that when it comes to the semantics of the progressive, we are only interested in the chance of the event *e* picked out by the progressive continuing in some world on the continuation branch purely on the basis of what is internal or inherent to the stage of *e*. Thus, the trucks are irrelevant in the semantics of the progressive in case of the crossing-street event. Instead, what is important here is whether the event is continuing normally within the subject of the progressive's capacity that she will complete it. For example, in a sentence like *Max was crossing the street*, we are only concerned with Max's capability of completing the event. If Max has the capacity, then Max will get to the other side of the street in the continuation branch without regard to the external or outer possible danger—i.e. the trucks which are approaching Max. In the street-crossing event, Max actually has such capacity, so he would have finished crossing the street in a world which is on the continuation branch. This ob-

viously makes this sentence true. In the same vein, the external force −i.e the Roman soldier killed Mary after she attacked several Roman soldiers−is irrelevant in case of Mary's wiping out the Roman army. In this case, Mary does not have an ability of wiping out the whole Roman army because she is a normal female person and is not strong enough to destroy all the Roman army at all. Thus, she would not have completed the wiping-out event in a world on the continuation branch, which might makes this sentence false.

However, there are cases where outer force or danger might interrupt an event picked by the progressive. To see this, consider the following scenario; Max, who is an internationally famous swimmer because he has swum across the Atlantic twice before, is enjoying his vacation on a beach in France with his family. He is swimming with his son in the sea near the beach without any intention of swimming across the Atlantic at all. In this situation, the following sentence would be definitely false:

(24) Max was crossing the Atlantic.

According to what was mentioned about Landman's framework in the previous passage, the internal force is what is relevant in analyzing the semantics of the progressive, so we need to consider Max's capacity to complete the event of crossing the Atlantic. In the scenario we have considered above, he has such an ability. Nothing would interrupt the event of Max's crossing the Atlantic. Thus, Landman's theory has to say that Max would have completed the event of swimming across the Ocean in some world on the continuation branch. Thus, Landman's theory of the progressive would have to make a wrong prediction that (24) is true. This shows that Landman's notion of internal or inherent properties is not sufficient to deal with the semantics of the progressive. What I have discussed so far suggests that we need more rigorous definition of reasonalbeness and that we need to consider properties, whether internal or external, relevant to the meaning of the progressive. The external force or properties should be incorporated in the semantics of the progressive, together with internal properties, as long as they are relevant to the interpretation of the progressive.

Another problem that arises from Landman's analysis of the progressive is that it fails to treat what Bonomi (1997) calls the multiple-

choice paradox, a term which is used to describe multiple possible developments of an ongoing event. This will be elaborated upon in the following sub-section which is devoted to reviewing Bonomi's theory of the progressive.

2.6. Bonomi (1997): A Context-based Approach

As was mentioned in the previous sub-section, what Bonomi (1977) calls the multiple-choice paradox or the indetermination is not well accounted in terms of Landman's theory of the progressive. To see this, consider the following scenario. Suppose that John has planned to travel around the northeastern part of the U.S.A. He is driving northbound on I-95 from Richmond, Virginia to New York City.[4] He is considering spending his first night in one of the following places: Jersey City, Manhattan, and Brooklyn, because he thinks that the three places are convenient for a visit to the Liberty Island. So the three places can be his possible destinations. At 3 p.m., he has decided to go to Jersey City, while driving to New York. In this situation, the following sentence is true.

(25) John is going to Jersey City at 3 p.m.

Two hours later, he has changed his mind. He has decided to go to Manhattan because he thinks that it is more convenient than Jersey City. As we saw in (25), the following sentence is also true in the situation we have mentioned above:

(26) John is going to Manhattan at 5 p.m.

It is worth noting that the truth values of (25) and (26) are completely dependent upon the reference time provided by the respective sentences. In the scenario addressed above which exhibits the multiple-choice paradox, (25) is true at 3 p.m., while this is not the case with (26), and (26) is, on the other hand, true at 5 p.m., whereas this is not the case with (25). According to the definition of Landman's (1992) continuation branch, the event of John's going to Jersey at 3 p.m. should

4) The example is inspired by Bonomi (1977).

be extended on its continuation branch into the event of John's going to Manhattan, since the event picked by (25) is a stage of John's journey up to 5 p.m.[5] In other words, the event of John going to Jersey City amounts to a part of the event of John going to Manhattan. For this reason, Landman's framework of the progressive has to predict that (25) and (26) are both true at 3 p.m., which is against our intuition.

In order to resolve the multiple-choice paradox, Bonomi (1997) argues that the conversational background, or the context, plays a crucial role in determining which might be most likely to be realized among the multiple choices associated with the progressive sentence in question. The conversational background is said to consist of normal or stereotypical courses of events. It determines the truth of the progressive sentence whether there is sufficient relevant information provided by the context. The relevant information is regarded as the concomitant facts or events which surround the event in question, and should be included in the context. Which characteristics of the event and the concomitant facts are relevant relies on the properties of the context. In other words, if an event e of a certain type is realized, and other concomitant eventualities are also realized, then e can be seen as part of an event f of the intended type. With this in the mind, let us consider the semantics definition of the progressive by Bonomi (1997: 193):

(27) $[\![\mathrm{PROG}(e, V)]\!]^{H,t} = 1$ iff $\exists \mathbf{F} \exists C_H [\forall H' \in \mathbf{F}(e, C_H)$
$\rightarrow \exists f\, [t \subset \tau(f)\ \&\ f \in H'\ \&\ \mathbf{V}(f)\ \&\ e \sqsubset f]]]$

In (27), **F** is a stereotypical conversational background, C_H a context which consists of a set of eventualities in H, H a course of events, $\mathbf{F}(e, C_H)$ a function from eventualities to contexts, τ a function from eventualities to times, **V** an event type, and e and f are events. Give this, (27) says that an eventuality e of type **V** in Progressive is true with respect to H and a time t iff there are some stereotypical conversational background **F** and some context C_H[6] such that for every

5) Recall that Landman's theory of the progressive allows for no other alternative continuation branch.

6) Notice that the context C_H is a set which includes the event picked by the progressive and the concomitant events.

course of events selected by this stereotypical conversational background, there is an event *f* such that the evaluation time t is included in the time denoted by τ(*f*) and *f* is an event in H′ and *f* is an event of type **V**, and e is an sub-event of *f*. To see how the semantics of the progressive proposed by Bonomi works, consider the following sentence:

(28) John is going to Manhattan.

(28) can semantically be represented as (29) in terms of Bonomi's framework:

(29) PROG(e, go-to-Manhattan(j))

According to the semantic definition of the progressive in (27), (29) is true in a course of events H at a time t iff there is some context of concomitant facts in the stereotypical conversational background such that for every course of events with respect to the context, there is an event *f* of the type *go-to-Manhattan(j)* at a time t′ denoted by *f* which includes t, and e is part of *f*. To put it differently, (29) is true iff there is a context of concomitant events compatible with the stereotypical conversational background such that the context forces the event e to be perceived as part of a process of John going to Manhattan. This kind of analysis predicts that the event e, whatever its extension may be, should be taken to be part of the event type picked by the predicate in the progressive, as long as the context of concomitant events allows for the perception of e as part of the event type.

In what follows, I will address what might be problematic in Bonomi's treatment of the progressive. Recall that depending on whether the conversational background, or the context has sufficient relevant information regarding the event of the progressive and the concomitant events, it is judged whether or not the event will extend into a further one or another stage of the event. In this respect, the function of the conversational background is a key to the understanding of the meaning of the progressive. In Bonomi's framework, the conversational background for the semantics of the progressive is based on the stereotypical course of events (or more exactly, normal course of event or normality). Thus, this probably faces the same problem as Dowty's (1979)

analysis does. Like Dowty (1979), Bonomi's analysis would predict wrongly that Vlach's (1981) example *Max was crossing the street when he was hit by a bus* should be false. This is because, as was discussed above, there is no context where in every course of events associated with the intended frame, the ideal developments of the event of Max crossing the street are never realized or completed,[7] according the conversational background based on the normal or stereotypical course of event.

Here is another point I'd like make regarding Bonomi's framework of the progressive. As was mentioned in the previous passage, Bonomi's (1997) semantic treatment of the progressive asserts that all the ideal developments of the event under the scope of the progressive lead to a completion of that event. One should notice that what he calls the ideal developments seem to pertain to the notion of ideal worlds in Kratzer's (1991) sense. One of the problems arising from his semantic framework of the progressive is that he does not present a rigorous way to define the ideal development of an ongoing event. Kratzer (1991) introduces an ordering source which is a conversational background whose key role is to order accessible possible worlds, where every proposition in a modal base is true. On the contrary, Bonomi does not explicitly address how to define the ideal developments of an ongoing event. Instead, he simply assumes that the stereotypical conversational background, together with the concomitant facts, tells us what needs to be taken all the ideal developments of the ongoing event in question.[8] Thus, it is not clear to me how the ideal developments can be obtained in a given context. Different ideal developments can be taken into consideration, depending on the context of use, so it is hard to pick the right ideal development. This is mainly because Bonomi's analysis of the progressive presents no constraints on specifying the most salient ideal development of an event picked by the progressive in a certain context.

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7) Bonomi's (1997) framework of the progressive is a modal-based approach, even though he does not mention it explicitly. For example, a sentence like *Max was crossing the street when he was hit by a bus* is, according to Bonomi's analysis, interpreted as being true iff the event of Max crossing the street is extended into all of its ideal developments. However, there is no possible world where the ideal developments are realized in such an example.

8) The reader can refer to the example of Leo's proving the theorem of completeness on page 193 in Bonomi (1997).

3. Preliminaries

In this section, I will address the formal framework or ontology that will be employed in the semantic analysis of the progressive. I assume the formal model for the interpretation of the progressive is 7-tuple M = < A, F, E, I, W, <, ∠>, where A is a non-empty set of individuals, F is an interpretation function which applies to all non-logical constants, E is a set of eventualities, I is a set of intervals, W is a set of possible worlds, < is a linear ordering on the set I, and ∠ is a mereological part relation.

Following Bach (1986), I will employ the term 'eventuality' which covers the aspectual classes such as activities, states, achievements, and accomplishments. Following Varasdi (2010), I will introduce the notion of an eventuality token to describe eventuality types. The eventuality token is a member in a set of eventualities E, i.e. for any e, e is an eventuality token if it is in E. A set of eventuality tokens is referred to as an eventuality type or a property, as in σ = {e: e ∈ E}, where σ is an eventuality type. For example, the sentence *John was building a house* describes an eventuality token of building a house, which is marked by an accomplishment eventuality token. The eventuality type refers to a set of such eventuality tokens, which is represented in terms of λ-terms, as in λe[build(j, a-house, e)] which denotes a set of eventualities which comprise the building-a-house event.

A concomitant event, which is intended to represent a mereological part of an eventuality, is referred to as a set of sub-events of an event. In a sense, the concomitant event is closely related to a process which involves the eventuality picked by the progressive sentence. For instance, the progressive sentence *John was building a house* involves the process that consists of making a brick wall, sawing wood, and erecting a pillar or column etc. All the processes that take place in the event of building a house can be taken to be concomitant events. This is true of an activity predicate like *walk*. The walking event involves concomitant events of moving and taking steps etc. To represent concomitant events of an eventuality e, I will introduce a concomitant operator CON that is applied to an eventuality token, as in CON(e) which reads as concomitant events of an eventuality e (i.e. a set of proper mereological parts of an eventuality e). CON(e) is defined as {e′ ∈ E: e′ ∠ e}, which denotes a proper mereological part of an even-

tuality e. We can define the proper mereological part of an eventuality type in much the same way, as in CON(σ) = $\bigcup_{e \in \sigma} CON(e)$ where σ ⊆ E. For example, if σ is an accomplishment type, then the mereological part of σ is the union of proper sub-parts of an eventuality e in the accomplishment type.

According to the definition of the proper mereoloigical parts or CON(e), whatever is a concomitant event canbe taken to be proper parts of an eventuality token. Hence it is too powerful in this respect. We need to impose constraints on the selection of concomitant events in such a way that it is made possible to pick only a set of concomitant events relevant to the eventuality in question. In other words, the constraints are about what eventualities are relevant to the current eventuality token as its mereological parts. I will introduce the predicate *relevant* to take care of this job. The predicate *relevant* is defined as (30):

(30) λPλe∃e′ [e′ ∠ e & P(e′) & lead-to(e′, e)], where P is an eventuality type.[9)]

(30) says that there is a sub-event of e such that it has the eventuality type or property p and it leads to the completion of its super-event e. According to this, if there is a proper mereological part of an eventuality e which has the property p and leads to the completion of e, then that mereological part is relevant to e. For instance, the event of sawing wood is a proper part of the event of building a house, and it is a process that leads to the completion of the event of building a house, so the event of sawing wood is relevant to its super-event. An eventuality must satisfy the condition in (30) if it is relevant proper part of another eventuality.

Based on (30), we can determine what eventualities are relevant to a given eventuality token as its proper part. Once this is determined, we can consider a set of those relevant sub-events that can lead to the completion of a given eventuality token. For example, sawing wood, hammering nails, and making a brick wall may be taken to be elements in a set of relevant proper mereological parts of the event of building a house. All the relevant mereological parts work together to

9) Recall that the eventuality type P is a subset of E, as in P ⊆ E.

possibly bring a house into an existence. In this sense, we need to define a set of relevant mereological parts of an eventuality token, so that all the concomitant events should be taken into consideration. A set of relevant events can be defined as $\Re$ = {relevant(P_1), relevant(P_2), relevant(P_3), ……, relevant(P_n)}, where P_1, P_2, …… and P_n are eventuality types or properties. Suppose that John saws wood, hammers nails, and makes a brick wall in order to build a house. The events of John sawing wood, hammering nails, and making a brick wall are relevant merelogical parts of the event of John's building a house, since they possibly lead to the completion of the eventuality. In this situation, the set of relevant proper parts of the eventuality of John building a house can be represented as $\Re$ = {relevant(λe[saw(j, wood, e)]), relevant(λe[hammer(j, nails, e)]), relevant(λe[make(j, a-brick-wall, e)])}. As we can see here, the argument of the predicate *relevant* denotes a property or a set of eventuality tokens.

Given the set of relevant proper parts of an eventuality token, we are in a position to take into consideration all the properties that follow from a given eventuality token. We can say that if a proper sub-event of another eventuality token has a property that are relevant to that eventuality token, then the super eventuality also has the property. Let's take a walking event for instance. If the step-taking event which is a relevant sub-event of the walking event has the property of moving, then the walking event has the property of moving as well. In this respect, we need to introduce the principal filters[10] to capture all the appropriate or relevant properties or eventuality types that follow from a proper merelogical part of an eventuality token. The principal filters ↑A refers to a set of all the supersets of A, where A is a non-empty set. This can be defined as ↑A = {X: A $\overline{X}$}. By the same token, we can give the definition of the principal filters *F* which are generated by the set of relevant mereological parts $\Re$ of an eventuality token e in a world w, as in (31):

(31) $F_{\Re(<e,\ w>)}$ = ↑(∩$\Re$(<e, w)>) = {X ⊆ E: ∩$\Re$(<e, w>) ⊆ X},
where ∩$\Re$(<e, w>) is a non-empty set.[11]

As was indicated by (31), the principal filters *F* of ∩$\Re$(<e, w>) rep-

10) A filter is a subset of a partially ordered set.

11) $F_{\Re(w)}$ denotes the principal filters generated by $\Re$ in a world w.

resents all the supersets of the intersection of sets of relevant proper mereological parts of an eventuality token e in a world w. For instance, suppose that an eventuality token like *eating* is comprised of the three following relevant proper parts which hold in w: a biting event, a chewing event and a swallowing event, as in $\Re$(<e, w>) = {relevant(λe [biting(e)]), relevant(λe[chewing(e)]), relevant(λe[swallowing(e)])}.[12] Notice that given the normal process of eating something, the biting event is followed by the chewing event and the swallowing event (i.e. the chewing event ∪ the swallowing event) and that the chewing event is followed by the swallowing event (i.e. the swallowing event). So $\cap\Re$ (<e, w>) = {relevant(λe[swallowing(e)])}. The principal filters $F_{\Re(<e,\ w>)}$ generated by $\cap\Re$(<e, w>) is $F_{\Re(<e,\ w>)}$ = ↑(swallowing event), which denotes all the supersets (or the super-events of swallowing) of the eventuality type described by the swallowing event.[13]

4. A Brief Introduction of Kratzer's Theory of Modal

I will explore the semantics of the progressive in terms of the theory of modal semantics which is proposed by Krazter (1977 and 1991), along with the ontology I have discussed in the previous section. For this reason, I will discuss the main ideas in her framework of modality briefly before getting into the main line of the discussion.

The theory of modality proposed by Kratzer (1977 and 1991) is characterized by relative modality. According to her, modals are neutral in meaning, and hence they are relativized with respect to the properties of the conversational background which assigns sets of propositions to possible worlds. The variability in the meaning of modals is due to different types or properties of conversational backgrounds such as the deontic conversational background provided by the law or regulations

12) There are, in fact, other sub-events involved in the eventuality of eating. However, we are considering only three sub-events relevant to the eating event here for convenience's sake.

13) Giving an example of an ant which is pulling an leave to the river to cross the river on it, one anonymous reviewer points out that it is disputable to which extent sub-events can be considered as merological parts of an eventuality token. This is clear in the approach this paper is pursuing here. According to the definition of the principal filters *F* of $\cap\Re$(<e, w>), the eventuality of the ant pulling the leave to the river is relevant to the crossing-the-river event, as long as the eventuality is carried out for the ant to cross the river.

and the epistemic conversational background generated by what is known to the speaker, and the bouletic conversational background derived from one's desire and so forth.

Two important parameters are introduced in Kratzer's treatment of modality: a modal base and an ordering source. The modal base is a conversational background which determines the fundamental understanding of the modal force. For instance, the epistemic modal base is what is known to the speaker, while the deontic modal base is every fact that is circumstantial. The modal base determines the set of accessible worlds. The ordering sources, which are taken to be a (stereotypical) conversational background, establish an ordering relation among accessible possible worlds that states how the set of accessible worlds are ordered according to the normal course of events.[14] In other words, they determine which world ranks higher than which world and vice versa, depending on the degree of regularity or normality. The partial ordering relations can be defined as this: for all w, w′ $\in$ W, for any A $\subseteq$ B(W), w $\leq_A$ w′ iff {p: p $\in$ A and w′ $\in$ p} $\subseteq$ {p: p $\in$ A and w $\in$ p}, where W is a set of possible worlds, A set of propositions, and B a function from W into a set of sets of propositions. To put it differently, a world w is closer to the ideal represented by A than a world w′ iff every proposition in A which is true in w′ is also true in w. It is worth noticing that the ordering on the set of accessible worlds plays a role in excluding those worlds which are away from the ideal established by the ordering sources. A set of ideal worlds generated by the ordering source forms a set of accessible worlds with respect to which modalized expressions are evaluated. This has been a brief discussion of Kratzer's framework of modality. In what follows, I will discuss how we can incorporate Kratzer's basic ideas into the semantics of the progressive.

14) Kratzer (1991) discusses several arguments in favor of the ordering relation. One of her arguments is that the modal semantics into which the ordering relation is incorporated is in a better position than the classical modal semantics in dealing with graded modals such as *good possibility*, *better possibility* and *weak necessity*, etc. which have been hard to account for in the classical modal semantics. I will not go into the detail of her arguments here. The reader can refer to Kratzer (1981, 1991).

5. Semantic Analysis of the Progressive

5.1. Modal Base and Ordering Sources for the Progressive

Recall that one of the problems arising from Landman's theory of the progressive is that it fails to deal with the case that the agent's intention is involved in the event described by the progressive sentence. A possible way out would be to say that the modal base should include all the facts that are relevant to the eventuality under the scope of the progressive. Depending on the context of use, the relevant facts could possibly be viewed not only as the internal properties of the agent carrying out the eventuality in progress and the situation the agent is in at the utterance time if the agent is involved in the ongoing event, but also as the normal process (or the obedience of physical laws) of the event in progress if it has no agent. The internal properties are marked by what is internal or inherent to the agent – i.e. those regarding the agent's intention (cf. Naumann and Piñon 1997), the agent's capability, reasonableness (cf. Landman 1992), the state of the agent, and so on, to mention a few. In a sentence like *John was crossing the Atlantic*, for instance, the internal properties are those relevant facts about whether the agent John has an intention of crossing the Atlantic, whether he is able to cross the Ocean, whether he has a reasonable chance of crossing the Atlantic, or whether his body is in a normal state of performing the event of crossing the Atlantic (more exactly, he is not sick, and his one arm does not break etc.) and so on. When it comes to the case where the event in progress does not have an agent, a normal course of events determines what must count as the relevant facts. In a sentence like *The rock is rolling*, for instance, it is normally reasonable to say that the rock is rolling from a high place (or the top) to a low one (the bottom) in the actual world, not the other way around.

Given what I have discussed in this paragraph, we can notice that a set of relevant facts for the progressive are contextually determined. A set of propositions that express those relevant facts should count as important factors in judging whether the progressive sentence in question is true or not. I will refer to those relevant facts as eventuality-internal propositions in the sense that they describe properties that are internal to the eventuality in question. As was mentioned earlier, they

are already presented in the modal base for the progressive at the utterance time of a progressive sentence.

I assume that eventuality-internal propositions are represented in terms of a set of eventualities which have properties internal to a given event. For example, suppose that John intends to cross the Atlantic. The proposition expressed by *John has an intention of carrying out the Atlantic-crossing event* might be one of the eventuality-internal propositions that are relevant to the event (i.e. the Atlantic-crossing event) under consideration in this context.[15] The proposition is assumed to denote an eventuality of John having an intention of performing the event.[16] The set of eventuality-internal propositions of an eventuality token e in a world w $\Pi(<e, w>)$ is defined as follows:

(32) $\Pi(<e, w>) = \{p$: p is a proposition that expresses an eventuality-related intrinsic or extrinsic property of an eventuality e in w$\}$.

Given this, we are in a position to determine the modal base for the progressive. The modal base is a function which assigns a set of eventualities to possible worlds. The modal base for the progressive I have in mind is the union of the principal filters F generated by the set of relevant mereological parts $\Re$ in a world w and the set of eventuality-related intrinsic or extrinsic propositions of an event e in a world w, as represented in (33):

(33) $MB(<e, w>) = F_{\Re(<e, w>)} \cup \Pi(<e, w>)$, where MB stands for a modal base.

Recall that the principal filters $F_{\Re(<e, w>)}$ are introduced to capture all

15) One anonymous referee says that no intention is involved in the raining event, as in a sentence like *It was raining*. The eventuality-internal properties that I introduce into the establishment of the modal base contain such information as is intrinsic to the eventuality in question. Hence, in the modal base, they describe the property of the raining event being free from intention as one of the qualities of the raining event. Notice that the eventuality-internal properties do not always have to be related to intentionality and capability. Instead they are completely dependent upon the intrinsic properties of an eventuality.

16) One should note that a relevant fact or proposition may express either a state or an event, depending on the context of use. In order to capture this, I will employ the notion of eventuality, a cover term for an event and a state, following Bach (1986).

the relevant eventuality types (or properties) that follow from a proper merelogical part of the eventuality token under consideration. Thus, it is reasonable to say that the principal filters need to be included in the modal base. The modal base in (33) plays the role of determining an accessibility relation for the progressive. A set of accessible possible worlds for the progressive is defined as a set of possible worlds where all the eventualities in the modal base hold, as illustrated in (40).

(40) $\cap MB(<e, w>) = \{w': \forall e[e \in MB(<e, w>) \rightarrow hold(e, w')]\}$

According to (40), for any world w and w′, w′ is a accessible world from w if and only if every eventuality in $\cap MB(<e, w>)$ holds in w′. The set of accessible worlds functions to restrict the domain of the progressive to relevant possible worlds.

As was mentioned in the previous section, the ordering source plays the role of imposing a further restriction on the domain (i.e. a set of accessible worlds) of a modal expression. When defining the ordering source for the progressive, we need to take two things into consideration. One is about whether the eventuality in progress is interrupted or not, and the other is, on the other hand, about what eventuality token −more precisely, aspectual class−occurs in the progressive. As Landman (1992) Bonomi (1997) note, whatever force is external to the eventuality in progress cannot be a hindrance to the completion of that eventuality. Let's consider the street-crossing event once again. The bus that is running toward Max at the speed of 100 km/h does not affect the completion of Max's crossing event. The event would continue with no any interruption in every possible world until it is completed, whether or not there is an obstacle that could prevent the street-crossing event from being completed. This aspect should be reflected in the ordering source.

Let's get back to the other thing which was mentioned above. The aspectual class of the predicates which are predicated of the subject plays an important role in understanding the meaning of a progressive sentence. The imperfect paradox takes place when the progressive form occurs with the accomplishment, while this is not the case with the activity. The ordering source must provide such information as this, so that it counts those possible worlds where this holds as the domain of the progressive, and rules out those in which this does not. In case of

accomplishments, the eventuality type under the scope of the progressive is not a completion of but a proper partial realization of an eventuality token. In case of activities, on the other hand, the eventuality type can be compatible with the completion of or the partial realization of an eventuality token. In this way, we can capture the fact that the entailment is valid in the progressive sentence with an activity predicate, as shown in the example where *John was sleeping* entails that John slept.

Given what I have discussed in the last two paragraphs, the ordering source we are considering must have two parts; one part is for the progressive with telic predicates like achievements and accomplishments, whereas the other part the progressive with atelic predicate like activities. Let g be a function which assigns to every possible world a set of propositions that denote an eventuality in the principal filters $F_{\mathfrak{R}(<e,\ w>)}$ which is not interrupted or a partial realization of an eventuality token. The ordering source g for the progressive is something like this:

(41) $g(w) = \{p : p$ denotes e such that $\neg$ interrupted(e) and either $CON(\sigma) \subset CON(e)$, or $CON(\sigma) \subseteq CON(e)\}$

In the ordering source in (41), $CON(\sigma) \subset CON(e)$ implies that an eventuality type is a proper partial actualization of an eventuality token e, but never be an completion of e. This is intended to represent the properties of the progressive with accomplishments. In contrast, $CON(\sigma) \subseteq CON(e)$ indicates that an eventuality type can be compatible with the partial realization or the completion of an eventuality token e. As you might notice, this is introduced for the progressive with activities. The set of propositions in the ordering source g(w) plays an important role in ordering accessible worlds in $\cap MB(<e, w>)$. The set of worlds in $\cap MB(<e, w>)$ which are best-ranked according to the ordering $\leq_{g(w)}$ established by the set of propositions in g(w) counts as the best accessible worlds for the progressive. In the following sentence *Max was crossing the street*, for instance, the most highly ranked worlds are those in which Max's crossing event is not interrupted and the set of eventuality tokens which comprise Max's crossing event is a proper partial realization of Max's crossing event. The less ideal worlds are those in which there exists one external factor which interrupts Max's crossing event, say, Max had his leg broken. The worst worlds are

those where the eventuality is interrupted and completed. The set of worlds which are not best ranked according to the ordering source will be ruled out as worst worlds, even though they are in $\cap$MB(<e, w>).

Given the ordering source, we can determine which worlds are better than which worlds on the basis of the ordering source. Here is the definition of the ordering of accessible worlds in terms of the ordering $\leq_{g(w)}$ established by g(w):

(42) For any world z and v $\in \cap$MB(<e, w>), z $\leq_{g(w)}$ v iff $\{p : p \in g(w)$ and $v \in p\} \subseteq \{p : p \in g(w)$ and $z \in p\}$.

According to (42), a world z is either better than or ranked the same as another world v, iff every proposition that is true in v is also true in z. The domain of the progressive is a set of accessible worlds in $\cap$MB(<e, w>), and this set will be further restricted by ordering those worlds in this set according to the ordering $\leq_{g(w)}$ established by the ordering source. The worlds in this set which are away from the ideal established by $\leq_{g(w)}$. will be excluded from the most highly ranked worlds.

5.2. Semantic Analysis of the Progressive

This section is mainly concerned with presenting a semantic analysis of the progressive based on what we have discussed in the previous section, and illustrating how the semantic analysis presented here will resolve the problems arising from the previous studies of the progressive. On the ground of the modal base and the ordering source discussed in the previous section, the semantics of the progressive can be defined as follows:

(43) PROG(e, ϕ) is true in a world w iff for all best accessible worlds w′, there is an eventuality e′ $\in F_{\mathfrak{R}(<e,\ w>)}$ such that ϕ(e′) is true in w′.

Brief comments on LF: The VP-internal hypothesis is adopted in this paper, and hence the NP in the subject position moves from [SPEC, VP] to [SPEC, TP], leaving a trace behind. Predicates contain an extra argument for an event, and for example, a one-place predicate is of type <e, <ev, t>>.[17] VPs denote a property. PROG is applied to VP

at LF−i.e. PROG is a VP-operator, which is along the line of Landman (1992). Then the tense operator is applied to PROG(VP), as in TENSE (PROG(VP)), where TENSE is a PAST or PRESENT tense operator.

Let us get back to (43). In (43), e and ϕ represent an eventuality token and an eventuality type or property with <s, <ev, t>>, respectively. Specifically, ϕ denotes a set of eventuality tokens or properties which are induced by the λ-expression, as in $^\wedge\lambda e[\phi(e)]$, where ^ is an intensional operator. The formula PROG(e, ϕ) asserts that e is being partially realized as the eventuality type denoted by ϕ. In other words, e will develops into the eventuality type of ϕ, if e keeps continuing. Notice that $e' \in F_{\mathfrak{R}(<e,\ w>)}$ indicates that an eventuality e′ is one of the members in a set of relevant proper mereological parts of an eventuality token e in a world. Recall that the best accessible worlds in (43) are those in $\cap$MB(<e, w>) which are ordered according to the ordering source generated by $\leq_{g(w)}$. This can be represented as {w′: w′ $\in$ $\cap$MB(<e, w>) and there is no u $\in$ $\cap$MB(<e, w>) such that u $\leq_{g(w)}$ w′}, which is abbreviated as {w′: best-ranked(MB(<e, w>), g(w))}. Given this, the semantic definition in (42) can be rewritten more formally as follows:

(44) PROG(e, ϕ) is true in a world w iff for every w′ $\in$ {u: best-ranked(MB(<e, w>), g(w))}, there is an eventuality $e' \in F_{\mathfrak{R}(<e,\ w>)}$ such that $\phi(e')(w')$ is true.

Let us take an example to see how the semantics for the progressive in (44) works. The progressive sentence *John is building a house* can translate as PROG(e, $^\wedge\lambda e[\exists x[\text{house}(x)\ \&\ \text{build}(j, x, e)]]$), whose truth conditions can be stated, according to (44), as this: $[\![\text{PROG}(e, {}^\wedge\lambda e[\exists x[\text{house}(x)\ \&\ \text{build}(j, x, e)]])]\!]^{MB,\ g,\ w} = 1$ iff for every best-ranked world w′, there is an eventuality e′ which is a partial realization of the building-a-house event such that there is x such that x is a house and the sub-eventuality e′ of the event of John building x is true in w′. Armed with (44), we are in a position to see how the semantic definition of the progressive proposed in this paper fits in to solve the problems such as the imperfective paradox and multiple choice paradox that have been addressed earlier. This will be elaborated upon in what follows.

17) The type *ev* is a semantic type for an event.

5.3. The Imperfective Paradox and the Interruption Problem

There have been several approaches to the resolution of the imperfective paradox in the literature. As a matter of fact, it seems that some of them are indeed quite successful in dealing with the paradox (cf. Dowty 1979; Parson 1990; Landman 1992; among others), although they have their own problems. For this reason, I will simply demonstrate how the present proposal works to deal with the imperfective paradox, instead of going into detailed discussions about the semantic analysis of the paradox.

As was mentioned above, the ordering source generated by $\leq_{g(w)}$ asserts that the ideal worlds are those in which the following conditions are met; i) an eventuality token in progress is not interrupted, and (ii) in case of the progressive sentences with telic predicates, an eventuality type is a partial realization of the eventuality token or in case of the progressive with a telic predicates, an eventuality type is either a completion or a partial realization of the eventuality token. Let us consider the examples of the imperfective paradox in which an accomplishment sentence like *John was building a house* does not entail that John had built a house, whereas an activity sentence like *Mary was walking on the street* entails that Mary had walked on the street. According to the ordering source, the most highly ranked worlds for the progressive with the accomplishment sentence in question are those in which the event of John building a house continues until its completion, no matter what may happen to it in the actual world, and a set of concomitant events relevant to the building event is a partial realization of it. Thus, it is quite natural to say that the progressive sentence *John was building a house* does not entail that John built a house since the event of John building a house would be completed in all the best-ranked worlds, not necessarily in the actual world. On the contrary, the best worlds for the progressive with the activity sentence in question are those in which the event of Mary walking on the streetis completed. Therefore, the activity sentence Mary was walking on the street entails that Mary had walked on the street.

In the same manner, the problem of interruption that arises from Landman's (1992) example like *Max was crossing the street when a bus hit him*, when uttered in the situation where two buses were running toward Max is predicted to disappear in the present proposal. Since

the event of Max crossing the street would come to a completion in every ideal world established by the ordering source g(w)−i.e. the event might not have been interrupted in every ideal world, the present proposal would assert that the sentence is true even when Max failed to get on the other side of the street in the actual world. As we saw in Landman's theory, the semantics of the progressive in (44) successfully treat the imperfective paradox as well as the interruption problem.

5.4. The Problem with Reasonable Chance

This sub-section is devoted to discussing how the problem that arises from Landman's framework of the progressive will be resolved in the semantics of the progressive proposed in this paper. As was mentioned earlier, Landman's framework would have to predict wrongly that the following sentence

(45) Max was crossing the Atlantic.

is true even in the situation where Max is simply swimming in some part of the Atlantic Ocean near a beach in France to enjoy his vacation, even though Max has a reasonable chance to swim across the Atlantic because he has done it several times before. According to Landman, the event e of Max crossing the Atlantic is extended on the continuation branch of a set of possible worlds until it is completed, due to the fact that Max has a reasonable capacity to swim across the Atlantic.

However, the present proposal would assert that (45) is false in this situation, which is intuitive. The modal base MB for the progressive sentence in (45) is something like this: a union of a set of proposition that express a set of relevant events that comprise the event of Max crossing the Atlantic (Notice that this is defined in terms of the principal filter) and a set of propositions that express the event-related intrinsic or extrinsic properties that can be represented as follows:

(46) $\Pi(\langle e, w\rangle)$ = {.... Max is enjoying his vacation. Max is enjoying swimming near a in France. He has no intention of swimming across the Atlantic. His son is

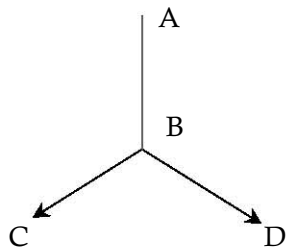
also swimming right beside him.....}

Given the modal base MB in this situation, ∩MB(<e, w>) definitely excludes any world in which a proposition that expresses the event of Max crossing the Atlantic holds because the world is not compatible with any world in ∩MB(<e, w>). Thus, (45), which is not treated successfully in Landman's theory, is false in the situation mention above. This is a desirable result.

5.5. The Multiple Choice Paradox

In this sub-section, I will discuss how the present proposal will deal with the multiple choice paradox, which is not properly dealt with in Landman's theory.[18] To see how the present proposal can deal with the multiple choice paradox, let us consider Bonomi's (1997) example of the avalanche. The avalanche normally descends either to gorge C or to D with almost equal probability, when it takes place. Both areas are populated by chamois, so the avalanche must be destroyed by a specially designed cannon at point B B where the avalanche path forks off in the two different directions, before it gets into either of the gorges, as illustrated in (47):

(47)



Suppose the avalanche was destroyed at point B. Then the sentence *The avalanche was descending to a valley populated by chamois when it was destroyed by a special cannon*[19] is definitely true. However, none of the following sentences below in (48) is true in this situation.

18) The problems that arise from the multiple choice paradox is discussed in sub-section 2.4. The reader can consult with it.

19) This sentence is taken from Bonomi (1977:183).

(48) a. The avalanche was descending to valley C when it was destroyed by a special cannon.
b. The avalanche was descending to valley D when it was destroyed by a special cannon.

As was mentioned earlier, Landman's (1992) counterfactual account of the progressive would have to make an incorrect predication that (48a) is true since the avalanche would have descended to valley C if it hadn't been destroyed by a special cannon. This is also true of (48b). Notice that it was not determined whether the avalanche was going down to valley C or valley D at the moment of its destruction by the cannon. To be more precisely, what makes (48a-b) true is, according to Landman's account, that the eventualities described by (48a-b) are realized in a world on their continuation branch which might lead to the completion of the event of the avalanche falling down into valley C or D. Obviously, this kind of explanation is counter-intuitive in the situation we are considering.

Let us see whether the present proposal will make a correct prediction about the multiple choice case. Consider (48a-b) once again. One should remember that neither of the two sentences is true in our scenario. Notice that the eventualities described by (48a) and (48b) are accomplishment events which are in the set of eventualities E. An accomplishment event will be usually accompanied with activities that are relevant proper mereological part of that accomplishment, and hence, the activity events in this case are considered as sub-events of the accomplishment eventuality. For instance, the accomplishment eventuality tokens in (48a-b) have an activity event of a large block of snow moving down as their sub-event. This sub-event is relevant to its super-event of the avalanche descending to a valley. For convenience's sake, I will refer to the event of snow moving down along A and B, the event of snowing moving down along A and C, and the event of snowing moving down along A and D as e_1, e_2, and e_3, respectively.

According to the scenario that was mentioned above, the avalanche was destroyed at point B by a special cannon. In this situation, the modal base MB for the progressive can be calculated in the following way. MB for the event in progress in w is the union of the principal filter of all relevant mereological parts and the set of events that are eventuality-related intrinsic or extrinsic properties, as in MB(<e, w>) =

$F_{\mathfrak{R}(<e,\ w>)} \cup \Pi(<e, w>)$. One should note that $\Pi(<e, w>)$ does not plays a significant role in accounting for the meaning of the avalanche case, since the subject is not an agent that might have an intention or willingness to carry out some actions. Thus, the principal filter part in the definition of MB needs to be paid attention to. Given the scenario under consideration, the set of relevant sub-events $\mathfrak{R}_1(<e, w>)$ would be something like this:[20)]

(49) $\mathfrak{R}_1(<e, w>)$ = {relevant(λe_1[moving-down-along-A-and-B(snow, e_1)])}

The intersection of $\mathfrak{R}_1(<e, w>)$, or $\cap\mathfrak{R}_1(<e, w>)$ is equivalent to itself because $\mathfrak{R}_1(<e, w>)$ is the only set that is available in this context. Given this, the principal filter $F_{\mathfrak{R}1(<e,\ w>)} = \uparrow(\cap\mathfrak{R}_1(<e, w>))$ can be represented as follows:

(50) $F_{\mathfrak{R}1(<e,\ w>)}$ = {descending-to(the-avalanche, B, e_1) $\cup$ descending-to(the-avalanche, C, e_2) $\cup$ descending-to(the-avalanche, D, e_3)]}

Based on (50), the modal base MB can be defined as MB(<e, w>) = $F_{\mathfrak{R}1(<e,\ w>)} \cup\Pi(<e, w>)$. The avalanche was destroyed by a special cannon when it reached the B point. This event should be added to the existing MB, more precisely the eventuality-related intrinsic or extrinsic part of MB −i.e. $\Pi(<e, w>)$, and consequently, the existing MB ends up being updated, as illustrated in (51):

(51) MB = $F_{\mathfrak{R}1(<e,\ w>)} \cup$ {..... The avalanche was destroyed when it reached the B point ..... }

The updated modal base MB in (51) would say that the following sentence is true since it entails (51), even when the avalanche was destroyed by a special cannon.

(52) The avalanche was descending to B, C, or D, when it was destroyed by a special cannon.

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20) Recall that the sub-event we are considering here is that of a large block of snowing moving down.

Recall that both valley C and D are populated by chamois. The principal filter $F_{\Re 1(<e,\ w>)}$ also contains this property. As a result, a sentence like *The avalanche was descending to a valley populated by chamois when it was destroyed by a special cannon*[21] is true in the situation under consideration.

However, this is not the case with sentences like (48a-b). When the cannon destroyed the avalanche, it did not exist at the B point any longer. Therefore, the updated modal base provides no information whatsoever of the direction toward which the avalanche was descending. In other words, at point B, it is not certain whether the avalanche was descending into valley C or valley D, according to the updated modal base. Thus, a world w where the avalanche descending into valley A is not included in the set of accessible world $\cap$MB, i.e. w $\in \cap$MB. Therefore, (48a) is false in the above scenario. Likewise, we can account for the falsity of (b) in exactly the same way as we did in (48a).

Before closing the discussion, I'd like to show what might have happened if the avalanche had not destroyed completely. Suppose that the avalanche was not totally destroyed and some part of it was moving to valley C. In this situation, the following sentence

(53) The avalanche was descending to valley C

is true, but the following sentence

(54) The avalanche was descending to valley D

is false. For the sentence in (53), $\Re_2$(<e, w>) = {relevant(λe_1[moving-down-along-A-and-B(snow, e_1)]), relevant(λe_2[moving-down-along-B-C (snow, e_2)])}. This is equivalent to {descending-to(the-avalanche, B, e_1) $\cup$ descending-to(the-avalanche, C, e_2) $\cup$ descending-to(the-avalanche, D, e_3), descending-to(the-avalanche, C, e_2)}. Given this, the intersection of $\Re_2$(<e, w>) is this: $\cap\Re_2$(<e, w)>) = {descending-to(the-avalanche, C, e_2)}. Thus, the filter $F_{\Re 2(<e,\ w>)}$ = $\uparrow(\cap\Re_2$(<e, w>)) = $\uparrow$ {descending-to (the-avalanche, C, e_2)}, which happens to be equivalent

21) Remember that this is Bonomi's (1997) example. Intuitively, this is true even when the avalanche was destroyed when it reached point B. The analysis presented in this paper deals with the example successfully.

to $\cap\Re_2(<e, w>)$) in this case, since there is no super-event (or superset) which takes $\cap\Re_2(<e, w>)$) to be its sub-event (or subset). Thus, $\cap\Re_2(<e, w>)$) ends up being a part of MB, making (53) true. We can show why (54) is false in this situation in much the same way. Thus, I will not get into the detail of it. Instead, I will leave it to the reader.

6. Concluding Remarks

This paper has been an attempt to provide a proper semantic analysis of the progressive by incorporating the mereological relations among events and the principal filters into Kratzer's modal semantics. What has been proposed in this paper has no difficulty with treating problems such as the imperfective paradox, the reasonable chance problem, and the multiple choice paradox, to mention a few, which arises from the literature of the progressive. In this respect, this paper seems to present a more extended understanding of the meaning of the progressive.

References

Bach, E. (1986). "The Algebra of Events", in *Linguistics and Philosophy* 9, 5-16

Bennett and Partee (1972). "Toward Logic of Tense and Aspect in English", reprinted by *Indiana Linguistics Club in 1978*, Bloomington, Indiana.

Bonomi, A. (1997). The Progressive and the Structure of Events. *Journal of Semantics* 14. 173-205.

Dowty, D. (1979). *Word Meaning and Montague Grammar*. Dordrecht, D. Reidel Publishing Co.

Fernando, T. (2008). Branching from Inertia Worlds. *Journal of Semantics* 25. 321-344.

Glasbey, S. (1996). The Progressive: A Channel-theoretic Analysis. *Journal of Semantics* 13. 331-361.

Kratzer, A. (1977). What 'Must' and 'Can' Must and Can Mean?, *Linguistics and Philosophy* 1. 337-355.

Kratzer, Angelika (1981). "The Notional Category of Modality", in H. Eikmeyer and H. Rieser (eds.), *Words, Worlds, and Contexts*. Berlin, Water de Gruyter. 38-74.

Kratzer, A. (1991). 'Modality', in von Stechow and D. Wunderlich (eds.), *Seamntics: An International Handbook of Contemporary Research*. Walter de

Gruyter, Berlin. 639-650.
Landman, F. (1992). The Progressive, *Natural Language Semantics* 1. 1-32.
Lewis, D. (1973). Causation. *Journal of Philosophy* 70. 556-557.
Lewis, D. (1981). "Ordering Semantics and Premise Semantics for Counterfactuals", in *Philosophical Logic* 10. 217-234.
Montague, R. (1968). Pragmatics, in R. Kiblansky (ed.), *Contemporary Philosophy: A Survey*, Florence. 102-122.
Naumann, R. and C. Piñon. (1997). Decomposing the Progressive, in P. Dekker, M. Stokhof and Y. Vennema (eds.), *Proceedings of the 11th Amsterdam Colloquium*. Amsterdam: University of Amsterdam. 241-247.
Parsons, T. (1989). "The Progressive in English: Events, states and Processes", in *Linguistics and Philosophy* 12.
Parsons, T. (1990). *Events in the Semantics of English: A Study in Subatomic Semantics.* Cambridge MA, MIT Press.
Portner, P. (1998). The Progressive in Modal Semantics. *Language* 74.4. 760-787.
Scott, D. (1970). Advice on Modal Logic, in Karl Lambert (ed.), Philosophical Problems in Logic. Reidel, Dordrecht. 143-174.
Smith, Carlota (1991). *The Parameter of Aspect*. Dordrecht, Kluwer Academic Publishers.
ter Meulen, A. (1985). Progressive without Possible Worlds, in W. Eilfort, P. Kroeber, and K. Peterson (eds.), *The Proceedings of CLS*. 408-423. Chicago: Chicago Linguistics Society.
Varasdi, K. (2010). A Higher Order Extensional Framework for the Progressive. *Journal of Semantics* 27. 177-206.
Vlach, F. (1981) "The Semantics of the Progressive", in Tedeschi, P. and A. Zaenen, (eds.), *Syntax and Semantics 14: Tense and Aspect*. 272-292. New York: Academic Press.

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Received: October 17, 2012
Revised version received: December 10, 2012
Accepted: December 16, 2012