Information Articulation and Truth Conditions of Existential Sentences

Yookyung Kim
Stanford University

Yookyung Kim 1997. **Information Articulation and Truth Conditions of Existential Sentences.** *Language and Information.*
This paper investigates the semantics of English *there* existential sentences. By examining discourse functions and pragmatic facts, it accounts for semantic facts which have not been discussed elsewhere. Further, it is a new attempt to incorporate information-theoretic notions into formal semantics. I propose that existential statements present a situation, and I analyze them in Situation Semantics as expressing Austinian propositions. The proposed meanings account for the fact that post-copular NPs cannot constitute the restriction of an adverb of quantification nor admit a partitive reading. (**Stanford University**)

1. Introduction

This paper presents a new formal semantic analysis which reflects information articulation of a statement. Information articulation refers to the way that the information conveyed by a statement is packaged in order to facilitate the addition of information to the hearer's knowledge store (Vallduvi 1990). Information articulation at a statement level is concerned with the topic-comment structure and the focus-background structure. Since Rooth (1985), the effect of focus on the interpretation of a statement, in particular its

truth-conditional effect has been much discussed in the literature. While the topic-comment structure has been the main concern of discourse analyses or syntactic analyses from the point of view of functional grammar, its truth- conditional effect has not been seriously considered in formal semantic studies.

The purpose of this paper is two-fold. First, I propose that statements which differ in information articulation with respect to the topic-comment structure should be analyzed as having different propositional contents based on the fine-grained analysis of propositions in Situation Semantics (Barwise and Perry 1983). Second, I present cases in which truth-conditional differences arise due to different topic-comment structures, and give an account of them by the proposed analysis.

As a case study, I will consider the interpretation of a *there* existential sentence in comparison with that of the corresponding subject-predicate sentence without *there*. After showing that they are distinguished in terms of the topic-comment structure, I will analyze existential sentences as expressing Austinian propositions about some situation, capturing their theticity. Categorical subject-predicate statements, by contrast, will be analyzed as expressing Russellian propositions about their topic.

My analysis will explain why the same cardinal quantifier admits of different readings in (1).[1]

(1) a. There were 26 bumble-bees busily feeding.
(cardinal reading only)
b. 26 bumble-bees were busily feeding.
(partitive and cardinal readings both possible)

[1]Most examples in this paper are obtained from the New York Times and Hector Corpus

I will also account for the fact that indefinite subjects can constitute the restriction of an adverb of quantification, but post-copular NPs of existential sentences cannot. (2c) has a reading in common with (2d) but (2a) does not have a reading in common with (2b).

(2) a. There are usually pigeons twittering in a basket.
b. Most pigeons are twittering in a basket.
c. Sales usually suffer in hot weather.
d. Most sales suffer in hot weather.

2. Comparison between Existential Sentences and Subject-Predicate Sentences

Let us compare an existential sentence such as (3a) with the corresponding subject-predicate sentence in (3b).

(3) a. There was a car hanging off the edge.
b. A car was hanging off the edge.

Except for the expletive element *there*, the two sentences in (3) are composed of the same parts. From the tradition of compositional truth conditional semantics, their propositional contents would be calculated to be the same. The two sentences would have the same truth conditions. However, truth conditions do not exhaust the meaning of a sentence. Considering the two statements in terms of the information they convey in an appropriate context, we find some difference between them. They differ in the way of packaging information to be conveyed, in particular, in the topic-comment structure. While (3b) can be used

to give information about a certain car, (3a) is not used that way but rather it is used to describe a state of affairs as a whole without singling out an entity denoted by *a car* from the event.

2.1. Sentence Topic

Topics of sentences are one of the means available in the language to organize or classify the information exchanged in linguistic communication. In the literature, the notion of *topic* has been used in various senses. Among those, "the sentence topic" in Reinhart (1981) is the most relevant notion to differentiate existential sentences and subject-predicate sentences. A sentence topic corresponds to an expression whose denotation is what the sentence is about.[2] Identification of the sentence topic is based on the following two principles proposed in Strawson (1964). First, "the principle of the presumption of knowledge" requires that assertions depend for their effect upon knowledge assumed to be already in the audience's possession. Second, "the principle of relevance" requires that discourse relates itself to and makes use of what is presumed to be known and it intends to give or add information about what is a matter of standing or current interest or concern. The first principle leads us to expect that the sentence is about what is already in our presumed knowledge, and accordingly the sentence topic is more or less old information. But more importantly, the second principle guides us to understand an expression as representing the topic if the assertion is understood as intending to expand our knowledge of

[2]This pragmatic definition of "sentence topic" is distinguished from the definition of "link" in Vallduvi (1990), which is decided by fall-rising accent and characterized by ushering to find a new file to record information.

the entity denoted by that expression.

In addition to these principles, verification of statements is also a criterion to identify the sentence topic. Assessments of statements as true or false are commonly, though not only, topic-centered. The selection of a topic for a given assertion in a given context may be viewed as a selection among the various ways to assess it---it will be verified by checking what we know about the topic.

Consider the following two statements which contain a definite description whose presupposition is not satisfied. Note that they are assessed differently. (4a) tends to be assessed as false but (4b) as truth-valueless.

(4) a. The exhibition was visited yesterday by the king of France.
b. The king of France visited the exhibition yesterday.

The NP *the exhibition* tends to be selected as the topic of (4a), and thus the statement can be verified by checking the list of people who visited the exhibition. Since we will not find the king of France in the list because there is no king of France, the statement is assessed as false. The offending definite description *the king of France* is absorbed in the predicate and do not cause a truth-value gap. On the other hand, (4b) is assessed as truth-valueless because *the king of France* is most easily selected as the topic and its presupposition is not satisfied. Even if the identification of the topic is determined by pragmatic aboutness, independently of truth conditions, it may affect the actual verification strategies.

Reinhart's (1995) survey shows that the sentences in (5a) and (5b) are assessed differently.

(5) a. There were two American kings in New York. (False)
b. Two American kings lived in New York. (False or truth-valueless)

Given no context, half of the class-participants judged (5b) as false and the others judged it as truth-valueless. Because there is no individual satisfying the description *American kings*, when it is selected as the sentence topic, the sentence is judged as truth-valueless. But there was no variation in judgments of (5a) and all participants judged (5a) as false. This fact indicates that the NP *two American kings* is never selected as the sentence topic in (5a). While (5b) can be a statement about two American kings, (5a) is not so interpreted but interpreted as a simple (false) description of a state of affairs without topic or a statement about New York. From the assessment pattern illustrated in (5), we can argue that the post-copular NP of an existential sentence cannot be the sentence topic, in contrast to the subject NP of a subject-predicate sentence. Another piece of supporting evidence for this claim can be found in relativization facts. Compared to ordinary subject-predicate sentences of which any part can be freely selected as the sentence topic in an appropriate context, it is well-known that the topic and focus of a locative inversion sentence is determined constructionally: the locative phrase is the topic and the theme argument is the presented element in focus. Aissen (1975) and Langendoen (1979) observed that in locative inversion sentences only the locative but not the theme argument can be relativized, as in (6).

(6) a. I expect that on these trails can be found many kinds of mushrooms.

b. ... these trails, on which I expect -- can be found many kinds of mushrooms.
c. ?*... many kinds of mushrooms, which I expect on these trails can be found --.

The unacceptability of (6c) can be explained from the assumption that the relativized element is the grammaticalized topic of the sentence (Bresnan 1994). Because the theme argument is what is presented by the construction, it cannot be the topic, and thus it cannot be relativized.

(7) shows that the post-copular NP cannot be relativized, while the adjunct locative phrase can. Therefore, we can conclude that the post-copular NP cannot be the sentence topic while the adjunct can.

(7) a. I expect that there are many kinds of mushrooms on these trails.
b. ... these trails, on which I expect there are many kinds of mushrooms --.
c. ?*... many kinds of mushrooms, which I expect there are -- on these trails.

The following tables represent the contrast in the topic/comment structures of existential sentences and subject-predicate sentences.

(8) a.

There be Post-copular NP Coda Predicate Adjunct
No Topic

b.

There be Post-copular NP Coda Predicate	Adjunct
Comment	Topic

(9) a.

Subject Predicate
No Topic

b.

Subject	Predicate
Topic	Comment

In most cases, an existential sentence contains no sentence topic, as in (8a), but sometimes an adjunct phrase may be selected as the topic, as in (8b). Crucially, neither post-copular NP nor coda predicate can be the sentence topic in any case. The existential sentence in (5a) illustrates that only the adjunct *New York* but not the post-copular NP *two American kings* can be the sentence topic. In contrast, the subject[3] of a subject-predicate sentence can be selected as the topic, as in (9b), while the sentence may also be regarded as having no sentence topic, as in (9a). For instance, the sentence in (5b) can have either of the topic-comment structures in (9): when it has (9a), it is judged false because there is no situation described that way, and when it has (9b) with *two American kings* as the topic, it is judged as truth-valueless because the topic fails to refer to anything.

2.2. Thetic vs. Categorical Statements

We compared existential sentences with subject-predicate sentences regarding the question whether they can contain a sentence topic and which part can be the topic. The difference found in these respects is related to another interesting distinction

[3]Other NPs than the subject NP can be the sentence topic, too. For the relation between the subject and topic, see Li and Thompson (1976).

identified by Brentano (1973), namely the distinction between categorical and thetic statements, which has received attention in the linguistics literature including Kuroda (1992), Sasse (1987), Ladusaw (1994) and McNally (1995).

The two statements in (10), from Schmerling (1976), exemplify a categorical statement and thetic statement, respectively. They illustrate how a different type of statement is chosen in a different context. In English, different intonation patterns are used for the two types of statement. A thetic statement is made by putting an accent on the subject only, whereas a categorical statement is made by putting accents on the predicate as well as the subject.

(10) a. TRUman's DIED. (categorical)
b. JOHNson's died. (thetic)

Although the same event of death is described in (10a) and (10b), they are distinguished in terms of the information expected by the hearer. The whole nation has been concerned with Truman's condition because he has been ill. For this reason, the event of death in (10a) is used to characterize his condition, and Truman constitutes an independent entity outside the event. In contrast, Johnson's death came entirely unexpectedly and thus the addressees were not prepared to hear about Johnson's condition; in such a case it is necessary to present the involved entity as part of the event. Consequently, the entity, Johnson is included in the unexpected information.

Due to different contexts, more particularly due to different information available prior to the statements, (10a) and (10b) are uttered in different ways to make different packaging of

information possible. We could characterize the different contexts for (10a) and (10b) using different salient questions in (11a) and (11b), respectively.

(11) a. What happened to Truman?
b. What's new?

As these questions show, in (10b) the information of Johnson's death is significant as a whole. Both parts, the event and the individual involved, are of equal communicative value. In (10a) the question is put in such a way as to require information about Truman. Hence, it is assumed that Truman and the event of his death are of different communicative values.

As illustrated above, categorical statements are utterances which are analyzed into two successive mutually related judgments, one naming an individual and one naming an event. They make a "predication". The term "predication" is reserved for a relation holding between an element denoting an entity and an element used to say something about that entity: "ascribing a property to and thereby adding information about an autonomous, independently established individual" (Sasse 1987). An entity serving as a predication base is always autonomous, that is, independent of and *outside* the predicated event.

The choice of the predication base of categorical statements is determined, by and large, by the topic. Not just any given 'situationally present' or 'generally known' element, but only those elements about which information is expected to be added can qualify as a predication base, Therefore, the sentence topic, as defined in the previous section, can be said to serve the predication base of a categorical statement. Hence, a sentence

which lacks a sentence topic cannot be used to make a categorical statement.

Existential sentences usually do not contain a sentence topic. This means that they make a thetic statement without making a predication. A state of affairs is simply posited (hence 'thetic', from Greek *thetik'os* 'positive'). An entity that may happen to be involved in the state of affairs so asserted is not picked out as the predication base but is presented as part of the event. An entity involved in a simple 'recognition' is *inside* the event and may not be conceived as an entity at all. Statements made by existential sentences are thetic statements in which the logical relations between the various parts of the communicated state of affairs remain unanalyzed.

Strictly speaking, it is wrong to say that existential sentences are used only as thetic statements, as claimed in Ladusaw (1994). In case an existential sentence has an adjunct and it is selected as the sentence topic, the sentence is used as a categorical statement about the entity denoted by that adjunct. When some existential sentence is claimed to be used only as a thetic statement, that should be understood as being the case because the sentence does not have a topic adjunct.

In sum, the difference between subject-predicate sentences and existential sentences can be stated in the following way: a subject-predicate sentence can be used as a categorical statement whose predication base comes from the subject NP, but an existential sentences cannot be used to make a categorical statement about the entity denoted by the post-copular NP.

To illustrate the difference clearly, let us compare the two sentences in (3), repeated in (12).

(12) a. There was a car hanging off the edge.
b. A car was hanging off the edge.

The NP *a car* can be the sentence topic of (12b), but not of (12a). (12b) can be not only a thetic statement but also a categorical statement giving information about a certain car. (12a) can only be a thetic statement about a certain situation in which "a car" remains an unanalyzed part of information.

While it may be said that the two sentences are truth-conditionally equivalent, their information articulations are different. Due to such a difference, they are used in different utterance contexts. For instance, when one intends to contrast a car's condition to some bus' condition, only (12b) is appropriate, as in (13). Because contrasting between two entities presupposes naming those entities, only a categorical statement about a car is felicitous.[4]

(13) In that accident, a bus managed to stay on the road, but
a. a car was got off and was hanging off the edge.
b. *there was a car hanging off the edge.

3. Formal Analysis in Situation Semantics

We have shown that existential sentences and the corresponding subject-predicate sentences can be distinguished in terms of information articulation information. When one tries to incorporate such an aspect in a formal analysis of the interpretation of the sentences, the kind of tools that one needs have to be more

[4]If a contrast is made between two situations instead of the two entities, two thetic statements can be made using existential sentences.

fine-grained than those provided by the classical view of propositions as sets of possible worlds. In Situation Semantics (Barwise and Perry 1983), a finer-grained classification of information is achieved by adopting a structured universe of situation theoretic objects, in which various things such as individuals, properties, relations, types, situations, propositions and units of information are objects on their own right.

A semantic analysis of a natural language involves quite complicated situation theoretic objects. To represent them in a way that is perspicuous, Barwise and Cooper (1993) developed EKN (Extended Kamp Notation), which I will use in this paper. EKN is a sorted notation system which contains only terms, not sentences. The sorts of EKN form the smallest set containing the basic sorts such as *Situation, Infon, Proposition, Relation, Type, Assignment*, and *Object* and closed under the rule. For each sort υ there is also a sort υ-abstract. The terms of sort υ-abstract denote objects obtained by abstracting parameters from objects denoted by terms of sort υ. The terms of EKN are defined inductively. Atomic terms are constants and parameter symbols. The set of terms consists of atomic terms plus boxes constructed from them. We assume that we have a denotation function D which assigns denotations to the basic constant and parameter symbols. For instance, if R is a relation symbol, then $D(R)$ is a relation.

The basic notions of situation theory are that of a situation and information. The notion of *information* that Devlin (1991) adopts is "objects a_1 ... a_n do/do not stand in the relation P." Such a unit of information is called an infon. For instance, an infon that Claire is reading *War and Peace* is represented as (14). It denotes the information that the individual named Claire and the

book named War and Peace stand in the relation of reading.

(14) reading(Claire, WP)

To represent basic *propositions*, we need to represent the fact that some infon holds in some situation. Propositions rather than infons are what can be true or false. The following box in (15), which is constituted of situation s and and the supported infon, represents a proposition that situation s makes true of (*supports*) the information that Claire is reading War and Peace. Because only a small part of the world is needed to verify such a fact, a situation, i.e., a part of the world, rather than the whole world is used to constitute a proposition.

(15) s | reading(Claire, WP)

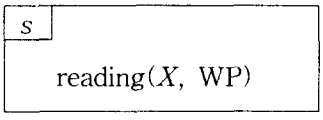
In general, a proposition is a predication that some arguments are of a certain type, as represented in (16).

(16) A | T, where A is an assignment term and T is a type term.

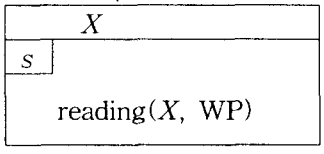
(16) denotes the proposition that $[[A]]$ is of type $[[T]]$. (15) is a special case where the type is an infon and the argument is a situation, and such propositions are called *Austinian* propositions, contrasted to *Russellian* propositions (Barwise and Etchemendy 1987).

A parameter term instead of a constant term can be used in any situation-theoretic objects. For instance, when a parameter X occupies an argument position of a relation, as in (17), we call such a proposition a parametric proposition. We can abstract over the parameter to form a proposition-abstract, which is called a type. In this case, we obtain a type of individuals reading WP in s, as represented as (18).

(17)

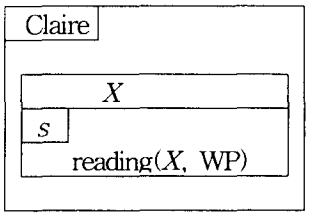


(18)



If we predicate the type in (18) of an assignment term which assigns the individual constant Claire to the parameter symbol X, we obtain another proposition in (19).

(19)



The two propositions in (16) and (19) are logically equivalent but distinct from each other. (16) asserts that the situation s is of the type corresponding to the infon that Claire is reading War and Peace, while (19) asserts that Claire is of the type of

individuals reading War and Peace in *s*. Because many distinct but logically equivalent objects are available, Situation Semantics can readily accommodate different information articulations of a statement. Note that an assignment term which assigns Claire to *X*, or simply speaking the individual term Claire is an immediate constituent of the proposition in (19), but not of that in (16). This difference will be crucially used in differentiating the interpretation of a categorical statement from that of a thetic statement.

According to Gawron and Peters (1990), the meaning of any expression is a relation of circumstances in which the expression is uttered to the content that the utterance of it expresses in those situations. In the case of a sentence, its content would be a proposition. In current Situation Semantics, all utterances of declarative sentences are taken to be about situations, but I propose that the propositional content of a sentence should reflect its information articulation in the given utterance situation. Therefore, in my proposal, a sentence may have two different propositional contents: the propositional content of a thetic statement is an Austinian proposition about a certain situation, whereas that of a categorical statement is a Russellian one about an individual which its sentence topic denotes.

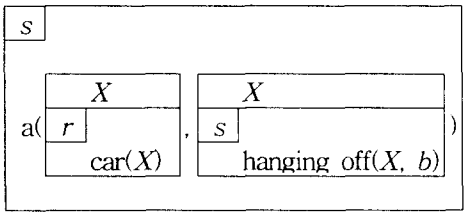
For instance, the sentence in (20) can be used as either a thetic statement or a categorical statement.

(20) A car was hanging off the edge.

When (20) is used to make a thetic statement, it describes a situation without singling out any part of the sentence as a predication base. Accordingly, its content will be analyzed as an

Austinian proposition about a situation *s*, chosen by the speaker, as follows.

(21)



The proposition (21) is constituted of some situation and an infon and asserts that the situation *s* supports a quantificational infon, which is composed of the determiner *a* and its restriction and nuclear scope.[5] (21) is true iff there is an object in *s* which is a car in some resource situation *r* and it was hanging off an edge *b* referred to by the utterance of "the edge". The fact that a situation instead of an entity expressed by a part of the sentence is the predication base of the proposition captures the theticity of the statement.

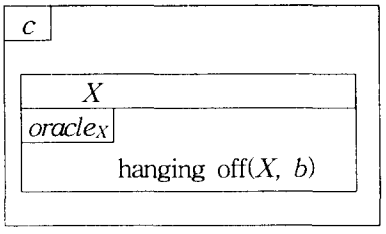
The same sentence (20) is analyzed to express the following Russellian proposition when it is used as a categorical statement about some specific car *c* referred to by the speaker by utterance of "a car". I assume that indefinite NPs should be interpreted referentially (Fodor and Sag 1982) to be a sentence topic.[6]

---

[5]Following Generalized Quantifier theory (Barwise and Cooper 1981), I assume that a determiner relates two types. The restriction type of the quantifier exploits a resource situation *r* which may be different from the described situation *s*.

[6]An anonymous reviewer pointed out that in the following pair of sentences, both indefinite NPs can be a topic, while the first is attributive and the latter is referential.

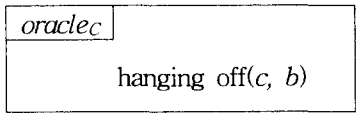
(i) a. A man who can lift this stone is stronger than an ox.
b. A man who can lift this stone came to my office yesterday.

(22) 

The proposition (22) says that a car *c* is of the type of individuals which were hanging off the edge. The argument of the predication of this proposition comes from the subject NP *a car* and the rest part of the sentence makes the type predicated of that argument, which nicely reflects the information articulation of the categorical statement: the NP *a car* is the sentence topic and the rest of the sentence is a comment about it.

Another thing to note in this proposition is the use of an oracle situation. The oracle of an individual *a*, notated as *oracle*$_a$ is the situation comprising that part of the world and the entire "body of knowledge" that concerns *a* (Devlin 1991). The use of the oracle situation is intended to make sure that the utterance of a categorical statement expands the information about an individual instead of an arbitrary situation.

(22) is logically equivalent to the following proposition in (23).

(23) 

It is true that the indefinite NP of (ia) is interpreted as the topic of the sentence, but note that it is interpreted generically. (ia) does not mean that there is a man who can lift this stone and is stronger than an ox. If we assume that a generic indefinite refers to a kind (Carlson 1977), the claim that only referential indefinites can be a topic can be maintained.

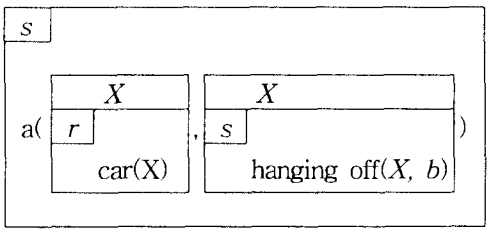
Let us compare (21) and (23). The truth of (23) depends on the object denoted by c and the fact regarding it, whereas the truth of (21) depends on the situation denoted by s and the fact it supports. Even if the fact that a car was hanging off the edge holds in the world, (21) could be false, if some inappropriate situation is chosen for s. However, (23) is true as long as there is a situation which supports the fact that a car c was hanging off the edge because the oracle of c includes all the facts about it.

Now, let us consider an existential sentence such as (24).

(24) There was a car hanging off the edge.

Because (24) can never make a statement about a car but a situation, its propositional content will be analyzed only as (25), which is the same as (21).[7]

(25)



As in the thetic interpretation of a subject-predicate sentence, the truth of (25) depends on the choice of s, as (25) is about a certain situation, not about the whole world nor about a certain car.

[7]In Kim (1996), the propositional content of an existential sentence is analyzed as more complicated than the one presented here to incorporate a presentative function of the sentence.

To sum up this section, adopting the fine-grained analysis of a proposition in Situation Semantics, we could formalize the interpretations of an existential sentence and a subject-predicate sentence in different ways incorporating their different information articulation. In the following two sections, we will discuss two cases where the two types of sentence even have different truth conditions. We will see how useful it is to incorporate information articulation in the semantic analysis in dealing with such cases.

4. No Partitive Reading in Post-copular NPs

It is well-known that weak quantifiers have a partitive reading as well as a simple cardinal reading (Diesing 1992, de Hoop 1992). For instance, the quantifier *twenty six bumble-bees* can be interpreted as 'twenty six out of a certain set of bumble-bees' in addition to simply indicate that the cardinality of bumble-bees is twenty six.

In order for a weak quantifier to have a partitive reading, there must be some particular set in the context for which the partition is applied. The set serving for the domain of weak quantifiers in the partitive reading must be a "familiar" one, which the addressee is able to uniquely identify because he already has a representation of it (Gundel et al. 1993, Buring 1994).

Consider the following discourse in (26).[8]

(26) Although in the garden at present there are around 70

[8]The original discourse has (26b). But (26a) also makes a perfect discourse with the same interpretation.

species of plants in bloom, on some sunny days recently it became apparent that only two of these were attracting mass attention from insects, and that the latter were demonstrating marked specific preferences. Thus on a patch of a deep purple thyme, about a square yard in extent,

a. Twenty six bumble-bees were busily feeding.

b. There were twenty six bumble-bees busily feeding.

In the given context, there is no familiar set of bumble-bees which would serve for the domain of the quantifier *twenty six bumble-bees* in (26a) or (26b). Because the condition for the partitive reading is not met, the quantifier gets the cardinal reading in both (26a) and (26b).

To distinguish an existential sentence from a subject-predicate sentence in terms of the availability of a partitive reading, we need a discourse in which the domain for the partition is established and a clear truth conditional difference between the two readings is manifested. Consider the following simple discourse.

(27) We planted twenty species of plants in our garden in the spring.

a. Unfortunately, at most five species are in bloom now.

b. Unfortunately, there are at most five species in bloom now.

c. (ok after a.; # after b.) But, the ten species we had planted last year are all again in bloom, so the garden is beautiful.

First of all, note that the cardinal reading of (27a) entails its partitive reading. But not vice versa.[9] In the cardinal reading,

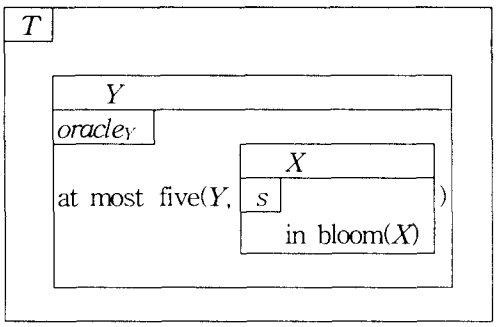
[9]For a monotone increasing quantifier, the entailment is reversed.

(27a) means that the number of species of plants in bloom now is at most five. This contradicts to the following sentence in (27c). However, in the partitive reading, (27a) only means that at most five out of twenty species planted in the spring are in bloom now, without committing the total number. The fact that (27c) is infelicitous after (27b) indicates that the existential sentence has only the cardinal interpretation, in contrast to the subject-predicate sentence which could have a partitive reading. Truth-conditions for (27a) and (27b) are clearly different. (27a) can be true even if total fifteen species are in bloom now as long as at most five of them are planted in the spring. (27b) is certainly false in such a case. It is true just in case the total number of species in bloom now is at most five.

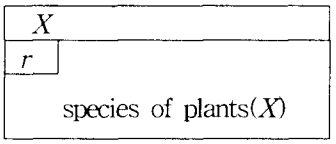
We can explain this contrast in terms of the different information articulation of the two sentences. Recall that a subject-predicate sentence can make not only a thetic statement but also a categorical statement. In the previous section, we considered a case where an indefinite subject refers to a specific object and provides the predication base of a categorical statement. When the subject NP is not referential but quantificational as in (27a), we can assume that the type which is the restriction of the quantification is the predication base of the categorical statement.

(27a) can be interpreted as giving information about a certain set of plants such that at most five species of the set are in bloom now. In this information articulation, its propositional content can be represented as follows.

(28)



where T is of the type



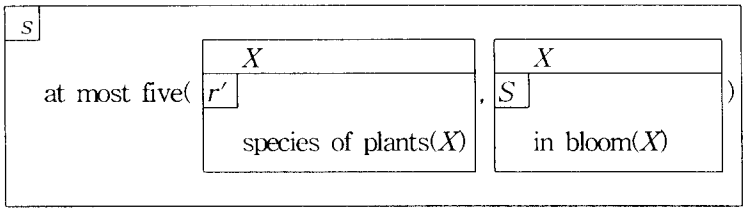
The type T, which is a type of species of plants in r, is not only the restriction of the quantifier *at most five* but also the predication base, i.e. the topic of the categorical statement. Hence, T should not be any arbitrary type of plants but a type of plants familiar in the preceding discourse which is appropriate to be the topic of the sentence. Only a certain set of plants salient in the context, such as something in the score-board (Lewis 1979), can be the appropriate object for T.

The resource situation r in T mediates the interpretation. In the given circumstances of the discourse, the situation in the spring where the speaker planted twenty species of plants is salient. Hence, it can be chosen for the resource situation r in the type. In that case, the extension of the type T can be the set of twenty species planted in the spring. The proposition (28) is true iff at most five members out of this set are in bloom now. Because it is a proposition about that certain type of plants instead of any arbitrary plants, it renders the partitive reading.

On the other hand, the proposed interpretation of an existential

sentence is incompatible with the partitive reading of its weak post-copular NP. An existential sentence describes a situation without a topic status given to the post-copular NP. The post-copular NP combines with the coda predicate to form an infon supported by the described situation. The propositional content of the existential sentence (27b) can be represented as (29).

(29)



A certain type of plants is the restriction of the quantifier *at most five* both in (28) and (29), but it has a different status in the information articulation in the two cases: in (28) it is the predication base (topic), but in (29) it is merely part of the information characterizing the described situation. Because the type is not the topic in (29), it does not need to refer to a pre-established set in the score-board, but any relevant set of people can be its extension.[10] Any set of plants qualifies as the domain of the quantification, as far as it is a relevant set of plants at the workshop. There is no reason for the domain to be restricted to the plants planted in the spring excluding those

[10]Although the cardinal reading of *at most five species of plants* does not quantify over a pre-established set about which the sentence is intended to give information, the domain of the quantifier need not be the set of plants in the whole world. Generally, a quantifier quantifies over objects in some restricted domain relevant to the context. The use of resource situation r' is intended to capture this fact.

planted last year. This renders the simple cardinal reading.[11] The proposition (29) is true iff the described situation *s* supports the infon that the number of species of plants which are in bloom is at most five.

An essential point of this account lies in the different possibility of information articulation of the two sentences. The subject-predicate sentence in (27a) can be analyzed to express a proposition asserted of a certain type of plants, hence the domain of the cardinal quantifier is restricted to a pre-established type of plants, rendering the partitive interpretation. In contrast, as the existential sentence in (27b) is interpreted as a proposition asserted of a situation, the domain of the same quantifier is not restricted to a pre-established type but any appropriate type available in the context, which renders the cardinal reading. Crucially, existential sentences cannot be interpreted as giving information about a certain pre-established type of individual, hence the partitive interpretation of a weak quantifier in the post-copular position is impossible.

Consider (30), which seems to be a counter-example of this claim.

(30) a. Mary: We need some students to prepare the orientation. My students are all out of town. What about your students?

b. John: There are three students available.

It seems that (30b) gives information about John's students and

[11]It seems that the restriction type tends to pick the biggest set available in the context compatible with the description. Why this must be the case needs further research.

the quantifier *three students* is interpreted as 'three of John's students'. But this apparent partitive interpretation is simply inferred due to the conversational maxim of relevance (Grice 1975). Although Mary's question seeks information about John's students, John's answer using the existential sentence does not give information about his students but about a situation in which three students are available. While the domain of the quantifier can be restricted to the set of John's students to make the statement a relevant answer, it is only a pragmatically inferred interpretation. The addition of (31) does not make the discourse incoherent.

(31) They are Bill's students.

In this case, John's statement would not be a direct answer to Mary's question but it can still be regarded as a relevant answer, for it provides information relevant for the purpose of the conversation. This means that the utterance of the existential sentence in (30b) is still thetic describing a situation in which the number of students available is three. The quantifier has a simple cardinal reading and its apparent partitive interpretation is a pragmatically inferred one.

In this section, we have seen that the different information articulations of an existential sentence and a subject-predicate sentence can give rise to different interpretation of the same cardinal quantifier contained there. The proposed analysis that the subject NP but not the post-copular NP can provide the predication base of the proposition explains the fact that the partitive reading is possible in subject-predicate sentences but absent in existential sentences.

5. Adverbs of quantification

Another interesting truth conditional contrast can be found between subject-predicate sentences and existential sentences when they contain adverbs of quantification. The following subject-predicate sentences in (32) and existential sentences in (33) illustrate that indefinite subjects can constitute the restriction of an adverb of quantification, whereas post-copular NPs cannot be so interpreted and keep their existential forces.

(32) a. Sales usually suffer in hot weather.
b. Milk is usually marketed in the republic through co-ops whose farmer members own #1 shares.
c. Industrialists are always coming along to him claiming that even if their mergers are anti-competitive in the UK, this will be offset by gains in efficiency or international competitiveness.
d. Rights issues are always bad news for the City---except for the institutions making money out of managing them.

(33) a. There has always been a problem in the relationship between Mel, who's a smashing lad, and the supporters.
b. There's always a really lively atmosphere day and night.
c. There's always a great atmosphere among the players.
d. And always, in the museum, there is music playing.
e. There is never a sense of lives and reigns being at stake.
f. There is usually a live human being to take information or answer questions.
g. There is usually a breakdown in communications between mothers and their teenagers who become pregnant.

(32a) means that 'most sales suffer in hot weather'. But (33a) does not mean that 'every problem has been in the relationship between Mel and the supporters', but means that 'in every relevant situation or all the time, some problem or other has existed between Mel and the supporters'.

The correlation between information articulation and adverbial quantification has been noted in the literature. Rooth (1985, 1995) shows focus can affect the interpretation of sentences with adverbs of quantification. The sentences in (34a) and (34b) have different truth conditions.

(34) a. Mary usually took John$_F$ to the movies.
'When Mary took someone to the movies, she usually took John.'
b. Mary$_F$ usually took John to the movies.
'When someone took John to the movies, Mary usually took him.'

If Mary took John to the movies five times and Bill did so ten times, (34a) can be true, but (34b) is certainly false. These examples show that when everything else remains the same the different position of focus can change the truth conditions.

Assuming that the logical form of a sentence with an adverb of quantification has a tripartite structure with a quantifier, its restriction and nuclear scope, Rooth (1985) obtains the restriction of an adverb of quantification from the focus closure of the main sentence, i.e. the union of the set of events where the focused position is replaced with an alternative object. This has the effect of existentially quantifying the focused position. In the case of (34a), the union set is the set of events at which Mary takes

someone to the movies. Thus, (34a) is interpreted as meaning that most events of Mary taking someone to the movies are events of Mary taking John to the movies. In contrast, (34b) is interpreted as meaning that most events of someone taking John to the movies are events of Mary taking John to the movies.

In his analysis, adverbs of quantification can quantify over not only events (de Swart 1991) but also variables introduced by indefinites, as illustrated in (35).

(35) a. A dog is usually intelligent$_F$.
b. USUALLY ([dog(x) & x has some property], [x is intelligent])
c. When something is a dog, it is usually intelligent.
(Most dogs are intelligent.)

Similarly, (36) is interpreted as (37b) via the logical form in (37a).

(36) Gangs always fight$_F$ in the park.
(37) a. ALWAYS ([gang(x) & x has some property in the park], [x fight in the park])
b. All gangs fight in the park.

However, the corresponding existential sentence in (38) never gets such an interpretation even though some heavy accent is put on the coda predicate *fighting*.

(38) There are always gangs FIGHTING in the park.

If we assume that the post-copular indefinite NP is existentially quantified over instead of introducing free variables,

we can avoid the interpretation in (37). However, if the focus is still assumed to be only on the coda predicate, (38) would have the logical form in (39a), where the adverbial quantifier quantifies over situations, and would be interpreted as (39b).

(39) a. ALWAYS ([*s* is a situation in the park and some gangs have some property in *s*], [the gangs have the property of fighting in *s*])
b. Whenever there are some gangs in the park, they are fighting there.
(Every situation in the park where there are some gangs is a situation in which they are fighting.)

While this interpretation does not involve quantification over gangs, it quantifies over situations in the park in which there are some gangs. This is still not the correct interpretation of the existential sentence in (38).

Suppose that gangs come to the park only on weekends and they fight whenever they are in the park. In this case, (38) is false, but it is incorrectly judged true according to the interpretation in (39). This means that (38) is interpreted as (40), the quantifier simply quantifying over situations in the park whether it has gangs or not.

(40) a. ALWAYS ([*s* is a situation in the park and some fact holds in *s*], [some gangs are fighting in *s*])
b. Every situation in the park is a situation in which some gangs are fighting.

This interpretation is obtained if the whole part composed of

the post-copular NP and the coda predicate is regarded as being in focus in (38), as in (41).

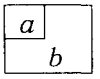
(41) There are always [gangs FIGHTING]$_F$ in the park.

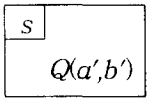
Presumably, the accented coda predicate *fighting* gets some contrastive focus, but what is relevant to the adverbial quantification is presentational focus. Because (38) describes a situation in the park as one supporting the infon that some gangs are fighting, the post copular NP *gangs* should be taken in the focus as well as the accented coda predicate *fighting*. The automatic application of alternative semantics to existential sentences ignoring this fact cannot work.

Apart from the effect of focus, it has been noted that there is some correlation between the topic (background) and the restriction on the one hand, and the comment (focus) and the nuclear scope on the other hand (Partee 1991, von Fintel 1994). However, this interesting line of approach has not reached a full-fledged formal analysis. This was partly because there was not a theory available to formalize the notion of topic in a formal analysis of a sentence. The proposed analysis of a propositional content of a statement which incorporates the topic-comment structure can be regarded as a way to formally accommodate this correlation between the topic and the restriction of adverbial quantification.

In syntax, an adverb of quantification Qadv is a one-place operator modifying a sentence p, as in (42a). If p has the propositional content in (42b) and Qadv denotes a quantifier relation Q, then the quantificational sentence Qadv(p) is interpreted as (42c), where a' and b' are relevant types formed from a and b.

(42) a. Qadv(p)

b. 

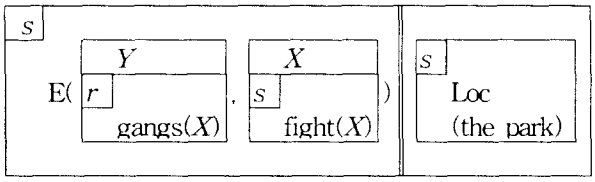
c. 

There arises no partition problem for an adverbial quantification in our analysis, because the propositional content of p is already given some kind of partition reflecting its information articulation. A sentence p is interpreted as a proposition which involves predication of some argument a---a situation or an individual which is expressed by the sentence topic). We can form the restriction of Q out of the predication base a, and the nuclear scope from the predicating part b. An adverb of quantification relates between types like other generalized quantifiers. Depending on the predication base, an adverb of quantification quantifies over situation types or individual types.

Now, we can account for the different interpretation of the two sentences in (36) and (38). According to the proposed semantics of existential sentences, the post-copular NP and the coda predicate are not separated into a and b but they together form b, an infon characterizing a, a situation. The non quantificational existential sentence (43a) is analyzed as expressing the proposition (43b). The PP adjunct *in the park* restricts the spatial location of the described situation s, and provides the background information for the proposition that some gangs are fighting in s. The proposition in (43b) does not assert of an arbitrary situation, but a situation whose location is in the park.

(43) a. There are gangs fighting in the park.

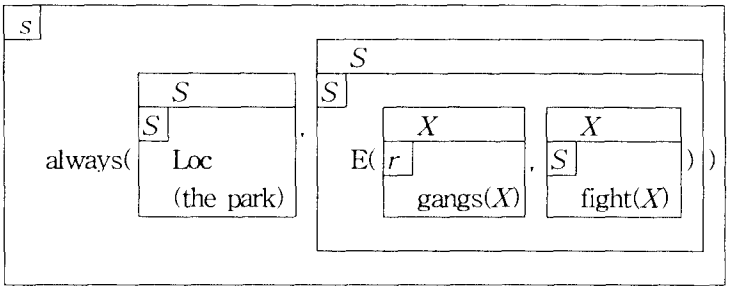
b.



When the adverb of quantification *always* combines with (43a), the propositional content of the quantificational existential sentence (44a) (=(38)) can be represented as (44b).

(44) a. There are always gangs fighting in the park.

b.



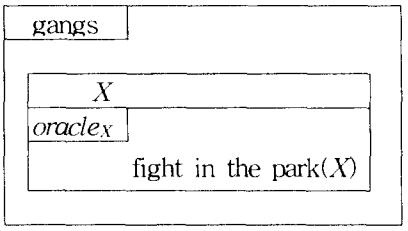
The restriction of the quantifier *always* in (44b) is obtained from the predication base of (43b). As (43b) is asserted of a situation whose location is in the park, the type of such a situation serves the restriction of the adverbial quantification in (44b). The proposition (44b) correctly captures the interpretation of (44a): every situation in the park is of the type of situation supporting the infon that some gangs are fighting.[12]

[12]If the locative phrase it *in the park* is syntactically analyzed as part of the coda predicate rather than an adjunct, it would belong to the information supported by the described situation *S*, hence part of the focus. Under this information articulation, the quantificational existential sentence is analyzed to mean that every (relevant) situation supports the infon that some gangs are

On the other hand, the subject-predicate sentence in (45a) can be analyzed to have the following propositional content in (45b), because it is possible for the subject NP to be the topic and for the rest part to be its comment.

(45) a. Gangs fight in the park.

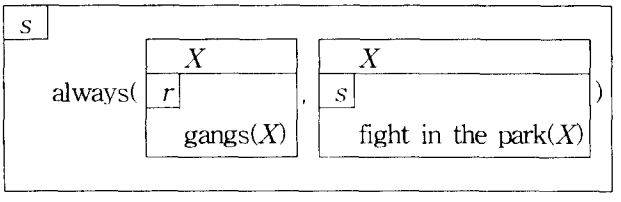
b.



Accordingly, when it is modified by the adverb of quantification *always*, as in (46a) (=(36)), it can be interpreted as (46b). Since (46b)'s predication base is an individual constant *gangs*,[13] the type of individuals who are gangs constitutes the restriction of the quantifier *always* in (46b). Therefore, it means that all gangs fight in the park.

(46) a. Gangs always fight in the park.

b.



fighting in the park.

[13]In this case, the bare plural names a kind. (Carlson 1977) It is beyond the scope of this paper to propose a way to handle bare plurals in Situation Semantics. A relevant discussion is found in Glasbey (1995).

Compare the role of the same type box representing the type of gangs in (44b) and (46b). It constitutes the restriction of *always* and the parameter in it is bound by the quantifier in (46b). In contrast, it belongs to the nuclear scope of *always* and the parameter in it is bound by an existential quantifier in (44b). Hence, the two propositions have different truth conditions. If there is no gang at all in the park, (44b) is false, but (46b) is still true. If there are gangs who never fight in the park, (46b) is false, but (44b) still can be true as far as fightings of some gangs always happen in the park. Such truth conditional differences are due to the fact that the indefinite NP *gangs* has a different role in the information articulation of the two sentences: it is part of the comment in (43) but the topic in (45). To sum up this section, considerations of the topic-comment structure is essential to account for the different truth conditions of existential sentences and subject-predicate sentences modified by an adverb of quantification.

6. Conclusion

In this paper, a semantic analysis of existential sentences was proposed to capture their information articulation distinguished from that of subject-predicate sentences. The interpretation of an existential sentence was formalized in a way reflecting the fact that its post-copular NP can never be the topic but rather must always be part of the comment. It was achieved by assuming that the post-copular NP and coda predicate together form a fact characterizing the situation described by the utterance of the existential sentence. In contrast, a subject-predicate sentence, which can be readily interpreted as a statement about the subject

NP, was formalized as asserting that the individual denoted by the subject NP is of a certain type.

By analyzing the propositional contents of the two types of sentence in a way fine-grained enough to distinguish their different information articulation, we could account for the different interpretation of cardinal quantifiers and adverbial quantification in the two types of sentence: the partitive interpretation is absent in the post-copular NP but possible in the subject NP, and only the subject NP but not the post-copular NP can constitute the restriction of an adverb of quantification. The fact that even such truth-conditional differences arise due to information articulation strongly supports the proposed position that the propositional content of a statement should be analyzed in a way to accommodate not only its truth-conditions but also its information articulation.

References

Aissen, Judith. 1975. "Presentational-*There* Insertion: A Cyclic Root Transformation," in *Proceedings of CLS 11.1*, 1-14.

Barwise, Jon, and Robin Cooper. 1981. "Generalized Quantifiers and Natural Language," *Linguistics and Philosophy* 4, 159-219.

Barwise, Jon, and Robin Cooper. 1993. "Extended Kamp Notation: A Graphical Notation for Situation Theory," in P. Aczel, D. Israel, Y. Katagari, and S. Peters. eds., *Situation Theory and its Applications*, 29-54. Stanford: CSLI.

Barwise, Jon, and John Etchemendy. 1987. *The Liar: An Essay on Truth and Circularity*. New York: Oxford University Press.

Barwise, Jon, and John Perry. 1983. *Situations and Attitudes*. Cambridge,

MA: MIT Press.

Brentano, Franz. 1973. *Psychology from an Empirical Standpoint*, Translated by Antos C. Rancurello, D. B. Terrell, and Linda L. McAlister from *Psychologie vom Empirischen Standpunkt* (1874).

Bresnan, Joan. 1994. "Locative Inversion and the Architecture of Universal Grammar," *Language* 70, 72-131.

Büring, Daniel. 1994. "Topic," in Peter Bosch and Rob van der Sandt, eds., *Proceedings of the IBM/Journal of Semantics Conference on Focus*, 271-280. Heidelberg.

Carlson, Gregory N. 1977. *Reference to Kinds in English*. Bloomington: Indiana University Linguistics Club.

de Hoop, Helen. 1992. *Case configuration and Noun phrase Interpretation*. Groningen University dissertation.

Devlin, Keith. 1991. *Logic and Information, Volume 1: Infons and Situations*. Cambridge, England: Cambridge University Press.

Diesing, Molly. 1992. *Indefinites*. Cambridge, MA: MIT Press.

von Fintel, Kai. 1994. *Restrictions on Quantifier Domains*. University of Massachusetts at Amherst dissertation.

Fodor, Janet, and Ivan Sag. 1982. Referential and Quantificational Indefinites," *Linguistics and Philosophy* 5, 355-398.

Gawron, Jean Mark, and Stanley Peters. 1990. *Anaphora and quantification in Situation Semantics*. Stanford: CSLI.

Glasbey, Sheila. 1995. A Situation-Theoretic Interpretation of Bare Plurals. Center for Cognitive Science, University of Edinburgh Ms.

Grice, H. Paul. 1975. "Logic and Conversation," in Peter Cole and Jerry L. Morgan, eds., *Syntax and Semantics 3: Speech Acts*. New York: Academic Press.

Gundel, Jeanette, Nancy Hedberg, and Ron Zacharski. 1993. "Cognitive Status and the Form of Referring Expressions in Discourse,"

Language 69, 274-307.

Kim, Yookyung. 1996. *A Situation Semantic Account of Existential Sentences*. Stanford University dissertation.

Krifka, Manfred. 1992. "A Framework for Focus-Sensitive Quantification," in *Proceedings of SALT II*, 215-234. Ithaca, NY. Cornell University.

Kuroda, S.-Y. 1992. *Japanese Syntax and Semantics*. Dordrecht: Kluwer.

Ladusaw, William. 1982. "Semantic Constraints on the English Partitive Construction," in *Proceedings of WCCFL 1*, 231-242. Stanford, CA: CSLI.

Ladusaw, William. 1994. "Thetic and Categorical, Stage and Individual, Weak and Strong," in *Proceedings of SALT IV*, 220-229. Ithaca, NY: Cornell University Press.

Langendoen, Terence D. 1979. "More on Locative Inversion Sentences and the Structure-Preserving Hypothesis," *Linguistic Analysis* 5, 421-437.

Lewis, David. 1979. "Score-Keeping in a Language Game," in R. Bäuerle, U. Egli, and A. von Stechow, eds., *Semantics from Different Points of View*. Berlin: Springer.

Li, Charles N. and Sandra A. Thompson. 1976. "Subject and Topic: A New Typology of Language," in Charles N. Li, ed., *Subject and Topic*, 457-589. New York: Academic Press.

McNally, Louise. 1995. Stativity and Theticity," in *Proceedings of Bar-Ilan conference on Event and Grammar*.

Partee, Barbara H. 1991. "Topic, Focus and Quantification," in *Proceedings of SALT I*, 159-187. Ithaca, NY. Cornell University.

Reinhart, Tanya. 1981. "Pragmatics and Linguistics: An Analysis of Sentence Topics," *Philosophica* 27, 53-94.

Reinhart, Tanya. 1995. "Topics and the Conceptual Interface. Part IV of Interface Strategies, Ms.

Rooth, Mats E. 1985. *Association with Focus*. University of Massachusetts at Amherst dissertation.

Rooth, Mats E. 1995. "Indefinites, Adverbs of Quantification, and Focus Semantics," in Greg Carlson and Jeff Pelletier. eds., *The Generic Book*. University of Chicago Press.

Sasse, Hans Jürgen. 1987. "The Thetic/Categorical Distinction Revisited," *Linguistics* 25, 511-580.

Schmerling, Susan F. 1976. *Aspects of English Sentence Stress*. Austin: University of Texas Press.

Strawson, P. F. 1964. "Identifying Reference and Truth-values," in D. Steinberg and L. Jacobovits, eds., *Semantics*, 86-99. Cambridge University Press.

Vallduví, Enric. 1990. *The Informational Component*. University of Pennsylvania dissertation.

Department of Linguistics, Stanford University, Stanford CA 94305
e-mail: yookyung@csli.stanford.edu

접수일자: 1997. 7. 15.
게재결정: 1997. 10. 28.