Towards a Semantics of
Japanese Existential Sentences

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Modern Japanese has a noun *sonzai* which means existence in general. According to Akira Yanafu [1] who has studied many words which were newly created just after the Meiji Restoration, this noun first appeared as a translation of French *étre* in Meiji 4 (1860), and became a part of the standard philosophical vocaburary soon after. It is not hard to guess why such a noun was thought necessary; as Yanafu points out, unlike French, German, or English, Japanese had no noun corresponding to the existential verb, which has the two forms, *aru* and *iru*. You can well imagine how frustrating it would be if you had to talk about the concept which you could not refer to by a noun. However, when there is a simple and convenient expression to talk about a concept, that might become an obstacle to see the complexity of the real working of the concept. In particular, the nouns can mislead us about the real nature of the corresponding concepts, as Wittgenstein reminds us.

> We are up against one of the great sources of philosophical bewilderment: a substantive makes us look for a thing that corresponds to it. [2]

If you wish to analyze a concept, what you should look at is not how we talk about the concept, but how we use the concept in talking about other things. A Japanese philosopher Tetsuro Watsuji, who was born in the same year as Wittgenstein, tried to deduce the meaning of *sonzai* from the meanings of the two Chinese characters which had been borrowed to make the word. This is a misguided way to analyze the concept. If we wish to be clear what the concept of existence is by looking at the working of a language, what we should concentrate on is not the nouns such as *existence* or *sonzai* but the verbs or verbal constructions such as *there is* or *aru / iru*. [3]

In thinking that we can make clear the concept of existence by analyzing how the verbs *aru* and *iru* are used, we are presupposing that these two verbs

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[1] Yanafu (1982).

[2] Wittgenstein (1958) p.1.

[3] Although the verb *sonzaisuru* is derived from the invented noun *sonzai*, it is now an entrenched part of Japanese. Therefore, it is worthwhile to examine the use of this verb and compare it with those of *aru* or *iru*. But, this is a task for another occasion.

express existence. However, it seems to be still a disputed point whether *aru* and *iru* can express existence distinct from location or possession. Hence, our first task is to establish that these verbs have a purely existential meaning that cannnot be reduced to location or possession. §1 is devoted to this. In the following §2, it is argued that Japanese also has grammatical constructions very much similar to those discussed under the name of "*there*-insertion". This fact can be appreciated only after we distinguish a purely existential meaning from a locational meaning of *aru* and *iru*. The last section is a discussion of various ways to give a semantics to Japanese existential sentences. There is no way to give an adequate analysis of the concept of existence without a satisfactory semantics of existential sentences. Throughout this discussion, we hope to make clear that various methods of analysis proposed for a language much different from Japanese can equally apply to Japanese.

Japanese has only a make-shift noun in order to express the concept of existence; but, that does not mean that it has no systematic way of expressing existence. Thus, an analysis of Japanese existential sentences can be also a route to the clarification of the concept of existence.

1 *Iru* and *aru*: location, existence, and possession

A pair of verbs *iru* and *aru* [4] have at least three uses. Firstly, they are used to express the location of a subject as shown in the following examples.

(1) *Taro wa kouen ni iru.* (Taro is in the park.)

(2) *Daibubun no hon wa gakkou ni aru.* (Most of the books are in the school.)

Secondly, they are used to express existence.

(3) *Waratta ooku no gakusei ga iru.* (There are many students who laughed.)

(4) *Taro ga yonda ooku no hon ga aru.* (There are many books Taro has read.)

Lastly, as the following examples show, they are used to express possession. [5]

(5) *Hanako (ni) wa kodomo ga iru.* (Hanako has a child / children.)

(6) *Hanako (ni) wa yuuki ga aru.* (Hanako has courage.)

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[4] As is well known, there is much discussion as to how *iru* and *aru* are distributed and what causes such a distribution. Fortunately, to the concern of this paper, there is no need to go into this controversial issue.

[5] As remarked by Landman (2004, pp.198f.), it is quite misleading to term the relation expressed in (5) as "possession". Roughly, what is called the "possessive" use of *iru* or *aru* here is the use which is best rendered in English by employing the verb "have".

The first and second uses are frequently put into the same category of meaning. For example, Masuoka and Takubo describe the construction using *iru* and *aru* as "existential-locative construction", and claim that

(a location) + *ni* + (the subject of existence) + *ga* + *iru* / *aru*

is the fundamental pattern of a sentence expressing existence. [6] Thus they are assimilating the second use which is existential to the first one which is locative. In the same vein, Kishimoto [7] says that *iru* and *aru* have two meanings, one of which is "locative-existential" and the other is "possessive".

Why do these authors put the first and second uses into the same category? One reason might be that the sentences like (3) and (4) can be used to express either existence or location. But, the existential uses and the locative uses can be distinguished clearly and easily. One way of doing that is to see whether it makes sense to ask "*Doko ni* (where is it / where are they)?": if it makes sense the sentence expresses location, if not it expresses existence. [8]

The same point can be argued more formally. In general, two readings S_1 and S_2 of a sentence S uttered in a certain context are semantically distinct, if it can be shown that (i) there is a situation where S_1 is true and S_2 is false, and that (ii) there is a situation where S_1 is false and S_2 is true. Let us consider a sentence

(7) *Choudo san-nin no waratta gakusei ga iru.* (There are exactly three students who laughed.)

(7) has two readings:

(7a) Exactly three students laughed.

(7b) At the location l understood contextually, there are exactly three students who laughed, and it is not necessarily true that exactly three students laughed (there might be more than three students who laughed).

It is easy to see that (7a) and (7b) are mutually independent. If exactly three students laughed and the number of those students who laughed and are at l is not three, and (7) is uttered in this situation, it has both a true reading (7a) and a false reading (7b). Conversely, if the number of the students who laughed and are at l is exactly three, but they are only a part of the students who laughed, then (7) has (7a) as a false reading and (7b) as a true reading.

This shows that (7) has two semantically distinct—differing in truth condition—readings. Then, could we conclude that (7) is an ambiguous sentence and the cause of the ambiguity resides in the the verb *iru*? The answer depends on how we think about the architecture of the theory of meaning for a language. In philosophy at least, there are still many who adhere to the principle like the following:

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[6] Masuoka and Takubo (1992) p.84.

[7] Kishimoto (2000)

[8] This shows that there is something wrong with Masuoka and Takubo's "fundamental pattern" of an existential sentence.

(TC) For any sentence S and any context C, the meanings assigned
to the constituents of S together with the relevant parameters sup-
plied by C determine the truth condition of S relative to C.

Here "constituents" of S includes not only the words occuring in S but also the
way they are combined in S.

Given (TC), if there are two readings of S in the same context differing in
truth condition, there must be some difference in the assignement of meanings
to the constituents of S. This in turn must arise either from the fact that S
admits two different ways to be analyzed into constituents, or from the fact that
the different meanings are assigned to some consituent of S; the former is a case
of structural-ambiguity, and the latter is a case of homonymy.

However, if we do not accept (TC), then we can no longer conclude from
the existence of two readings differing in truth condition to the existence of an
ambiguity. To reject (TC) means that the meanings assigned to S by a theory
of meaning are not enough to determine its truth condition even when all the
relevant contextual parameters are in.

Still, I think there are some considerations which suggest that what we have
here is a case of ambiguity, in particular, that of homonymy. Let us term the
occurrence of *iru* in the reading (7a) as that of existential *iru*, and that in the
reading (7b) as that of locative *iru*. Then, in general, existential *iru* and *aru*
are distinguished from either locative or possessive *iru* and *aru* in at least three
respects.

Firstly, they seem to have different argument sturctures. While locative
and possessive *iru* and *aru* take two arguments, existential *iru* and *aru* take
a single argument. This agrees with the forementioned fact that the locative
readings of (3) and (4) admit the question "*Doko ni* (where is it / where are
they)?" while their existential readings do not. But it may be objected that this
difference in argument structure is only an appearance that can be explained
away. We will come back to this point later.

Secondly, there is a difference with respect to tense. The verbal tenses of
existential *iru* and *aru* do not affect the truth value of the sentence in which
they occur. For example, the following sentence which has the past form of *iru*

(3′) *Waratta ooku no gakusei ga ita.* (There were many students
who laughed.)

has the same truth value as (3) which has the non-past form of *iru*. Even when
the subordinate clause is non-past in tense, the matter is not different. Consider:

(8) *Asu kuru ooku no gakusei ga iru.* (There are many students who
will come tomorrow.)

(9) *Asu kuru ooku no gakusei ga ita.* (Literally: There were many
students who will come tomorrow.)

(8) and (9) have the same truth condition, because both of them are equivalent to the following: [9]

(10) *Ooku no gakusei ga asu kuru.* (Many students will come tomorrow.)

On the other hand, it is clear that (1) and

(1′) *Taro wa kouen ni ita.* (Taro was in the park)

or, (5) and

(5′) *Hanako (ni) wa kodomo ga ita.* (Hanako had a child / children.)

can differ in truth value. [10]

Thirdly, they behave differently with respect to negation. If we replace *iru* or *aru* at the ends of (1)–(6) with *inai* or *nai*, which are the negative forms of *iru* and *aru* respectively, we can negate them. The results are:

($\overline{1}$) *Taro wa kouen ni inai.* (Taro is not in the park.)

($\overline{2}$) *Daibubun no hon wa gakkou ni nai.* (Most of the books are not in the school.)

($\overline{3}$) *Waratta ookuno gakusei ga inai.*

($\overline{4}$) *Taro ga yonda ooku no hon ga nai.*

($\overline{5}$) *Hanako (ni) wa kodomo ga inai.* (Hanako has no children.)

($\overline{6}$) *Hanako (ni) wa yuuki ga nai.* (Hanako has no courage.)

($\overline{1}$) and ($\overline{2}$) are still concerned with the location of some subjects, and similary, ($\overline{5}$) and ($\overline{6}$) are still concerned with some sort of possession. What is remarkable here is that ($\overline{3}$) and ($\overline{4}$) no longer admit different readings; ($\overline{3}$) can only mean that at some particular place understood in the context there are no students who laughed, and similarly, the only meaning ($\overline{4}$) can have is that at some contextually understood location there are none of the many books which Taro has read. [11]

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[9]These examples suggest that the tenses are required of the existential verbs only for syntactic reasons. Then, are the existential sentences tenseless? Are there no difference between (3) and (3′), or (8) and (9)(of course, in existential readings)? These are interesting questions I would like to pursue on another occasion.

[10]For that matter, if (3) and (3′) are read as locative sentences, they can differ in truth value.

[11]It might be objeted that the following sentence has an existential reading as well as a locative one.

(i) *Waratta gakusei wa inai.*

In a locative reading (i) means that the students who laughed are not at some location which is understood contextually, and in an existential reading it means that there are no students who laughed.

However, instead of (i), consider

(ii) *Waratta gakusei ga inai.*

Despite these differences, there seems to be a strong temptation to assimilate the existential *iru* and *aru* with the locative ones. If you think the former can be reduced to the latter, or vice versa, you have given way to the temptation.

If you think that the existential *iru* and *aru* can be reduced to the locative *iru* and *aru*, it would be natural to suppose that, though the existential *iru* and *aru* that occur in such sentences as (3) and (4) seem to be a verb with only one argument, they are really the verbs that take two arguments. There are two cases where a verb that takes two arguments in nature looks like a verb with a single argument. They are

(a) the case where one of the two arguments is quantified (usually, existentially quantified), and

(b) the case where one of the two arguments is filled, because its value is understood tacitly in the context. According to an influential school of Japanse grammar, this filling of the argument is done by "zero-pronouns".

Therefore, if the existential *iru* and *aru* are really disguised locative verbs, then their location arguments must be either (a) existentially quantified, or (b) understood tacitly in the context. However, consider the following two sentences.

(11) *Shimetsu-shita ooku no doubutsu ga iru.* (There are many animals which have become extinct.)

(12) *Mada kakarete inai subarashii ongaku ga takusan aru.* (There are many splendid pieces of music which are yet to be written.)

It makes no sense to talk about the location where many extinct animals are, nor the location where many splendid pieces of music which are yet to be written can be found. If (11) and (12) are derived from some other sentences which have the argument place for a location, either by existential quantification into the location argument place, or by getting a contextually determined value for it, then they would be either false or meaningless, because there is no place where the extinct animals are or the unwritten pieces of music can be found. But it is obvious that (11) and (12) can be true.

How about the other strategy, namely, that of reducing the locative *iru* and *aru* to the existential ones? In order for this strategy to succeed, the seemingly two-place locative *iru* and *aru* must be really the complex verbal

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This sentence is not ambiguous and admit only a locative interpretaion, while the positive sentence

(iii) *Waratta gakusei ga iru.*

has both the existential reading ("There are students who laughed") and the locative reading (for example, "The students who laughed are here.").

It is significant that in a locative meaning of (i) and (iii) *waratta gakusei* is a definite noun phrase, while it is indefinite in an existential reading of them. In (ii), *waratta gakusei* cannnot be interpreted as indefinite.

phrases consisting of the single-place existential *iru* or *aru* and some adjunctive element.

Then the phrase which expresses a location should be considered not as an argument to the verb, but as an adjunct. For example, *kouen ni* in (1) and *gakkou ni* should be regarded not as noun phrases with a case particle *ni*, but as postpositional phrases with a postposition *ni*.

As a postpositional phrase is an optional element of the sentence, it can be dropped without the loss of grammaticality. For example, in

(13) *Taro ga kouen de koronda.* (Taro fell in the park.)

kouen de is a postpositional phrase and therefore can be dropped. The resulting sentence

(14) *Taro ga koronda.* (Taro fell.)

can be used by itself to make a complete utterance. Besides, (14) is a logical consequence of (13).

The view we are now considering is that *iru* and *aru* are not essentially locative, and the locative use of them is only the existential use with an adjunctive which indicates a location. However, there are no grounds to take this view. Consider the following sentences. [12]

(15) *Inai gakusei ga iru.* (Literally: There are students who are not.)

(16) *Inai gakusei wa inai.* (Literally: There are no students who are not.)

(17) *Nai mono ga aru.* (Literally: There are things that are not.)

(18) *Nai mono wa nai.* (Literally: There are no things that are not.)

In (15)–(18), each sentence contains two occurrences of *iru* or *aru*, because

$inai = iru + nai$

$nai = aru + nai.$

If *iru* and *aru* in these sentences were the verbs with a single argument, then (15) and (17) would be contradictions, and (16) and (18) would be tautologies. But obviously we can make true assertions using (15) or (17), and false assertions using (16) or (18).

This fact can be explained if we think that each of (15)–(18) contains the occurrences of the two homonymous verbs; *iru* and *aru* that occur as a part of the complex noun phrases are the locative *iru* and *aru*, while *iru* and *aru* at the end of the sentence are the existential ones. The locational argument of the former are filled contextually, in most cases it is just *koko* (here). So, the seemingly contradictory (17) means really the same thing as the following sentence does.

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[12] I owe (18) to Yuji Nishiyama.

(19) *Koko ni nai mono ga aru.* (There are things that are not here.)

Similar paraphrases apply to other sentences. [13]

Before moving to the next section, we would like to make a short observation about *aru* which takes as an argument a noun phrase which refers to an event. In this case too, we should distinguish three meanings as the following examples show.

(20) Location: *Nichiyoubi ni shiai ga aru.* (There will be a match / matches on Sunday.)

(21) Existence: *Taro ga katta shiai ga aru.* (There is a match / are matches which Taro won.)

(22) Possession: *Dekigoto ni wa subete gen-in ga aru.* (Every event has a cause.)

To locate an event is to locate it in time. What is characteristic of a locative sentence about an event is that it is an event sentence and not a state sentence. [14] A way of distinguishing a state sentence from an event sentence is to see whether a non-past form of the sentence can be about the present. If the non-past tense particle of the sentence can be interpreted as indicating the present, the sentence is a state sentence; if it can be interpreted only as indicating some time after the present, the sentence is an event sentence. [15] Accordingly, (20) is an event sentence, because the Sunday when the match will be held must be in the future. This makes a contrast to the fact that the locative sentences like (1) and (2) whose subjects are not events, are state sentences.

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[13]One possible objection is that (17) can mean

(i) *Koko ni nai mono ga* <u>*dokoka ni*</u> *aru.* (<u>Somewhere</u> there are things that are not here.)

However, consider the following sentence:

(ii) *Doko ni mo nai mono ga aru.*

The literal translation of this would be

(iii) There are things that are not anywhere.

So, if we paraphrase this in the same way as (17) is paraphrased into (i), the resulting sentence will be the contradictory

(iv) Somewhere there are things that are not anywhere.

However, it is clear that (ii) does not express a contradiction.

Another objection is to say that (17) has two occurrences of the same one-place existential *aru* with a postpositional phrase and without one. According to it, (17) is an abbreviated form of

(v) *Koko ni nai mono ga aru.*

But, as noted with (13) and (14), a sentence with a postpositional phrase implies the sentence without one. In this case, we have the implication from "*kokoni aru.*" to "*aru*", and therefore, we also have the implication from "*nai.*" to "*kokoni nai.*".Though this implication does not make (v) contradictory, it makes (18) tautologous, which is clearly not.

[14]Althogh this claim sounds tautologous, it is not. For the distinction between an event sentence and a state sentence, see Iida (2001a).

[15]Cf. Iida (2001a) pp.2–4.

While the tense particle in (20) can indicate only the future time, the tense particle in (21) cannot indicate the future time. Just as in (3) and (4), with respect to tense, the decisive factor is the tense of the modifying clause to the subject noun, and the tense of the existential *aru* does not contribute to the tense of the complete sentence, as can be seen from the fact that (21) has the same truth condition as

(23) *Taro ga katta shiai ga atta.* (There was a match / were matches which Taro won.)

This already shows that it is necessary to distinguish the locative *aru* and the existential *aru* with respect to *aru* with an event argument. However, if you want the example similar to (8) or (9), you get one in

(24) *Yari-nokoshita koto ga takusan aru.* (There are many things that are left undone.)

To ask when the things left undone occurred makes little sense, just as it is to ask where we can find the many animals that are extinct.

2   *There*-insertion: a Japanese version

Compare (3) and (4), which were cited as typical examples that show the existential use of *iru* and *aru*, with the following sentences.

(25) *Ooku no gakusei ga waratta.* (Many students laughed.)

(26) *Taro ga ooku no hon o yonda.* (Taro has read many books.)

It is obvious that (3) and (4) are closely related to (25) and (26). Each of the matching pair of the sentences are same in the meaning, in the sense that they have the same truth condion when used in the same context. Moreover, there is a formally characterizable relation between the paired sentences. Thus, in order to get (3) from (25), perform the following operations.

(i) Move the predicate at the end of the sentence to the head, and make it a modifying clause of the noun phrase which was formerly its argument. By this operation, you get a complex noun phrase *waratta ooku no gakusei* (many students who laughed).

(ii) In order to get a sentence from the complex noun phrase formed in (i), supply the case particle *ga*, and then put *iru* or *aru* at the end. The result is (3).

This procedure can be generalized so that it applies to the sentences like the following.

(27) *Sensei ga kyoushitsu de san-nin no seito o shikatta.* (A teacher scolded three students in the classroom.)

(28) *Kyoushitsu de san-nin no seito o shikatta sensei ga iru.* (There is a teacher who scolded three students in the classroom.)

(29) *Sensei ga kyoushitsu de shikatta san-nin no seito ga iru.* (There are three students whom a teacher scolded in the classroom.)

For a moment, let us suppose that a sentence like (27) consists of the predicate at the end and the preceding string of noun phrases and/or postpositional phrases, so that (27) is analyzed as

$(Sensei\ ga)_{\mathrm{NP}}\ (kyoushitsu\ de)_{\mathrm{PP}}\ ((san\text{-}nin\ no\ (seito))\ o)_{\mathrm{NP}}$
$(shikatta)_{\mathrm{Predicate}}$

More generally, where Q_n is a noun phrase or a postpositional phrase and Φ is a predicate, many Japanese sentences have the following form

$$Q_1 Q_2 \ldots Q_k \Phi.$$

Then, the formal relation between a sentence like (27) and the corresponding sentence ending with *iru* or *aru* can be diagrammed like this:

$\ldots Q_k \phi$

$\ldots \phi\ Q_k\ iru\ /\ aru$

Here "..." indicates a string of noun phrases and/or postpositional phrases, Q_k is a noun phrase, and ϕ is either a predicate or a predicate with a preceding string of noun phrases and/or postpositional phrases. [16] Let us call this procedure as "*iru*-addition". For example,

(25) and (3): "..." is an empty string, Q_k is *ooku no gakusei*, and ϕ is *waratta*.

(26) and (4): "..." is *Taro ga*, Q_k is *ooku no hon*, and ϕ is *yonda*.

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[16](3) [(4)] is not the only sentence corresponding to (25) [(26)]. The following sentences are also related to the original ones in a similar way.

  (i) *Ooku no waratta gakusei ga iru.* (There are many students who laughed.)

  (ii) *Ooku no Taro ga yonda hon ga aru.* (There are many books Taro has read.)

If we suppose a Japanese noun phrase or postpostional phrase Q_k have the structure $(D_k N)_k$, where D_k is a quantitative modifier like *ooku no* (many) and *san-nin no* (three persons), and N is a noun, then we can generalize the pattern to

  $\ldots (D_k N)_k \phi$

$D_k \ldots \phi N\ iru\ /\ aru$

The following pair of sentences show how this pattern works.

  (iii) *Taro ga takusan no hon o Hanako ni ageta.* (Taro gave many books to Hanako.)

  (iv) *Takusan no Taro ga Hanako ni ageta hon ga aru.* (There are many books Taro gave to Hanako.)

(27) and (28): "..." is an empty string, Q_k is *sensei*, and ϕ is *kyoushitsu de san-nin no seito wo shikatta.*

(27) and (29): "..." is *sensei ga kyoushitsu de*, Q_k is *san-nin no seito*, and ϕ is *shikatta.*

As can be ascertained, the pair realizing the pattern consists of the sentences that agree in the truth condition: uttered in the same context, (26) and (4) have the same truth condition, and the same holds with other pairs. However, this holds only with the existential readings of these sentences. If (3) is interpreted as a locative sentence which has the same meaning as

(30) *Waratta ooku no gakusei ga koko ni iru.* (Here are many students who laughed.)

it does not have the same truth condition as (25).

The common pattern found in these pairs of Japanese sentences reminds us of a subject which has been investigated vigorously for many years since Milsark (1977). [17] As the following examples show, in English there are noun phrases which can occur in the sentences beginning with "there" and those that cannot; the former is called "a weak noun phrase (a weak NP)" and the latter is called "a strong noun phrase (a strong NP)".

(31) There were two/some/many students at the party.

(32) *There were all/the/most students at the party.

There was a time when it was supposed that a sentence like (31) came from a sentence like

(33) Two/Some/Many students were at the party.

by a transformational operation called "*there*-insertion". And, what attracted the most attention was why this operation cannot be applied to the sentences like

(34) All/The/Most students were at the party.

In comparing Japanese *iru*-addition with English *there*-insertion, we have to be careful about several things. For one thing, although (31) is usually called an "existential sentence", according to the classification we are adopting here, it is really a locative sentence. And, as far as the locative sentences are concerned, in Japanese there is no difference like that between (31) and (32). All of the following are perfectly good sentences.

(35) *Futari no / ∅ (empty string) / Ooku no gakusei ga paatei ni ita.* (Two/∅/Many students at the party.)

(36) *Subete no / Sono / Daibubun no gakusei ga paatei ni ita.* (All/The/Most students were at the party.)

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[17] For a survey, see Lumsden (1988).

Only when they are turned into the existentials sentences by *iru*-addition, there emerges the difference similar to that found in English. If we apply the *iru*-addition to (35), then we get (37), which has an existential reading as well as a locative reading. In contrast to this, if we apply the same operation to (36), we get (38), which have only a locative reading.

(37) *Paatei ni ita futari no / ∅ (empty string) / ooku no gakusei ga iru.* (There are two/∅/many students who were at the party.)

(38) *Paatei ni ita subete no / sono / daibubun no gakusei ga iru.* (All/The/Most students who were at the party are here.)

It is no "peculiarity" [18] of English that only a certain class of NPs can occur in the construction "There is/are/was/were NP ...". In Japanese too, an exactly similar restriction is there. Thus, only a certain kind of Japanese NPs can occur in the existential construction "...NP *iru/aru*". [19] Moreover, between English and Japanese, there exists a remarkable agreement as to the kinds of NPs that can occur in the relevant construction and those that cannot. If we divide Japanese noun phrases into "weak NPs" which can occur in existential *iru/aru* sentences and "strong NPs" which cannot, the result is as follows. [20]

Weak NPs

- Noun phrases without any quantitative modifiers.

  (39) *Waratta gakusei ga iru.* (There are students who laughed.)

- Noun phrases with such quantitative modifiers as *ooku no* (many), *tasuu no* (many numbers of), *takusan no* (much), *nan-nin ka no* (several people

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[18] See the title of Milsark (1977).

[19] It is an interesting fact that English construction "There is/are NP ..." and Japanese construction "...NP *iru/aru*" are the mirror images of each other. This might be a reflection of the fundamental difference in the sentential structure between English and Japanese.

[20] From possessive *iru/aru* sentences, we can get the same classification of noun phrases. To see this, put various noun phrases into the blank of the following sentence:

Hanako ni wa ...kodomo ga iru.

If the blank is filled by the empty string, *ooku no* (many), *nan-nin ka no* (several people of), *syousuu no* (small number of), *san-nin no* (three people of), *san-nin ijyou no* (more than three people of), or *san-nin ika no* (less than three people of), the result is grammatcally correct. But, if it is filled by *subete no* (all), *daibubun no* (most), *hanbun no* (a half of), *ryouhou no* (both), or *sono* (that), then the result is an ungrammatical sentence like

Hanako ni wa subete no kodomo ga iru. (Literally: *Hanako has all the children.)

It is noted by de Swart (de Swart (2001) pp.71f.) that the distinction of weak NP/strong NP can be also obtained from the consideration of English possessive sentences with "have". The following are her examples.

a. The house has windows / at least two windows / many windows / no windows / less than five windows ...

b. *The house has all windows / most windows / neither windows ...

of), *suu-nin no* (a few people of), *ikutsuka no* (a few number of), *syousuu no* (a small number of), *wazuka no* (little).

> (40) *Waratta takusan no gakusei ga iru.* (There are many students who laughed.)
>
> (41) *Suu-nin no waratta gakusei ga iru.* (There are a few number of students who laughed.)
>
> (42) *Syousuu no waratta gakusei ga iru.* (There are small number of students who laughed.)

- Noun phrases with such numeral modifiers as *san-nin no* (three persons of), *san-nin ijyou no* (more than three persons of), *san-nin ika no* (less than three persons of).

> (43) *Waratta san-nin ijyou no gakusei ga iru.* (There are more than three students who laughed.)"
>
> (44) *San-nin ika no waratta gakusei ga iru.* (There are less than three students who laughed.)

- A quantificational phrase *dareka* (someone). [21]

> (44a) *Waratta dareka ga iru.* (There is someone who laughed.)

- (Problematic) Proper names and pronouns like *watashi* (I) and *sore* (that) might be classified in this category. In an appropriate context, the sentences such as "*Hanako ga iru.* (There is Hanako.)" and "*Sore ga aru.* (Literally: There is that.)" can be interpreted as existential. There are similar sentences in English, too: "There is John" is an example. However, usually proper names and pronouns are not classified as a weak NPs. [22]

Strong NPs

- Noun phrases with modifiers expressing universal quantification such as *subete no* (all of), *zenbu no* (all of), and *zen-in no* (all persons of). [23]

---

[21] I am not sure whether quantificational noun phrases of the form *dono . . . ka* (some . . .) can appear in the existential construction. For example, I am not sure whether (i) can have an existential meaning. Surely, it has a locative meaning.

> (i) *Waratta dono gakusei ka ga iru.*

[22] Now I tend to think that these cases should be considered as a separate class which might be called "presentational" use of *iru* and *aru*.

[23] In the following examples, a Japanese sentence with "#" is ungrammatical when it is interpreted as an existential sentence. These sentences are perfectly grammatical if they are construed as locative sentences. In other words, a sentence with "#" has only a locative reading and no existential reading. English translations given only to the existential readings. So, even when a Japanese sentence has a corresponding English translation with "*", it has a perfectly good English translation if it is read as a locative sentence.

(45) #*Subete no waratta gakusei ga iru.* (*There are all students who laughed.)

(46) #*Waratta zen-in no gakusei ga iru.* (*There are all members of the students who laughed.)

- (Problematic) Noun phrases with modifiers expressing proportional quantification such as *Daibubun no* (most of), *Hanbun no* (a half of), and *san-wari no* (three tenths of).

  (47) #*Daibubun no waratta gakusei ga iru.* (*There are most of the students who laughed.)

  (47a) ?#*Waratta hanbun no gakusei ga iru.* (* There are half of the students who laughed.)

  (48) ?#*Waratta san-wari no gakusei ga iru.* (*There are three tenths of the students who laughed.) [24]

---

[24](47a) and (48) might have an existential reading as well. Consider

- (i) *Hanbun no gakusei ga waratta.* (Half of the students laughed.)
- (ii) *San-wari no gakusei ga waratta.* (Three tenths of the students laughed.)

In Japanese, quantitative modifiers can "float" freely so that (i) and (ii) have the same truth condition as

- (iii) *Gakusei ga hanbun waratta.*
- (iv) *Gakusei ga san-wari waratta.*, and

respectively (though (iii) has a reading which means that the students laughed half-heartedly, we may ignore it here). We can still obtain the same distinction between weak and strong NPs from the sentences with "floated" modifiers. Compare (v) and (vi):

- (v) *Gakusei ga zen-in waratta.* (All members of the students laughed. Cf. (46))
- (vi) *Waratta gakusei ga zen-in iru.*

(vi) cannot mean the same as (v). What (vi) means is only that all of the students who laughed are here (or at some place understood contextually); it might be true that not all the students laughed.

   On the other hand, the following pairs of the sentences all agree in truth conditions.

- (vii-a) *Gakusei ga tasuu waratta.* (Many students laughed.)
- (vii-b) *Waratta gakusei ga tasuu iru.* (There are many students who laughed. Cf. (40))
- (viii-a) *Gakusei ga san-nin ijyou waratta/* (More than three students laughed.)
- (viii-b) *Waratta gakusei ga san-nin ijyou iru.* (There are more than three students who laughed. Cf. (43))

Let's go back to (i) *hanbun* (half) and (ii) *san-wari* (three tenths). Consider

- (i-b) *Waratta gakusei ga hanbun iru.*
- (ii-b) *Waratta gakusei ga san-wari iru.*

Clearly these sentences have an existential reading as well as a locative reading. So, (47a) and (48) may have an existential reading as well. However, (47) with *daibubun* (most) can have only a locative reading, and the same is true of the sentence with "floated" *daibubun*. In fact,

- (vi) *Waratta gakusei ga daibubun iru.*

has only a locative meaning. It is worth noting that *hanbun ijyou* (more than half) behaves like *san-wari* and not like *daibubun*.

- (vii-a) *Hanbun ijyou no gakusei ga waratta.* (More than half of the students laughed.)
- (vii-b) *Hanbun ijyou no waratta gakusei ga iru.* (There are more than half of the students who laughed.)
- (vii-c) *Gakusei ga hanbun ijyou waratta.* (More than half of the students laughed.)

- Noun phrases with *Ryouhou no* (both).

    (49) *#Ryouhou no waratta gakusei ga iru.* (*There are both students who laughed.)

- Noun phrases with demonstrative adjectives *sono*, *ano* and *kono*.

    (50) *#Sono waratta gakusei ga iru.* (*There is that student who laughed.)

- Partitives such as "*... no daibubun*" (most of ...), "*... no ooku*" (many of ...), "*... no hanbun*" (a half of ...) and "*... no uchi no san-nin*" (three persons of ...).

    (51) *#Waratta gakusei no ooku ga iru.* (There are many of the students who laughed.)

    (52) *#Gakusei no uchi no waratta san-nin ga iru.* (*There are three of the students who laughed.)

- A quantificational noun phrase *daremo* (everyone) and quantificational noun phrases of the form *dono ... mo*.

    (52a) *#Waratta daremo ga iru.* (*There is everyone who laughed.)

    (52b) *#Waratta dono gakusei mo iru.* (*There is every student who laughed.)

- Generic noun phrases. To see that they cannot occur in existential sentences, compare the two sentences.

    (53) *Tori wa sora o tobu.* (Birds fly in the sky.)

    (54) *Sora o tobu tori ga iru.* (There are birds which fly in the sky.)

    The latter sentence which is existential can not have the same meaning as the former which is generic.

As can be seen from the corresponding English translations, the agreement between the distinction in Japanese and that in English is remarkable. One difference is with negatives. As the following sentences show, the expression such as "no students" is classified as a weak NP.

(55) There are no students at the party.

(56) No students are at the party.

(vii-d) *Waratta gakusei ga hanbun ijyou iru.* (There are more than half of the students who laughed.)

All these sentences have the readings which agree in truth condition.

Japanese has no negative noun phrase like "no students", and a negative existential sentence is formed by predicating *inai* or *nai* to an indefinite noun phrase as can be seen from the follwing sentences which correspond to (55) and (56).

(57) *Paatei ni ita gakusei wa inai.*

(58) *Gakusei wa paatei ni inakatta.*

And here again, between a negative existential sentence like (57) and the corresponding negative sentence like (58), there is a relation very much similar to *iru*-addition. The pattern is like this.

. . . N wa φ nai

. . . φ N wa inai

If we ignore the problem of tense, we might think (57) is obtained from (58) by such an operation. However, these examples are unnecessarily complex, because they contain both the existential *iru* and the locative *iru*. Much simpler examples are these.

(59) *Kouen de seito wa warawa-nakatta.* (In the park no students laughed.)

(60) *Kouen de waratta seito wa inai.* (There are no students who laughed in the park.)

3 A variety of semantic theories for existential sentences

In order to give a semantics of English existential sentences, various methods have been proposed. As we will see, most of them also apply to Japanese existential sentences. We can get the classification of them by considering what alternatives are theoretically possible. There are two different and independent choices that to be made:

(i) Whether a weak NP is

    (a) a quantificational expression, or

    (b) a first-order predicate true of individuals.

(ii) Whether an existential predicate like "exist" is

    (a) a first-order predicate, or

    (b) a second-order predicate applicable to first-order predicates.

Therefore, there are four alternatives theoretically.

1. (i)(a) and (ii)(a): weak NPs are quantificational expressions, and an existential predicate is a first-order predicate true of individuals. This is the one adopted in the generalized quantifier theory (GQT); the now classical Barwise and Cooper (1981) is an example of this.

2. (i)(a) and (ii)(b): weak NPs are quantificational expressions, and an existential predicate is a second-order predicate. As far as I know, nobody has proposed to adopt this alternative.

3. (i)(b) and (ii)(a): weak NPs and an existential predicate are all first-order predicates. de Swart (2001) can be cited as an example of this; according to her, two kinds of first-order predicates are combined by an operation called "closure".

4. (i)(b) and (ii)(b): weak NPs are first-order predicates, and an existential predicate is a second-order predicate. McNally (1998) may be regarded as an example of this.

We should examine how each of these alternatives fares with respect to Japanese existential sentences. However, in this paper, we don't take up the alternative 2, not because we think it is a non-starter, but because at present there seems to be no one who defends it. We are going to examine the remaining three alternatives 1, 4, and 3 in that order.

We must remember that any satisfactory semantics for Japanese existential sentences must meet at least the following three conditions.

(I) For any Japanese existential sentence, it must supply it a correct truth-condition.

(II) It must explain why the sentences related by *iru*-addition agree in their truth-conditions.

(III) It must explain why there exists a distinction between weak NPs and strong NPs.

These conditions will function as the criteria to judge how sucessful each proposal is in the following discussions.

3.1 GQT

One way to analyze Japanese noun phrases in general as a quantificational expression is given in Iida (2000). There I constructed a language I called $\mathcal{L}_1$, in which (25) and (26) get a formal representation like

(61) $(\mathbf{ooku}_1 \ \mathbf{gakusei})_1 \mathbf{waratta}(x_1)$

(62) $(\nabla_1 \ \mathbf{Taro})_1 (\mathbf{ooku}_2 \ \mathbf{hon})_2 \mathbf{yonda}(x_1, x_2)$

respectively, if we ignore tense. [25] Let us add two first-order predicates "**iru**" and "**aru**" to $\mathcal{L}_1$. Then, we can represent (3) and (4) thus [26]

> (63) $(\mathbf{waratta}(x_1) : \mathbf{ooku}_1\ \mathbf{gakusei})_1\ \mathbf{iru}(x_1)$

> (64) $((\nabla_1\ \mathbf{Taro})_1\ \mathbf{yonda}(x_1, x_2) : \mathbf{ooku}_2\ \mathbf{hon})_2\ \mathbf{aru}(x_2)$

We add two new axioms to the semantic axioms of $\mathcal{L}_1$:

For an arbitrary sequence s of individuals,

$$\models_s \mathbf{iru}(x_i) \quad \Leftrightarrow \quad s(i) = s(i)$$
$$\models_s \mathbf{aru}(x_i) \quad \Leftrightarrow \quad s(i) = s(i)$$

Thus, *iru* and *aru* are treated as predicates true of any individual.

Then, we can deduce the truth condition of (63) relative to a context C as follows:

> For (63) to be true in C, it is necessary and sufficient that, for any sequence s, $\models_s^C$ (63). For that, it is necessary and sufficient that

>> (i) For many s' such that $s' \overset{1}{\sim} s$, $\models_{s'}^C \mathbf{waratta}(x_1)$, and $s'(1) \in \|\mathbf{gakusei}\|^C$

$$\models_{s'}^C \mathbf{iru}(x_1)$$

> By the semantic axiom of "**iru**", "$\models_{s'}^C \mathbf{iru}(x_1)$" always holds. So, (i) is equivalent to

>> (ii) There are many s' such that $s' \overset{1}{\sim} s$, $\models_{s'}^C \mathbf{waratta}(x_1)$, and $s'(1) \in \|\mathbf{gakusei}\|^C$.

> This is the desired truth condition.

---

[25]In Iida (2000), Japanese noun phrases are represented as the expressions containing restricted quantification. For example,

$$(\mathbf{ooku}_k\ N)_k \phi(x_k)$$

is satisfied by a sequence s iff, for many s' such that $s' \overset{k}{\sim} s$ and $s'(k) \in \|N\|$, s' satisfies $\phi(x_k)$.

"∇" is a unpronounced particular quantifier whose semantics is given as follow:

a sequence s satisfies "$(\nabla_k\ NN)_k \phi(x_k)$" iff for s' such that $s' \overset{k}{\sim} s$ and $s'(k) = \|NN\|$, s' satisfies $\phi(x_k)$

where NN is a proper name.

[26]"$:$" is an operator of restrictive modification, which functions essentially as a conjunction within the scope of the noun phrase in which it appears. See the derivation of the truth condition of (63) below.

It is easy to see that what (ii) expresses is that there are many students who laughed. Thus, this derivation shows also that (63) has the same truth condition as (61).

For other weak NPs such as *"ikutsuka no ..."*, *"wazuka no ..."*, *"san-nin no ..."* and *"san-nin ijyou no ..."*, we can show that the sentences containing them and related by *iru*-addition have the same truth condition in the similar way.

One notable feature of this approach is that even the sentences containing strong NPs like

    (65) *Subete no waratta gakusei ga iru.*

get an existential interpretation, contrary to our observation in §1 that they admit only locative interpretations. In fact, there is nothing wrong with an $\mathcal{L}_1$ formula (66), which is a formal counterpart of an existential interpretation of (65).

    (66) $(\mathbf{subete}_1\ \mathbf{waratta}(x_1) : \mathbf{gakusei})_1 \mathbf{iru}(x_1)$

However, if you derive the truth condition of (66), you will find out that it is a logical truth, that is, a sentence which can be shown to be true by the semantical axioms alone. In general, the existential sentences which have strong NPs as subjects are either always true or always false. [27] Thus, such sentences are never informative. Suppose someone utters (65) in the course of a conversation; if the hearer interprets it as an existential sentence like (66), she will have a hard time to understand why the speaker says such a thing; however, there is another interpretation of (65), which is locative and not hard to understand the point of saying it; so, she will adopt the locative interpretation of (65). Thus, the existential sentences with strong NPs will play no role in conversation. This explains why we do not think there is an existential interpretation for sentences like (65).

3.2 Weak NPs as first-order predicates

In GQT, the existential interpretation of (65) is both syntactically and semantically admissible; it is ruled out only by pragmatic considerations. Can't we rule it out in a more straightfoward manner? A way to do that is to construe weak NPs as first-order predicates. As for existential predicates *iru* and *aru*, we can construe them either first-order or second-order. But, for the present, let us suppose that they are second-order predicates. Then, an existential sentence would be the result of the application of the second-order predicate *iru* or *aru* to a weak NP α, which is a first-order predicate. Then, (3) would get a formal representation like [28]

---

[27]There are various ways to explain this in the framework of GQT.

[28]The case particle *ga* appears here in order to show which argument of the verb must be filled by the NP it attaches. In $\mathcal{L}_1$ this kind of information is coded by the index of an variable, instead of having the formal representation of case particles. However, if we don't

(67) ((**waratta** (**ooku** (**gakusei**))) **ga**) **iru**

The meaning of "**iru**" is given by the axiom

$$\models^C (\alpha \, \mathbf{ga}) \, \mathbf{iru} \quad \Leftrightarrow \quad \|\alpha\|^C \neq \emptyset \;\; \text{i.e.} \exists x x \in \|\alpha\|^C$$

Let us suppose that among the individuals that can be a value of a noun there are not only objects but also groups of objects. Then, the expressions like *ooku* (many) and *san-nin* (three persons) are first-order predicates true of individuals (objects and groups of objects). For example, for an individual x to be a semantic value of the noun phrase

(68) (**waratta**(**ooku**(**gakusei**)))

it is necessary and sufficient that x satisfies the three conditions "waratta", "ooku" and "gakusei". As is the case with most nouns in Japanese, "gakusei" (student) may refer to a group of students as well as a single student. "Ooku" (many) applies only to groups of students. Lastly, "waratta" (laughed) may apply to a group and then is distributed to each member of the group. The following holds with the semantic value of (68) in the context C

$$\|(\mathbf{waratta}(\mathbf{ooku}(\mathbf{gakusei})))\|^C = \|\mathbf{waratta}\|^C \cap \|\mathbf{ooku}\|^C \cap \|\mathbf{gakusei}\|^C$$

Thus, the truth condition of (67) relative to the context C is given by

(69) $\|\mathbf{waratta}\|^C \cap \|\mathbf{ooku}\|^C \cap \|\mathbf{gakusei}\|^C \neq \emptyset$

On the other hand, in order to derive the truth-condition of the sentences like

(70) ((**ooku**(**gakusei**)) **ga**)**waratta**

which consists of a weak NP and a verb (cf. (67)), we may assume a sort of "Axiom of Predication":

$$\models^C (\alpha \, \mathbf{ga})\phi \quad \Leftrightarrow \quad \exists x [x \in \|\alpha\|^C \wedge x \in \|\phi\|^C]$$

It is almost trivial to show that the truth condition of (70) relative to C is the same as that of (67).

Thus, the present approach makes it possible to show that the sentences related by *iru*-addition have the same truth condition in a very straightforward manner. It also explains naturally why the strong NPs cannot appear in the existential sentences : it is because they are quantificational phrases, which are not the sort of expressions applicable to the individuals among which the groups of objects are. In contrast, the weak NPs can appear in the existential sentences because they are first-order predicates applicable to individuals. Therefore, in

---

spare the work fo doing the classification of the verbs according to their argument structures, we can get the variable-free representations of Japanese sentences.

On the other hand, the particle *no* will not be represented here.

a more straightforward way than GQT, the present approach satisfies the two of the conditions which are required of a satisfactory semantics for Japanese existential sentences. However, it has a fatal defect. It is that it does not satisfy the condition (I), namely, it cannot deliver the correct truth conditions for all existential sentences. [29]

Consider the following sentence

(71) $((\mathbf{waratta}(\mathbf{san-nin}(\mathbf{gakusei})))\ \mathbf{ga})\mathbf{iru}$.

It must be obvious that the present accout delivers

(72) $\|\mathbf{waratta}\|^C \cap \|\mathbf{san-nin}\|^C \cap \|\mathbf{gakusei}\|^C \neq \emptyset$

as its truth condition relative to the context C. However, if we interpret *san-nin* not as "more than three persons" but as "exactly three persons", (72) is only a necessary condition for (71). To see this, let us suppose that the number of students who laughed was ten: then there exist several groups which consist of three from those ten, and as these three-membered groups are in the set specified on the left side of the equation (72), (72) becomes true even if there are more than three students who laughed. The same difficulty also arises with any monotone decreasing NP like *wazuka* (few, little) and *san-nin ika* (less than three persons).

It is clear that this difficulty arises not from the current treatment of *iru* and *aru*, but from that of the semantics of weak NPs, because there arises the same difficulty with the "Axiom of Predication", that is, according to this axiom, the sentence

(73) $((\mathbf{san-nin}(\mathbf{gakusei}))\ \mathbf{ga})\mathbf{waratta}$

where *san-nin* is interpreted as "exactly three persons", has the same truth condition as (72), which is not the correct truth condition for (73) just as (72) is not the correct one for (71).

3.3   A classification of weak NPs and the Axiom of Predication

One remedy to the difficulty we encountered in the previous subsection might be to revise the Axiom of Predication so that it applies differently to a different class of weak NPs. [30] For the sake of simplicity, let us suppose that Japanese weak NPs has one of the following forms:

$(\phi\ (D\ (N)))$
$(D\ (\phi\ (N)))$

where ϕ is a predicate like *waratta* (laughed), D is a quantitative adjective like *ooku* (many), and N is a noun like *gakusei* (student). Each of these two types is exemplified by the following.

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[29]See McNally (1998) p.378.
[30]Cf. de Swart (2001).

> (**waratta** (**ooku** (**gakusei**)))

> (**ooku** (**waratta** (**gakusei**)))

ϕ and D can be empty. Therefore,

> (**ooku** (**gakusei**))

> (**gakusei**)

are also the examples of weak NPs.

As before, a weak NP is construed as a first-order predicate. Those expressions which can be a constitutent of a weak NP, namely, predicates, quantitative adjectives, and nouns, are semantically all first-order predicates, which are applicable to groups of objects as well as single objects.

We divide weak NPs into three classes according to the kinds of the quantitative adjectives contained in them.

(i) monotone increasing: the noun phrases having no D, or one of the follwing as D: *ooku* (many), *tasuu* (many numbers), *takusan* (much), *nan-ninka* (a few persons), *suunin* (a few persons), *ikutsuka* (a few), *san-nin ijyou* (more than three persons) , etc.

(ii) monotone decreasing: the noun phrases having one of the following as D: *syousuu* (a small number), *wazuka* (few, little), *san-nin ika* (less than three persons), etc.

(iii) non-monotone: the noun phrases having as D a quantitative adjective like *choudo san-nin* (exactly three persons).

We are going to reformulate the Axiom of Predication so that it applies differently according to the kinds of a weak NP we have just characterized. But before doing that, we have to introduce some concepts which will be necessary.

Firstly, we suppose that, for each D which appears in a monotone decreasing NP, there is a quantitative adjective $\overline{D}$ which is a contrary to D. For example,
[31]

$$
\begin{aligned}
\overline{\textbf{syousuu}} &= \textbf{tasuu} \\
\overline{\textbf{wazuka}} &= \textbf{takusan} \\
\overline{\textbf{san} - \textbf{nin ika}} &= \textbf{san} - \textbf{nin yori ooku}.
\end{aligned}
$$

For a monotone decreasing NP α with a quantitative adjective D, "$\overline{\alpha}$" denotes the monotone increasing NP which can be got from α by replacing D with $\overline{D}$.

---

[31]English counterparts are:

$$
\begin{aligned}
\overline{\textbf{a small number}} &= \textbf{a large number} \\
\overline{\textbf{few}}, \overline{\textbf{little}} &= \textbf{many}, \textbf{much} \\
\overline{\textbf{less than or equal to three persons}} &= \textbf{more than three persons}.
\end{aligned}
$$

Given a weak NP α, "$\langle\alpha\rangle$" denotes the expression which results from α after erasing the quantitative adjective D contained there. If α contains no D, then $\langle\alpha\rangle$ is the same as α. Thus,

$$\langle(\textbf{ooku}\ (\textbf{waratta}\ (\textbf{seito})))\rangle \quad = \quad (\textbf{waratta}\ (\textbf{seito}))$$
$$\langle(\textbf{waratta}\ (\textbf{ooku}\ (\textbf{seito})))\rangle \quad = \quad (\textbf{waratta}\ (\textbf{seito})).$$

Next, we suppose that our metalanguage ontology has a part-whole relation between individuals. "$y \sqsubseteq x$" means that y is part of x. If a is a group of students consisting of Taro and Hanako, and b is another group of students consisting of Taro, Hanako and Jiro, then "Hanako $\sqsubseteq a$", "Hanako $\sqsubseteq b$", and "$a \sqsubseteq b$" are all true.

Now we can state the new Axiom of Predication. [32]

Axiom of Predication (new version)

For a weak NP α,

   (i) If α is monotone increasing, then $\models^C (\alpha\ \textbf{ga})\phi \Leftrightarrow$
$\exists x\ [x \in \|\alpha\|^C \wedge x \in \|\phi\|^C]$

  (ii) If α is monotone decreasing, then $\models^C (\alpha\ \textbf{ga})\phi \Leftrightarrow$
$\forall x\ [x \in \|\phi\|^C \rightarrow x \notin \|\overline{\alpha}\|^C]$

 (iii) If α is non-monotone, then $\models^C (\alpha\ \textbf{ga})\phi \Leftrightarrow \exists x[x \in \|\alpha\|^C \wedge$
$x \in \|\phi\|^C \wedge \forall y\ [[y \in \|\langle\alpha\rangle\|^C \wedge y \in \|\phi\|^C] \rightarrow y \sqsubseteq x]]$

In order for an individual x to be a semantic value of a weak NP α, it is sufficient that x satisfies every condition which is a constituent of α. Thus, let us adopt the following as one of our axioms:

Axiom of Predicate Modification

When X and Y are first-order predicates which can be constituents of a weak NP,

$$x \in \|(X(Y))\|^C \quad \Leftrightarrow \quad x \in \|X\|^C \wedge x \in \|Y\|^C$$

To see how all this works, let us consider an example of a monotone decreasing weak NP:

    (74) $((\textbf{San}-\textbf{nin ika}\ (\textbf{gakusei}))\ \textbf{ga})\ \textbf{waratta}$

---

[32]The present form of the axiom needs to be generalized further. For one thing, it must be reformulated so that it becomes aplicable to the sentences like "$(\alpha\ \textbf{o})\phi$" or "$(\alpha\ \textbf{ni})\phi$" which have the case particles other than the nominative one. For another, as ϕ need not be a one-place predicate, the axiom must be generalized for many-place ϕs.

which means that less than three students laughed. By the clause (ii) of the Axiom of Predication, its truth condition relative to the context C is

(75) For all x, if $x \in \|\mathbf{waratta}\|^C$, then $x \notin \left\|\overline{(\mathbf{san-nin\ ika\ (gakusei))}}\right\|^C$.

As

$$\overline{(\mathbf{san-nin\ ika\ (gakusei))}} \quad = \quad (\mathbf{san-nin\ yori\ ooku\ (gakusei)}),$$

(75) is equivalent to

(76) For all x, if $x \in \|\mathbf{waratta}\|^C$, then $x \notin \|(\mathbf{san-nin\ yori\ ooku\ (gakusei))}\|^C$

. By the Axiom of Predicate Modification, this in turn is equivalent to

(77) For all x, if $x \in \|\mathbf{waratta}\|^C$ and $x \in \|\mathbf{gakusei}\|^C$, then $x \notin \|\mathbf{san-nin\ yori\ ooku}\|^C$.

What (77) says is "if there are students who laughed, then they are not more than three". It is reasonable to suppose that this gives the truth condition of (74) correctly. [33] In the same way, we can verify the Axiom of Predication gives the correct results for the sentences with a non-monotone weak NPs,

Let us go back to our main topic, namely, the semantics of existential sentences. This time, we construe *iru* and *aru* as first-order predicates; so, in the present scheme, they belong to the same semantic category as the weak NPs. The present approach agrees with GQT in that the existential predicates are interpreted not as second-order predicates but as first-order ones. Moreover, just as in GQT, we claim the existential predicates are true of everything. This feature of the existential predicates should be stated explicitly as an axiom:

Axiom of Existential Predicates

For every individual x,

$$x \quad \in \quad \|\mathbf{iru}\|$$
$$x \quad \in \quad \|\mathbf{aru}\|$$

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[33] In order to be able to claim that (77) gives the truth condition of (74), we have to think that (74) does not imply that there is at least one student who laughed. But, consider the sentence

(i) *San-nin ika no waratta gakusei ga iru.* (There are less than three students who laughed.)

This sentence should be equivalent to (74). Could we think that (i) is true, even if there are no students who laughed? If you judge we could not, you may replace the right hand side of the clause (ii) of the Axiom of Predication with the following

For some y, $y \in \|\langle\alpha\rangle\|^C$, $y \in \|\phi\|^C$, and, for all x, if $x \in \|\phi\|^C$, then $x \notin \|\overline{\alpha}\|^C$.

Even after this change, Proposition 2 in the text still holds.

Combining this axiom with the Axiom of Predication, we get the follwing.

Proposition 1

For any weak NP α,

(i) if α is monotone increasing, then $\models^C (\alpha\ \mathbf{ga})\mathbf{iru} \;\Leftrightarrow\;$ for some x, $x \in \|\alpha\|^C$

(ii) if α is monotone decreasing, then $\models^C (\alpha\ \mathbf{ga})\mathbf{iru} \;\Leftrightarrow\;$ for all x, $x \notin \|\overline{\alpha}\|^C$

(iii) if α is non-monotone, then $\models^C (\alpha\ \mathbf{ga})\mathbf{iru} \;\Leftrightarrow\;$ for some x $x \in \|\alpha\|^C$, and, for all y, if $y \in \|\langle\alpha\rangle\|^C$ then $y \sqsubseteq x$

It is worth remarking that the subcase (i) is the result of combining the original form of the Predication Axiom in §3.2 with the present Axiom of Existential Predicates; this shows agin that the approach discussed in that section covers only the monotone increasing NPs.

From Proposition 1, it is easy to prove the following results which show the present approach satisfies the requirement (II) we stated at the beginning of this section. [34]

Proposition 2

$$\models^C ((D\ (\phi\ (N)))\ \mathbf{ga})\ \mathbf{iru} \;\Leftrightarrow\; \models^C ((D\ (N))\ \mathbf{ga})\ \phi$$
$$\models^C ((\phi\ (D\ (N)))\ \mathbf{ga})\ \mathbf{iru} \;\Leftrightarrow\; \models^C ((D\ (N))\ \mathbf{ga})\ \phi$$

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[34]See Appendix for a proof.

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Appendix—A Proof of Proposition 2

It is obvious that it is sufficient to prove one of the two propositions. Let us prove the former.

(i) Suppose D is monotone increasing.
By Proposition 1(i),

$$\models^C ((D\ (\phi\ (N)))\ \mathbf{ga})\ \mathbf{iru} \ \Leftrightarrow\ \exists x\ x \in \|((D\ (\phi\ (N))))\|^C.$$

By the Axiom of Predicate Modification,

$$x \in \|((D\ (\phi\ (N))))\|^C \ \Leftrightarrow\ x \in \|D\|^C \text{ and } x \in \|\phi\|^C \text{ and } x \in \|N\|^C$$
$$\Leftrightarrow\ x \in \|(D\ (N))\|^C \text{ and } x \in \|\phi\|^C.$$

Therefore,

$$\models^C ((D\ (\phi\ (N)))\ \mathbf{ga})\ \mathbf{iru} \ \Leftrightarrow\ \exists x\ x \in \|(D\ (N))\|^C \text{ and } x \in \|\phi\|^C.$$

The right hand side of this is equivalent to

$$\models^C ((D\ (N))\ \mathbf{ga})\ \phi$$

by the clause (i) of the Axiom of Predication.

(ii) Suppose D is monotone decreasing.
By Proposition 1 (ii),

$$\models^C ((D\ (\phi\ (N)))\ \mathbf{ga})\ \mathbf{iru} \ \Leftrightarrow\ \forall x\ x \notin \left\|\overline{((D\ (\phi\ (N))))}\right\|^C.$$

Notice that

$$x \notin \left\|\overline{((D\ (\phi\ (N))))}\right\|^C \ \Leftrightarrow\ x \notin \|((\overline{D}\ (\phi\ (N))))\|^C.$$

By the Axiom of Predicate Modification, the right hand side of this is equivalent to

$$x \notin \left\|\overline{D}\right\|^C \vee x \notin \|\phi\|^C \vee x \notin \|N\|^C,$$

that is,

$$x \in \|\phi\|^C \to x \notin \left\|(\overline{D}\ (N))\right\|^C.$$

Therefore,

$$\models^C ((D\ (\phi\ (N)))\ \mathbf{ga})\ \mathbf{iru} \ \Leftrightarrow\ \forall x\ x \in \|\phi\|^C \to x \notin \left\|(\overline{D}\ (N))\right\|^C.$$

The right hand side of this is equivalent to

$$\models^C ((D\ (N))\ \mathbf{ga})\ \phi$$

by the clause (ii) of the Axiom of Predication.

(iii) Suppose D is non-monotone.

By Proposition (iii),

$$\models^C ((D \ (\phi \ (N))) \ \textbf{ga}) \ \textbf{iru} \quad \Leftrightarrow \quad \exists x \ x \in \|((D \ (\phi \ (N)))\|^C \text{ and}$$
$$\forall y \ y \in \|\langle((D \ (\phi \ (N))))\|^C \to y \sqsubseteq x.$$

Call this (a). Just as in the case of (i),

$$x \in \|((D \ (\phi \ (N))))\|^C \ \Leftrightarrow \ x \in \|(D \ (N))\|^C \text{ and } x \in \|\phi\|^C .$$

Call this (b). Next,

$$y \in \|\langle((D \ (\phi \ (N))))\rangle\|^C \ \Leftrightarrow \ y \in \|(\phi \ (N))\|^C \ \Leftrightarrow \ y \in \|\phi\|^C \text{ and } y \in \|N\|^C .$$

As $y \in \|N\|^C \ \Leftrightarrow \ y \in \|\langle(D \ (N))\rangle\|^C,$

$$y \in \|\langle((D \ (\phi \ (N))))\rangle\|^C \ \Leftrightarrow \ y \in \|\phi\|^C \text{ and } y \in \|\langle(D \ (N))\rangle\|^C .$$

Call this (c).

Putting (b) and (c) in (a), we get

$$\models^C ((D \ (\phi \ (N))) \ \textbf{ga}) \ \textbf{iru} \quad \Leftrightarrow \quad \exists x \ x \in \|(D \ (N))\|^C \text{ and } x \in \|\phi\|^C \text{ and}$$
$$\forall y \ y \in \|\phi\|^C \wedge y \in \|\langle(D \ (N))\rangle\|^C \to y \sqsubseteq x.$$

The right hand side of this is equivalent to

$$\models^C ((D \ (N)) \ \textbf{ga}) \ \phi$$

by the clause (iii) of the Axiom of Predication.