

A Constraint-Based Analysis of Association with Focus in Japanese

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Abstract

In this paper, I present an explicit analysis of association with focus in Japanese. The proposed formal analysis, basically couched in Rooth's (1985) alternative semantics supported by the syntactic devices of HPSG, captures the behaviors of focus particles in Japanese in a fairly straightforward manner.

Section 1 is devoted to a survey of data and definitions of key terms and concepts in this paper. In section 2, I present my analysis and explain in detail how it accounts for the observed phenomena.

1 Focus and focus particles in Japanese

The term “focus”, as it is used in the context of modern generative linguistics, typically refers to some prosodic prominence which functions as indicating certain semantic and pragmatic emphasis (Rooth, 1996, 271). Since Rooth (1985), much attention has been paid to a class of function words called focus particles (FPs), representatives of which in English include *only*, *even* and *also*, that interact in a certain way with the phenomenon of focus (König, 1991). Typically, an FP appears with a focused phrase which is marked by a readily detectable pitch accent. The significance of the interaction between FPs and focused phrases is that it affects the truth-conditional interpretation of the sentences. Thus, the following sentences from Rooth (1985, 2) have different truth conditions although they are composed of exactly the same string of words:¹

- (1) a. I only introduced Bill_F to Sue.
- b. I only introduced Bill to Sue_F.

(1a) is true when I introduced Bill and no one else to Sue. (1b), on the other hand, is true when I introduced Bill to Sue and to no one else. Under the situation where I introduced Bill and Mary to Sue and no one else to anyone else, (1a) is false while (1b) is true. It is clear that the interpretation of the sentence is crucially dependent on what is the focused phrase. That is, the focused phrase is what the FP *only* is interpreted with respect to. This phenomenon is termed as “association with focus” (Jackendoff, 1972; Rooth, 1985). In (1a), for example, we say that the FP *only* associates with the focused phrase *Bill*.

In English, association with focus is more or less a clear-cut phenomenon. What is focused in a given sentence can be largely determined by phonologically observable evidence. In Japanese, on the other hand, the situation is somewhat obscured. Phonological stress does play a role in indicating a certain kind of emphasis in a sentence. But it is far less clear, as compared to English, whether what we call “focus particles” in Japanese (perhaps so named because they most closely resemble English ones in terms of their function and meaning) interact with something that can be independently defined by

¹In this paper, I mark the focused phrase with the subscript *F*. The definition of the term “focus” as used in this paper is given below.

means of some phonologically observable evidence. In Japanese, it is often the case that, when we have an FP in a sentence, there is no particular readily perceptible phonological stress involved. Thus, the following sentence can be read with no particular emphasis on any potential associate of *dake* and could be interpreted in various ways, some of which are shown as English translations:²

- (2) Watasi wa Hanako ni Taroo o syookai si ta dake da.
 I TOP Hanako DAT Taroo ACC introduce do PAST only COP
 “I introduced only Taro to Hanako.” / “I introduced Taro only to Hanako.”

However, given a sentence that contains an FP, it is intuitively clear which phrases the FP can associate with and which phrases the FP can *not* associate with. Since the aim of this paper is to give an explicit account of syntactic and semantic aspects of FPs and association with focus phenomenon in Japanese, it would be convenient for our present purposes to call what the FP semantically associates with the *focused* phrase. That is, focus is defined here entirely in terms of semantics, the realization of which in the phonological domain is assumed to be at most optional.³

1.1 Wide focus association

One major difference between a Japanese FP and an English one is that the former sometimes allows association with phrases larger than the one it attaches to, while the latter never allows it. This curious behavior of Japanese FPs has often been pointed out in the literature (Numata (1986), Numata (2000), Masuoka (1991)). Some examples follow.

- (3) a. [Daikin dake morat]_F te, sigoto o si nai.
 money only receive and work ACC do NEG
 “(He) only receives money and does not do the job.” (Numata, 2000, 167)
- b. Hanako wa onaka o kowasi ta ue ni [kaze mo hii ta]_F.
 Hanako TOP stomach ACC ruin PAST in addition to cold also catch PAST
 “In addition to having trouble with her stomach, Hanako also caught a cold.” (Numata, 1986, 147)

In (3a), the FP *dake* attaches to the noun *daikin* but what is focused and associated with it is the whole first conjunct containing the FP, as can be inferred from the English translation. Likewise, in (3b), the FP is associated not with the NP it attaches to, but rather with the whole VP containing it. I will call this phenomenon “wide focus association” (WFA).⁴ Note that such kind of association is strictly prohibited in English: “He receives only money” can not, in any of its readings, be equivalent to “He only [receives money]_F.”

It seems that not all Japanese native speakers allow the WFA reading freely with any sentence and that there is also a slight difference among FPs as to how easily they allow WFA readings. For example, with *dake*, a certain number of speakers seem to find it considerably hard to obtain the WFA reading, while

²It could be said, however, that if a heavy phonological stress is imposed on a candidate for the associate of an FP, there is a strong preference to interpret the stressed phrase as the associate.

³The correlation between syntactic, semantic and pragmatic aspects of prominence on the one hand and phonological aspects, on the other, of course, deserves serious investigations from both empirical and theoretical perspectives. But this issue is beyond the scope of the present paper.

⁴Aoyagi (1999, 39) remarks that when the case marker *o* is overtly attached to the phrase to which the FP is attached, the WFA reading is hard to obtain.

- (i) a. Manga bakari o yon de i nai de, bekyoo mo si nasai.
 comics only ACC read COP PRES NEG CONJ study also do IMP
 “Don’t only read comics but also study!” (Aoyagi, 1999, 39)

One reviewer made a similar observation. However, at least according to the intuitions of mine and some native speakers I consulted, the sentence (i) does not seem to have such drastic contrast in interpretation to its counterpart in which the case marker *o* is missing (i.e. “*Manga bakari yon de i nai de, ...*”). Even if the reported contrast were real, I have no explanation for it at hand. I leave this problem open.

mo seems to allow this reading much more freely. I am not yet sure whether this constraint is due to the semantic nature of the respective FPs or not. Also, as Masuoka (1991, 180-183) points out, one factor that is crucial to the realization of the WFA reading is the semantic link between the predicate and the phrase the FP attaches to.

- (4) a. Hanako wa tya mo non da.
 Hanako TOP tea also drink PAST
 "Hanako also drank tea."
 b. Hanako wa tya mo kobosi ta.
 Hanako TOP tea also spill PAST
 "Hanako also spilt tea." (Masuoka, 1991, 180-183)

According to Masuoka, the idiomatic connection between the phrase the FP attaches to and the predicate is stronger in (4b) than in (4a). We indeed find a contrast of readiness of WFA reading between (4a) and (4b). Thus, there are various factors determining the availability of the WFA reading in a particular sentence. To clarify these factors is of course an important theoretical question. However, since such an investigation leads us too far from the main concern of this paper, I abstract away from contrasts like those observed above in the remainder of this paper.

Most of the typical examples of WFA are those where the associate of the FP is at most as large as the VP (that is, the largest subpart of a clause not including the subject), like the above examples. However, in certain sentences, it is possible to include the subject of the clause as well in the associate.

- (5) [Okusan ga daikin dake morat]_F te, kare ga sigoto o si nai.
 wife NOM money only receive and he NOM work ACC do NEG
 "With only his wife receiving money, he doesn't do the job."

In this sentence, the most natural interpretation would be to construe the associate of *dake* as the whole first conjunct, as indicated above by the *F* marking.

It is of course not the case, however, that the associate of an FP can be widened without limitation. The following examples from Numata (2000, 169) suggest that the associate of a given focus particle can never be larger than the minimal clause containing the FP:

- (6) a. [Gakki mo konas eru] bookaru o bosyuu suru.
 instrument also manipulate can vocalist ACC look for PRES
 "We will look for a vocalist who can also play some instrument."
 b. [Gakki o konas e mo suru] bookaru o bosyuu suru.
 instrument ACC manipulate can also PRES vocalist ACC look for PRES
 "We will look for a vocalist who can also play some instrument."
 c. [Gakki o konas eru] bookaru mo bosyuu suru.
 instrument ACC manipulate can vocalist also look for PRES
 "We will look also for a vocalist who can play some instrument."

In their most natural interpretations, (6a) and (6b) mean something that is roughly equivalent as indicated in the English translation. (In this reading, (6a) is also an instance of WFA where the focused phrase is the VP *gakki mo konas eru*.) The crucial point here is that these two sentences, in which the FP is placed inside the embedded clause, cannot, in any of their interpretations, be equivalent to (6c), in which the FP is in the matrix clause. That is, if the FP in (6a) were to associate with the matrix object NP which contains the whole embedded clause inside itself as a relative clause, the interpretation of this sentence would turn out to be equivalent to one of the several possible interpretations for (6c) in which the FP associates with the NP it attaches to. But this is not the case; (6a) simply does not have such reading. As Numata (2000, 169) puts it, there is a constraint on the interpretation of FPs that requires an FP to find its associate within the minimal clause containing it. As a consequence of this constraint, it is by no means possible for the FP in (6a) to associate with the matrix object NP which is outside the embedded clause.

1.2 Narrow focus association

In Japanese, an FP can also associate with a phrase that is a subphrase of the phrase it attaches to. In this respect, it behaves in much the same way as its counterpart in English. I will call this phenomenon “narrow focus association” (NFA). Relevant examples are the following:

- (7) a. Gohan o tabe zu, [karai okazu]_F o tabe te bakari iru.
 rice ACC eat NEG salty food ACC eat COP exclusively PRES
 “He only eats salty food without eating any rice.” (Numata, 2000, 168; slightly modified)
- b. Taroo no imooto ni dake at ta.
 Taro POSS sister DAT only meet PAST
 “(I) only met Taro’s sister.”

In the most natural interpretation of (7a), what is focused is not the entire VP *karai okazu o tabe te* which *bakari* attaches to, but rather, just the object NP *karai okazu* inside it. The act of eating salty food is contrasted with the act of eating rice, thus constituting a felicitous context. In (7b), the associate can either be *Taroo* or *imooto* or *Taroo no imooto*. Which option to choose depends on the actual context in which the sentence finds itself. (Phonological factors might also play a role.)

Interestingly, NFA, in contrast to WFA, can take place across a clause boundary. The following example illustrates this point:

- (8) [[_SBaiorin_F o konas eru] bookaru] mo bosyuu su ru.
 violin ACC manipulate can vocalist also look for do PRES
 “We will look for a vocalist who can also play the violin.”

With no particular phonological stress, this sentence could be used to describe many situations. For example, it could be uttered when we will look for a vocalist who can play the violin as well as other types of performers with or without additional skills. (In this case, the whole NP with the sentential modifier is focused and associated with *mo*.) Or, this sentence might be used in a context where the type of people we want is more specific, namely, vocalists with additional skills to play some instruments. For example, in addition to vocalists who can play the drums and vocalists who can play the flute, “we are also looking for vocalists who can play the violin.” This is the reading we obtain if the noun *baiorin* inside the embedded clause is focused and associated with *mo*. In this reading, this sentence is an instance of NFA taking place crossing a clause-boundary.

One might question the assumption here by asking if we really have to distinguish these “different readings” in the domain of semantics. More specifically, it might seem to be more plausible to assume that (disregarding the cases of WFA) the only possible mode of association in (8) is the one in which *mo* associates with the phrase it directly attaches to and to attribute the apparent ambiguity entirely to pragmatic factors (i.e. by assuming some pragmatic mechanism constraining the set of alternatives to be contrasted appropriately according to the context).

This alternative account, however, faces some difficulties. First of all, under this pragmatics-based view, it would be difficult to account for the fact that phonological pitch accent, if it exists, constrains the possible interpretations in a systematic manner. With a phonological pitch accent on the noun *baiorin*, (8) is obligatorily interpreted in the reading in which this noun is focused and associated with *mo*. That is, in this case the sentence unambiguously means that we will look for a vocalist who can play the violin besides vocalists who can play other instruments. Thus, putting the sentence in a context inconsistent with this reading results in an infelicitous discourse.

- (9) #Doramu no senmonka no hoka ni, [Baiorin_F o konas eru] bookaru mo bosyuu su ru.
 drums GEN specialist in addition to violin ACC manipulate can vocalist also look for do
 ru. (with a pitch accent on the noun *baiorin*)
 PRES
 “In addition to a drum specialist, we will look for a vocalist who can also play the violin.”

In (9), the pitch accent on “*baiorin*” requires the set of alternatives to be a set of vocalists who can play instruments, but such a reading is inconsistent with the information supplied by the immediately preceding utterance. Hence, the utterance becomes inappropriate. In my analysis, this fact automatically follows if we assume that when a phonological pitch accent falls on a possible candidate for an associate of the FP, that phrase is obligatorily construed as the associate. In the pragmatics-based account, however, it is not at all clear how the phonological stress on a particular phrase could constrain the pragmatic process constraining the alternative set.

Second, the pragmatics-based account would predict what Aoyagi (1999) calls the “shifted association with focus”. Consider the following example:

- (10) Otya mo non da.
tea also drink PAST
“I also drank tea.”

One of the possible interpretations of this sentence is one in which the FP *mo* is associated with the whole VP as indicated in the English translation. Thus, according to Aoyagi (1999), it would be possible under the pragmatics-based account to constrain the alternative set in such a way that it appears as if only the verb *non* were focused and associated with *mo*, resulting in a reading that the speaker, not just drank, but also did something other than that to the tea (e.g. bought and prepared it). Such a reading is, however, intuitively unavailable. The impact of this observation is further strengthened by the fact that even if a phonological pitch accent falls on the verb *non*, the FP could never associate with it. This is in sharp contrast to sentences like (8) above in which a phrase c-commanded by the FP should obligatorily be interpreted as the associate of the FP if a phonological pitch accent falls on it. Hence, though pragmatic factors do play a role in constraining the alternative set, we can conclude that an approach in which the NFA-like effect is solely attributed to pragmatic factors is problematic and that we have to make a finer distinction between possible readings in the domain of semantics.

2 A formal account of association with focus

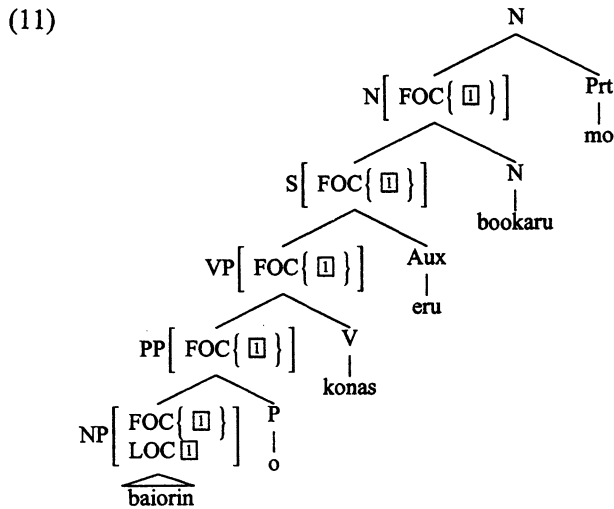
2.1 Basic mechanisms of association with focus

In this section, I formalize an explicit mechanism of association with focus in Japanese. The basic architecture of the theory is formulated in the alternative semantics of Rooth (1985) together with an HPSG syntax (Pollard and Sag, 1994).

More specifically, I will assume the following feature geometry. Most of the features that are basically syntactic in nature, e.g. features under LOC|CAT and NONLOC, are assumed to have almost the same internal structure as in Pollard and Sag (1994). What is radically different is the LOC|CONT feature, where semantic information of the sign is specified. I assume that the LOC|CONT feature of a given sign is specified for (divided into) the following two features: NORM(AL) and P-SET, the values of which correspond to Rooth’s (1985) normal semantic value and alternative semantic value, respectively. Semantic composition is assumed to be carried out for the most part by function application and the p-sets are computed in parallel to normal semantic values according to the definitions in Rooth (1985).

Now that the general architecture is determined, let us consider what kind of specific mechanisms we need to account for the data observed in the previous section. First of all, we need to determine how to represent formally the information that a certain phrase is focused. From the data in section 2, especially the instances of NFA such as (8) in which focus association takes place across a clause boundary, it is clear that such information must, at least sometimes, be inherited nonlocally. In the HPSG terminology, this is to say that we have to introduce a nonlocal feature for storing and inheriting the information of a focused phrase. I will call this feature the FOC(US) feature. Just like the SLASH feature, which serves the role of passing up the information of what is missing inside a phrase successively to upper phrases until the missing phrase is “found”, the FOC feature percolates up the information of what is focused

until it “finds” the FP that associates with the focused phrase. Thus, as a first step, I assume something like the following as a partial representation for the sentence (8):



In the above tree, the NP node dominating *baiorin* stores its LOC value in the set-valued FOC feature. This should be taken as the formal definition of the term “focus” in the present account. That is, we say that a particular phrase is focused iff the LOC value of that phrase is structure-shared with the object in the FOC set of that phrase.⁵ Putting aside for the moment the precise definitions of where the FOC value⁶ □ comes from, how its percolation takes place and terminates at an appropriate node, what is happening in the tree (11) should be clear. The FOC value originating from the NP node is inherited upward until it meets the FP that associates with the focused phrase *baiorin*. Note in particular that the percolation takes place across a clause boundary, as desired. This percolation of information makes it possible to carry out a kind of identification between the focused phrase and the FP.

But what about the cases of WFA like the following where the FP does *not* c-command the focused phrase?

- (12) [Pan dake o tabe]_F ta.
 bread only ACC eat PAST
 (I) did nothing but eat bread.

In (12), since the VP *pan dake o tabe* is focused, it has to have its LOC value in the FOC set, just like the noun *baiorin* in the above example. If the FOC value appeared on this VP node out of the blue, however, the FP would have no access to the information about its associate without an extra mechanism, since the information about the FP would not be available on the VP node. Thus, it would be reasonable instead to assume that the FOC value originates from the FP in this case. The idea is that, since the FOC value comes from the FP, the FP has access to the information about its associate which is encoded in the FOC value. (See the tree (13) below.)

Yet, this is not enough. Since WFA is a phenomenon in which the interpretation of the FP takes place at a syntactically higher position than what the FP actually attaches to, we also have to percolate up the information about the FP as high as to the position where the interpretation of that FP is carried out.⁷ To achieve this, I assume that an item of the FOC value is composed of two features T(AR)G(ET) and OP(ERATOR).⁸ The value of the TG feature is the LOC value of the focused phrase (i.e. what we were assuming above to be an item of the FOC value) and the value of the OP feature is an atomic value

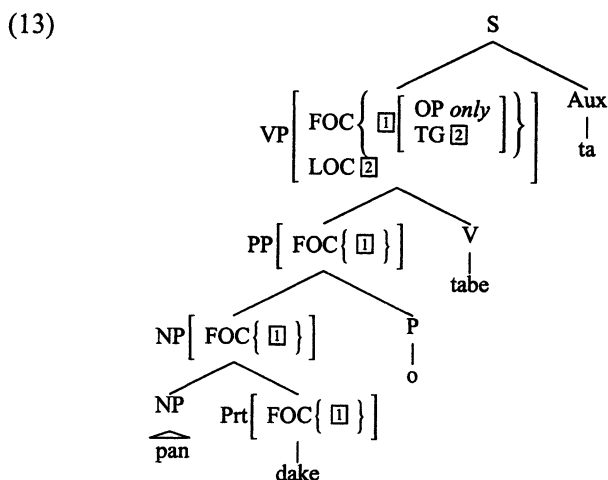
⁵This definition will be slightly modified below in accordance with the revision on the internal organization of the FOC feature.

⁶Though slightly inaccurate, I sometimes call the singleton element of the FOC feature as the “FOC value”.

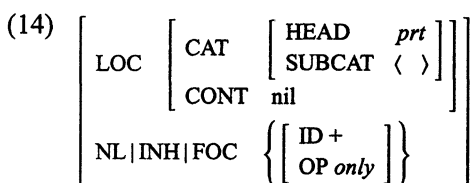
⁷The question of how semantic interpretation is carried out in such a way is postponed to later discussions.

⁸Later, I will add a third feature.

designating the name of the FP such as *only*.⁹ Thus, we have something like the following as a partial structural representation for the sentence (12) ((11) will also be revised accordingly.):

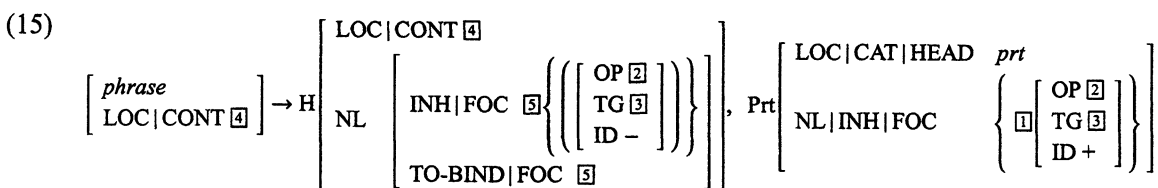


Though it wasn't made clear with respect to tree (11), I assume that the FP *mo* is actually specified for a nonempty FOC value there, too, which stores the information of the associate and of itself. As will be made clear below, this FOC value is indeed necessary for carrying out the semantic interpretation of the focus particle. Thus, the first approximation for the lexical entry for the FP *dake* will look like the following:



The ID feature that is newly introduced here serves the purpose of distinguishing FOC values originating from FPs and those not originating from FPs.¹⁰ This is a binary feature taking + or – as its value. “ID” here is meant to indicate whether the FOC value in question has been “identified” (has found) the FP that associates with the focused phrase. Thus, FOC values originating from focused phrases (such as the one in tree (11)) are specified as [ID –] while FOC values from FPs are specified as [ID +] as in the lexical entry (14).¹¹

The structure where the FP attaches to the head phrase is licensed by the following Head-Particle ID Rule.



This rule deals with two distinct cases in which the FP attaches to a head phrase (namely, WFA and NFA) and hence, is a bit complicated. If the head daughter has a nonempty FOC value (i.e. in the case

⁹Strictly speaking, I assume this value to be a function which will be utilized for semantic interpretation at a higher node by the Focus Resolution Rule below.

¹⁰As will be made clear below, the FOC feature is used for two different purposes in the present account and we need to make a distinction between these two.

¹¹The definition of a focused phrase is also slightly modified. A phrase is focused iff the TG value of the item in the FOC value is structure-shared with the LOC value of the phrase itself.

of NFA), this rule checks if the FOC values of the head daughter and the FP have identical values with respect to the TG and OP features. If the identification succeeds, the FOC value of the particle daughter is inherited to the mother node. The FOC value of the head daughter gets bound by virtue of the TO-BIND specification on the head daughter. If the head daughter has an empty FOC value (i.e. in the case of WFA), the FOC value of the particle daughter simply gets inherited.

Hence, the FOC value of the focus particle always gets inherited. This value will subsequently be inherited until the Focus Resolution Rule (defined below) deletes it by way of carrying out the semantic interpretation of the FP.¹² But there is one requirement for this. The interpretation of the FP has to be carried out within the minimal clause containing the FP. In other words, the Focus Resolution Rule has to be applied in the same clause as the FP is in. This can be ensured by checking the value of the FOC feature at the clause boundary. As will be made clear below, the only mechanism in the present account that binds off the inheritance of [ID +] FOC values contributed by FPs is the Focus Resolution Rule. Given this, the above requirement can be satisfied by prohibiting [ID +] FOC values from crossing a clause boundary. This requirement can be formulated as follows:

$$(16) \quad \text{sign:} \left[\text{LOC|CAT|SUBCAT} \quad \text{list} \left(\neg \left[\text{LOC|CAT} \left[\begin{array}{l} \text{SUBCAT} \langle \rangle \\ \text{HEAD} \quad \text{verb} \end{array} \right] \right] \right) \right] \right]$$

This constraint ensures that the SUBCAT list of any given sign cannot contain as its member an S ([HEAD *verb*, SUBCAT ⟨⟩]) which has an [ID +] FOC value. That is, no subcategorized clause can inherit an [ID +] FOC value from a phrase inside it.¹³ Thus, by virtue of this constraint, the Focus Resolution Rule is forced to be applied inside the minimal clause containing the FP and delete the [ID +] FOC value by way of carrying out the semantic interpretation of the FP.

2.2 Sample analyses of narrow focus association and wide focus association

In the previous subsection, I have outlined the basic ideas of the present theory. We are now ready to see in detail how semantic interpretation of WFA and NFA sentences are carried out. The full set of formal mechanisms (some of which have been already alluded to above) that are needed to carry out the semantic interpretation will also be introduced along the way.

NFA is a phenomenon in which the FP associates with only a subphrase of what it attaches to, as in the following example:

- (17) [s [Pan]_F o tabe ta] dake da.
 bread ACC eat PAST only cop
 “(I) ate only bread.”

In this sentence, the noun *pan* inside an S is focused and is associated with the FP *dake* that attaches to the S. The structure for (17) is shown in Figure 1. The fact that the noun *pan* is focused in this sentence is represented in Figure 1 by the structure-sharing between the LOC value $\boxed{3}$ of the NP node dominating *pan* and the TG value of the singleton element of the FOC value of this NP node. The meaning of this NP is specified in the CONT feature. The normal meaning is specified as *b(read)*, which is assumed to be an object of type *e*.¹⁴ The P-SET value here is the singleton set of *b*. Since what are focused are not limited to lexical phrases, I assume that all lexical phrases start out as having a singleton set of its normal semantic value as its P-SET value. Normal semantic values of larger phrases are computed by functional application and P-SET values are computed in parallel in the fashion of Rooth (1985) until the phrase to be focused is created. At the point where the phrase to be focused is created, the Focusing Rule is

¹²The reason why the interpretation of the FP is not immediately executed at the node where the FP attaches is, of course, to account for the WFA phenomenon.

¹³Note that this definition does not exclude the possibility for a FOC value originating from a focused phrase (i.e. an [ID –] FOC value) to cross a clause boundary, which has to be allowed in the cases of NFA taking place crossing clause boundaries.

¹⁴For expository ease, I assume that NPs denote objects of type *e* in this paper.

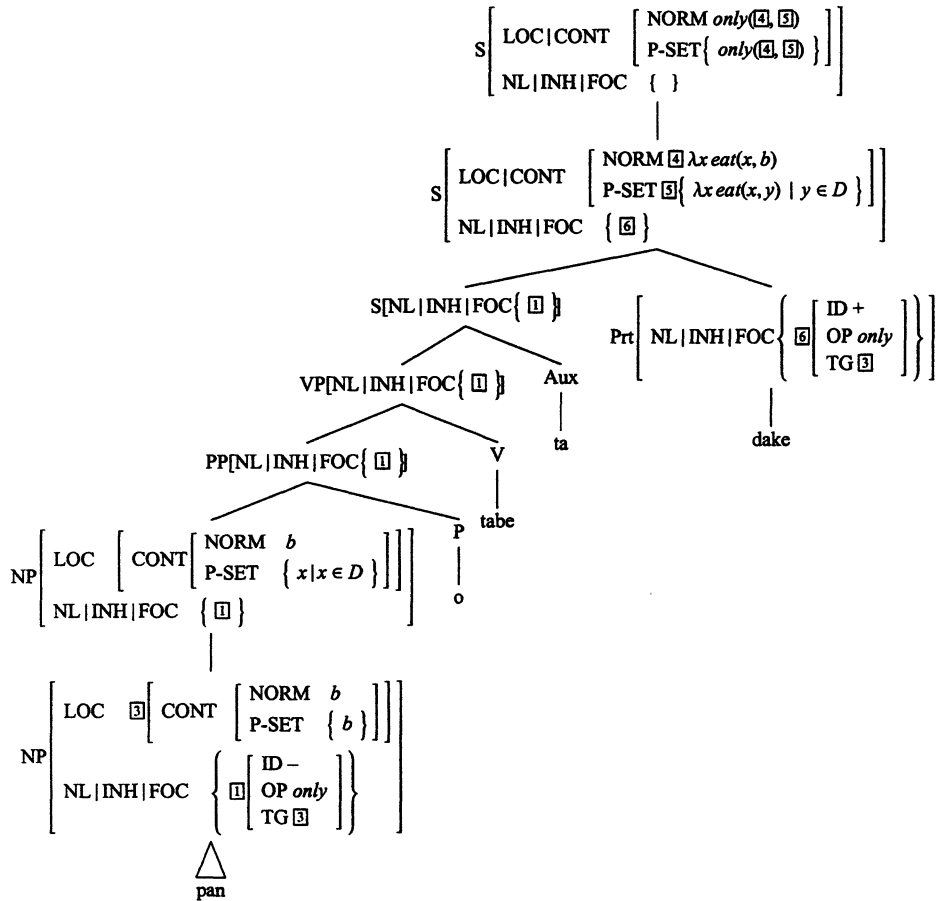


Figure 1: Tree for (17)

applied and an appropriate alternative semantic value for the focused phrase is created (in this particular case, a set containing objects of type e). The Focusing Rule is defined as in (18):

$$(18) \left[\begin{array}{l} \text{LOC} \left[\begin{array}{l} \text{CAT} \quad 5 \\ \text{CONT} \left[\begin{array}{l} \text{NORM} \quad 2 \\ \text{P-SET} \quad p\text{-set}(2) \end{array} \right] \end{array} \right] \\ \text{NL} \left[\text{INH|FOC} \left\{ 1 \right\} \right] \end{array} \right] \rightarrow \left[\begin{array}{l} \text{LOC} \quad 4 \left[\begin{array}{l} \text{CAT} \quad 5 \\ \text{CONT} \left[\begin{array}{l} \text{NORM} \quad 2 \\ \text{P-SET} \left\{ 2 \right\} \end{array} \right] \end{array} \right] \\ \text{NL} \left[\text{INH|FOC} \left\{ 1|\text{TG} \quad 4 \right\} \right] \end{array} \right]$$

where $p\text{-set}(P_a) = \{Q | Q \text{ is of type } a\}$

This rule is applied in the tree in Figure 1 immediately above the NP node dominating *pan*. It is a unary rule that is applicable when the LOC value of the phrase is structure-shared with the TG value of the item in the FOC value (i.e. when the phrase is focused), and it changes the P-SET value of the phrase to a set of objects of the type of the normal meaning of that phrase (i.e. the alternative semantic value in Rooth (1985) for focused phrases) on the immediately upper node. Thus, in the above tree, since the NP node immediately dominating *pan* has its LOC value 3 structure-shared with the TG value of the item in the FOC value, the Focusing Rule is applicable and we get the right alternative semantic value for the immediately upper node (i.e. a set of objects of type e).¹⁵

The FOC value 1 is percolated up to the lowest S node. When the focus particle *dake* attaches to this

¹⁵Notice that the structure-sharing between the LOC value and the value of the item of the FOC feature rules out a recursive application of the Focusing Rule. That is, once this rule is applied, the LOC value of the mother node is different from that of the daughter node with respect to the CONT feature. Thus, if the TG value of the item in the FOC feature is specified to be

node by the Head-Particle ID Rule, the OP and TG values of the items of the FOC features of the head and the particle are identified and the FOC value $\boxed{6}$ from the particle is inherited to the mother. Notice that the CONT value of the mother node is simply specified as identical to the CONT value of the head daughter in the rule (15).¹⁶ (The meaning of this node is not calculated by function application.) Hence, the semantic contribution from the FP doesn't yet get into the semantics of the phrase here. The semantic interpretation of the FP is carried out by the application of the Focus Resolution Rule at the immediately upper node. The Focus Resolution Rule is formulated as in (19):

$$(19) \quad \left[\text{LOC} \left[\begin{array}{l} \text{CAT} \quad \boxed{5} \\ \text{CONT} \left[\begin{array}{l} \text{NORM} \quad \boxed{4}(\boxed{2}, \boxed{3}) \\ \text{P-SET} \quad \{ \boxed{4}(\boxed{2}, \boxed{3}) \} \end{array} \right] \end{array} \right] \right] \rightarrow \left[\begin{array}{l} \text{LOC} \left[\begin{array}{l} \text{CAT} \quad \boxed{5} \\ \text{CONT} \left[\begin{array}{l} \text{NORM} \quad \boxed{2} \\ \text{P-SET} \quad \boxed{3} \end{array} \right] \end{array} \right] \\ \text{NL} \left[\begin{array}{l} \text{INH|FOC} \left\{ \boxed{1} \left[\begin{array}{l} \text{OP} \boxed{4} \\ \text{ID} + \end{array} \right] \right\} \\ \text{TO-BIND|FOC} \left\{ \boxed{1} \right\} \end{array} \right] \end{array} \right]$$

This rule (again, a unary rule) does two things. First, it incorporates the semantic contribution of the FP into the semantics of the phrase. More precisely, the function stored and inherited via the OP value of the item in the FOC feature (tagged as $\boxed{4}$ in the rule (19)) is applied to the normal and alternative semantic values ($\boxed{2}$ and $\boxed{3}$, respectively) of the daughter node and the output of the function application becomes the normal semantic value of the mother node. Since the interpretation of the FP is completed, the alternative set has to be suppressed. Hence, the P-SET value of the mother node is specified as the singleton set of its normal semantic value. Second, this rule binds off the item in the FOC value, which has also accomplished its role and no longer needs to be inherited higher.

This rule is applied at the topmost level in the tree in Figure 1. The function *only* is applied to the normal and alternative semantic values of this S node (so that the semantic contribution of the FP is integrated into the semantics) and the FOC value $\boxed{6}$ disappears on the topmost S node. The resolution of the FOC value is necessitated by the following constraint on initial symbols:¹⁷

$$(20) \quad \left[\begin{array}{l} \text{LOC} \left[\begin{array}{l} \text{HEAD} \quad \textit{verb} \\ \text{SUBCAT} \quad \langle \ \rangle \end{array} \right] \\ \text{NL|INH|FOC} \quad \{ \ \} \end{array} \right]$$

This constraint simply states that a sentence can stand alone only if it has resolved all its FOC values. From the constraint on initial symbols (20), which requires the FOC value of the top S node to be empty, the Focus Resolution Rule is forced to apply. Thus, the meaning of the FP gets incorporated into the semantics and the FOC value gets deleted.

In order to make sure that we have really come up with the right interpretation, let us calculate the semantic value of the topmost S node. In order to do so, we need the definition of the function *only*. It is given as in (21):

$$(21) \quad \begin{array}{l} \text{a. } \textit{only}(P_t, Q) = \forall R[[R \in Q \wedge R] \rightarrow R = P] \\ \text{b. } \textit{only}(P_{\langle e,t \rangle}, Q) = \lambda x \forall R[[R \in Q \wedge R(x)] \rightarrow R = P] \end{array}$$

With this definition, the interpretation for the sentence (17) can be calculated as in (22):

$$(22) \quad \textit{only}(\boxed{4}, \boxed{5}) = \lambda x_0 \forall R[[R \in \{ \lambda x \textit{eat}(x, y) | y \in D \} \wedge R(x_0)] \rightarrow R = \lambda x \textit{eat}(x, b)]$$

identical to the LOC value of the daughter, it can no longer be identical to the LOC value of the immediately upper node and the Focusing Rule is no longer applicable.

Notice also that the application of the Focusing Rule is optional. However, if the Focusing Rule does not apply, the Focus Resolution Rule, which is forced to apply in order to delete the FOC value later cannot calculate the semantics properly. Consequently the sentence would be assigned an illicit interpretation. Hence, the requirement for proper semantic computation makes the application of the Focusing Rule at an appropriate node virtually obligatory.

¹⁶The CONT feature of the FP *dake* in (14) is specified as "nil" (which is intended to indicate that the FP has no direct semantic contribution at the node where it attaches).

¹⁷An initial symbol is a phrase licensed by the grammar as a sentence that can stand alone.

For the sake of concreteness, let us assume that the subject slot is filled by the contextually appropriate value determined by some pragmatic mechanism and that, in this case, the referent of this subject is fixed as the speaker. Then, the meaning of the sentence will be something like: “I ate bread and nothing else.” That is, “I ate only bread.” This is indeed the desired result.

In the above explanations, I have been a bit sloppy about the precise mechanisms of how FOC values are generated and inherited. To make the theory complete, I introduce here the formal definition of the mechanism that is responsible for these:

(23) The FOC Principle

The INH|FOC value of any given phrase contains

a. the INH|FOC values of all daughters minus those on the TO-BIND|FOC of the head daughter, plus optionally,

b. an item satisfying the description $\left[\begin{array}{c} \text{ID} - \\ \text{TG } \square \end{array} \right]$, where \square is the LOC value of the phrase itself.

The item optionally added by clause b. in the above definition is what licenses the FOC value \square to appear on the NP node *pan* in the tree in Figure 1. It simply says that any phrase can identify itself as focused. Clause a. ensures that once FOC values are created, they are inherited higher until something explicitly binds it off.

Next, let us consider the case of WFA.

(24) [Pan dake o tabe ta.]_F

bread only ACC eat PAST

“(I) only ate bread.”

In (24), *dake* attaches to a phrase which neither is focused itself nor contains a focused subphrase (in other words, it has an empty FOC value). The structure for this sentence is shown in Figure 2. In this case, when the Head-Particle ID Rule is applied, the FOC value \square of the particle daughter simply gets percolated. From the constraint (16), the Focusing Rule and the Focus Resolution Rule are forced to apply somewhere inside the clause.¹⁸ In order for the Focusing Rule to apply, the FOC value from the FP has to identify its TG value with the LOC value of some phrase through the path of its percolation before it reaches the top S node. In this particular example, the FOC value originating from *dake* finds its target at the VP level and the Focusing Rule and the Focus Resolution Rule are applied immediately one after another.¹⁹ The meaning of the top S node is calculated as in (25):

$$(25) \text{ only}(\square, p\text{-set}(\square)) = \text{only}(\lambda x \text{ eat}(x, b), D_{(e,t)}) = \lambda x \forall R[[R \in D_{(e,t)} \wedge R(x)] \rightarrow R = \lambda x \text{ eat}(x, b)]$$

Assuming that the subject is “I”, this can be paraphrased as: “I did nothing but eat bread.” Thus, we can confirm that we have come up with an intuitively plausible interpretation.

3 Conclusion

In this paper, I formulated an explicit mechanism of association with focus in Japanese. The proposed analysis, by virtue of the explicit and precise nature of the formal syntactic and semantic analysis adopted, provides transparent accounts for some of the important characteristics of FPs in Japanese. The present account dealt with only a small portion of the entire phenomena which has been richly documented in the literature. To examine the validity of the proposals made here in light of the phenomena left unaccounted for remains as the task of future work.

¹⁸Strictly speaking, the Focusing Rule is required because the Focus Resolution Rule alone cannot calculate the semantics right.

¹⁹The reader can easily confirm that the resulting interpretation would be the same if they are applied at the S node.

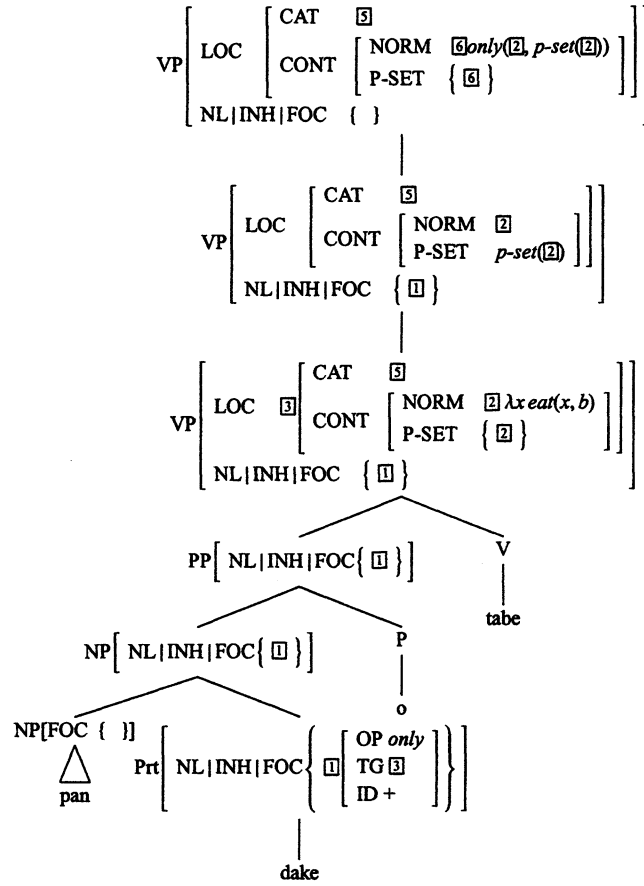


Figure 2: Tree for (24)

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