Japanese Subjects and Information Structure:
A Constraint-based Approach

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Abstract

This paper is concerned with how topic/focus articulation should be optimally integrated into Japanese grammar. Based on Engdahl and Vallduví's (1996) Information Structure, we propose an analysis with the following characteristics: (i) information structure is an integral part of Japanese grammar and interacts in principled ways with both syntax and phonology, (ii) the representations of topic/focus in the information structure and its interactions with the particles *wa/ga* show one-to-many relation, and (iii) the ordering of grammatical functions and its interactions with other grammatical parts play an important role in determining the focus domain.

1 Introduction

Japanese is a language in which topic and focus are identified by the use of the particles. In the case of subjects, they are either marked by *wa* or *ga*. The two particles are illustrated in the following examples:

(1) a. Ken-wa   kaet-ta.   b. Ken-ga   kaet-ta.
       Ken-TOP   leave-PAST   Ken-NOM   leave-PAST
       'Ken left.'   'Ken left.'

The fact that (1a) and (1b) are given the same semantic interpretation, does not tell us what *wa* and *ga* really mean. These particles are said to have two uses respectively. Kuno (1973),[1] for instance, distinguishes the use of *wa* by referring to (2a) as a *thematic*, and (2b) as a *contrastive*:

(2) a. 'As for Ken, he left.'
     b. 'As opposed to other people, Ken left.'

Much syntax-based work has been done on the use of these particles but the basic distinction between them is the same. Whatever the correct characterization of the uses of *wa* shown in (2) may be, the meaning of (1a) that is common to both uses is that the proposition that somebody left is true if that somebody is Ken. Whether a subject marked by *wa* is uttered in one use of *wa* or the other cannot be determined without knowledge of the context.

In this paper, we demonstrate that the relation between syntactic constituency and contextual information is not a tight one-to-one mapping as purely syntax-based analysis assumes. Based on Vallduví and Endahl's Information Structure (Vallduví, 1992; Engdahl and Vallduví, 1996; Vallduví and Engdahl, 1996), we propose a constraint-based one-to-many mapping mechanism which captures some aspects of topic/focus interpretation. The study of information structure, we argue, is essential in addressing fundamental questions regarding the multi-dimensional grammar for Japanese.

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[1] Kuroda (1965; 1972; 1990) recognizes the same distinction but characterizes it differently.

2 The data: Distribution of Topic/Focus

Before going into the detailed discussion, we first summarize how topic and focus are identified throughout this paper since their definitions vary considerably among linguists.

2.1 Test: Erteschik-Shir (1997)

Erteshik-Shir studies the interface between discourse structure and syntax in Erteschik-Shir (1997) and defines a grammatical level of focus structure in which topic and focus constituent are marked. To distinguish topic from focus, Erteschik-Shir adopts a topic test originally proposed in Reinhart (1981).

(3) Speaker A: Tell me about X

Speaker B: . . . X. . . . X = TOPIC   (Erteshik-Shir 1997:14, ex.11)

Erteshik-Shir also defines the topic as the subject of the predication. Thus, in (4) *The children* is the topic, and the predicate represents the assertion made about the topic.

(4) Speaker A: Tell me about the children.

Speaker B: [$_{top}$ The children] were eating the candy.

Topic is old information in the sense that it has been introduced in discourse.

Focus is determined by using question-answer pairs to identify the constituent which answers a Wh-question. Thus, in (5a), for example, only *The children* is the focus and the rest of the sentence is old information.

(5) a. Speaker A: Who ate the candy?   Speaker B: [$_{foc}$ The children] ate the candy.

b. Speaker A: What did the children eat?   Speaker B: The children ate [$_{foc}$ the candy].

c. Speaker A: What did the children do?   Speaker B: The children [$_{foc}$ ate the candy].
(Erteshik-Shir 1997:14, ex.13, slightly modified.)

Based on the definitions and test shown above, we examine the interpretation of *wa/ga*-marked subject.

2.2 Topic/Focus Particles and Interpretations of Subject

As seen in (6), the subject marked by *wa* has a topic interpretation.

(6) Speaker A: Tell me about the children.

Speaker B: [$_{top}$ Kodomotati-*wa*] amedama-o tabe-tei-ru.
             children-TOP   candy-ACC eat-PROG -PRES
           'The children are eating the candy.'

When *kodomotati* 'children' is already a topic of context, (6) is pronounced without any contrastive pitch on *kodomotati-wa* and is interpreted as *thematic* (Kuno, 1973).

When *kodomotati* is being contrasted with other parties, the phrase receives a high pitch (either on *kodomotati* or on *wa*) and is interpreted as *contrastive* (7).

(7) Speaker A: Who is eating the candy?

Speaker B: [$_{foc}$ Kodomotati-*wa*] amedama-o tabe-tei-ru (-kedo...)
             children-TOP   candy-ACC eat-PROG -PRES -BUT
           'It is (at least) the children who are eating the candy. . . '

Wa marked elements can also be interpreted as focus if they bear new information, as in (7). Thus, there is no direct correspondence between *wa/ga* and topic/focus, respectively.

The particle *wa* shows that the constituent marked with it carries a focus interpretation. In (8) the object *amedama* 'candy' is marked with *wa* and it is also interpreted as focus.

(8) Speaker A: What are the children eating?

Speaker B: [_top_ Kodomotati-*wa*] [_foc_ amedama-*wa*] tabe-tei-ru (-kedo...)
        children-TOP   candy-TOP   eat-PROG -PRES -BUT

'It is (at least) the candy which the children are eating...'

(8) implies that the children are eating the candy, but they were eating nothing else, e.g., chewing gum. The domain of focus can be extended beyond the constituent marked with *wa*. See (9) below:

(9) Speaker A: What are the children doing?

Speaker B: [_top_ Kodomotati-*wa*] [_foc_ amedama-*wa* tabe-tei-ru] (-kedo...)
        children-TOP   candy-TOP   eat-PROG -PRES -BUT

'It is (at least) eating the candy that the children is doing...'

In (9) the constituent *amedama-wa tabe-tei-ru* 'eating the candy', not just *amedama-wa* carries a focus interpretation, and the sentence implies that the children are eating the candy, but they aren't doing anything else, such as reading a book. Thus, there is no direct correspondence between the sentence form and its focus interpretation.

Ga differs from *wa* in some respects. See the example in (10) below:

(10) Speaker A: Who is eating the candy?

Speaker B: [_foc_ Kodomotati-*ga*] amedama-o tabe-tei-ru.
        children-NOM   candy-ACC eat-PROG -PAST

'It is (only) the children who are eating the candy.'

(10) shows that the subject, marked by *ga*, is also interpreted as focus.

Note that there is a difference between *wa* marked and *ga*-marked focus. In (7) and (10), *kodomotati* 'children' belongs to a set specified in discourse. *Kodomotati-ga* has to be the only members who are eating the candy in the context. Erteschik-Shir (1997) calls both *wa*-marked focus in (7) and *ga*-marked focus in (10) restrictive focus which presupposes a set specified in discourse of which the focus constituent is a subject.[2]

On the contrary, *wa*-marked focus, as shown in (8)-(9) does not require the focused element to be the only member of that set. To distinguish such a focus from restrictive focus, I will call the *wa*-marked focus non-nestrictive focus.

When a sentence with the *ga*-marked subject is uttered out-of-the-blue, the whole sentence bears new information. Consider (11) below:

(11) Speaker A: What is happening?

Speaker B: [_foc_ Kodomotati-*ga* amedama-o tabe-tei-ru].
        children-NOM candy-ACC eat-PROG -PRES

'The children are eating the candy.'

In (11), no set from which *kodomotati* is picked out is presupposed. Hence, it is not restrictive. I call the focus in (11) *all focus*, and distinguish from *restrictive focus*.[3]

2.3 Summary

In (12), we summarize the possible interpretation of *ga/wa*-marked NPs.

(12) a. *Wa* marked NPs are interpreted as *topic, restrictive focus* or *non-restrictive focus*.

b. *Ga* marked NPs are interpreted as either *restrictive focus* or *all/non-restrictive focus*.

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[2] In (10), all members which satisfy the condition have to be listed exhaustively (non-exhaustively in (7)). Kuno (1973) distinguishes the two usage of *ga* by referring to (10) as an *exhaustive listing*, and (11) as a *neutral description* which simply describes an event. Diesing (1988) and Heycock (1994) determine exhaustive listing reading *narrow focus*. See fn.3

[3] This is what Selkirk (1984) and Diesing (1988) call *wide focus*.

3 Analysis: Information Structure in HPSG

HPSG's (Pollard and Sag, 1987, 1994; Sag et al., 2003) multi-dimensional constraint-based architecture is well-suited for representing information structures which interact with syntax and prosody in principled ways (Vallduví, 1992).

In this section, we will see the previous constraint-based approach to English, with a simple example from Engdahl and Vallduví (1996), and then introduce the mechanism into Japanese grammar architecture.
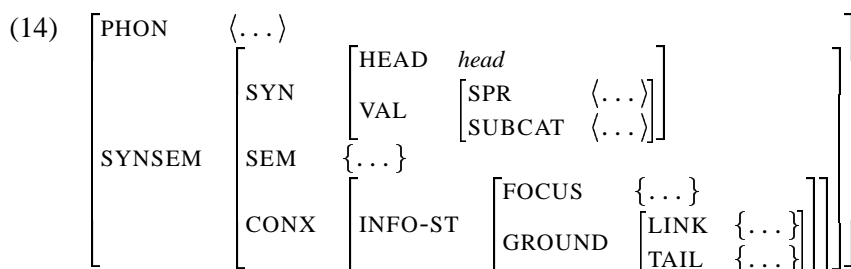
3.1 Framework: Engdahl and Vallduví's (1996)

Consider the mini-dialogue in (13), where **bold face** corresponds to so-called B-accent (L+H*), while SMALL CAPITALS correspond to so-called A-accent (H*).[4]

(13) Speaker A: So tell me about the people in the White House. Anything I should know?

Speaker B: Yes. The **president** [$_{\text{foc}}$ hates the Delft CHINA SET]. Don't use it.

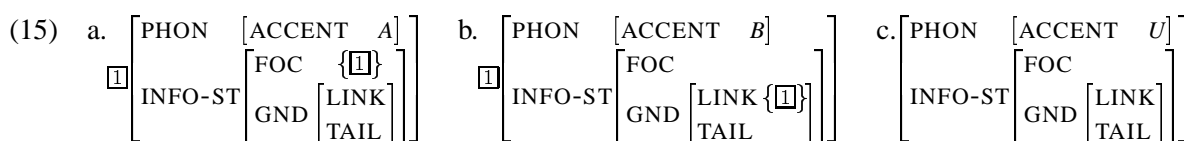(Engdahl and Vallduví 1996:5, ex.3)

Vallduví (1992) assumes a three-way partition of Information Structure of sentence. First, the information conveyed by a sentence is split into new information *focus* and information already present in the discourse *ground*. Second *ground* is further subdivided into *link* (*topic*, in our terms) and *tail*. Under the assumption that every utterance contains new information,[5] this leads to a four-way classification of utterances: *all-focus, focus-tail, link-focus-tail* and *link-focus* shown in (13:B).

Engdahl and Vallduví (1996) propose that Information Structure is represented within *signs'* value of CON(TE)X(T) feature as following way:[6]

$$
(14) \begin{bmatrix} \text{PHON} & \langle \ldots \rangle \\ \text{SYNSEM} & \begin{bmatrix} \text{SYN} & \begin{bmatrix} \text{HEAD} & head \\ \text{VAL} & \begin{bmatrix} \text{SPR} & \langle \ldots \rangle \\ \text{SUBCAT} & \langle \ldots \rangle \end{bmatrix} \end{bmatrix} \\ \text{SEM} & \{ \ldots \} \\ \text{CONX} & \begin{bmatrix} \text{INFO-ST} & \begin{bmatrix} \text{FOCUS} & \{ \ldots \} \\ \text{GROUND} & \begin{bmatrix} \text{LINK} & \{ \ldots \} \\ \text{TAIL} & \{ \ldots \} \end{bmatrix} \end{bmatrix} \end{bmatrix} \end{bmatrix} \end{bmatrix}
$$

As shown in (14), CONX is enriched with INFO(RMATION)-ST(RUCTURE) feature, which directly represents the three-way partition of information.

They also posit constraints expressing the claim that, for each word, this word's contextual contribution is part of the *focus* if and only if it bears the A-accent (15a), and it is part of *link* if and only if it bears the B-accent (15b). When accent is u(nmarked), the value of INFO-ST is not specified as in (15c).

$$
(15) \quad a. \begin{bmatrix} \text{PHON} & [\text{ACCENT} \quad A] \\ \boxed{1} \quad \text{INFO-ST} & \begin{bmatrix} \text{FOC} & \{\boxed{1}\} \\ \text{GND} & \begin{bmatrix} \text{LINK} \\ \text{TAIL} \end{bmatrix} \end{bmatrix} \end{bmatrix} \quad b. \begin{bmatrix} \text{PHON} & [\text{ACCENT} \quad B] \\ \boxed{1} \quad \text{INFO-ST} & \begin{bmatrix} \text{FOC} \\ \text{GND} & \begin{bmatrix} \text{LINK} \{\boxed{1}\} \\ \text{TAIL} \end{bmatrix} \end{bmatrix} \end{bmatrix} \quad c. \begin{bmatrix} \text{PHON} & [\text{ACCENT} \quad U] \\ \text{INFO-ST} & \begin{bmatrix} \text{FOC} \\ \text{GND} & \begin{bmatrix} \text{LINK} \\ \text{TAIL} \end{bmatrix} \end{bmatrix} \end{bmatrix}
$$

There are additional principles specifying how a phrases' INFO-ST is constrained by INFO-ST of its daughters:.
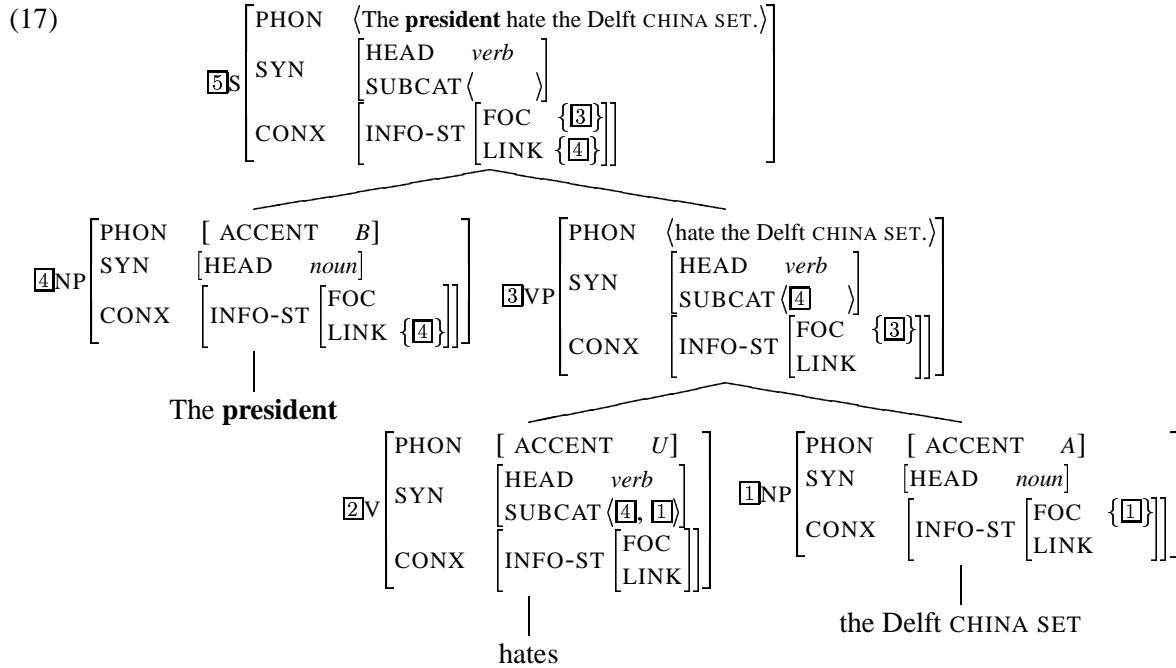
(16) INFO-ST *instantiation principle for English:*
Either (i) if a DAUGHTER'S INFO-ST is instantiated, then
the mother inherits this instantiation (*for narrow foci, links and tails*),
or (ii) if the most oblique DAUGHTER'S FOCUS is instantiated, then
the FOCUS of the mother is the *sign* itself (*wide focus*).   (Engdahl and Vallduví 1996:12, ex.15)

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[4] See Jackendoff (1972)
[5] See Chafe (1976)
[6] In HPSG the relevant units of linguistic information like syntax and semantics are called (lexical/phrasal) *signs*.

The feature structure and the principles in (14)-(16) lead to the following simplified representation of (13:B), in which values of the DTRS attribute are presented in the familiar constituent tree notation.

(17)

$$
\boxed{5}S\begin{bmatrix} \text{PHON} & \langle \text{The } \mathbf{president} \text{ hate the Delft \textsc{china set}.}\rangle \\ \text{SYN} & \begin{bmatrix} \text{HEAD} & \textit{verb} \\ \text{SUBCAT} \langle \quad \rangle \end{bmatrix} \\ \text{CONX} & \begin{bmatrix} \text{INFO-ST} \begin{bmatrix} \text{FOC} & \{\boxed{3}\} \\ \text{LINK} & \{\boxed{4}\} \end{bmatrix} \end{bmatrix} \end{bmatrix}
$$

$$
\boxed{4}NP\begin{bmatrix} \text{PHON} & [\ \text{ACCENT} \quad B] \\ \text{SYN} & [\text{HEAD} \quad \textit{noun}] \\ \text{CONX} & \begin{bmatrix} \text{INFO-ST} \begin{bmatrix} \text{FOC} \\ \text{LINK} \ \{\boxed{4}\} \end{bmatrix} \end{bmatrix} \end{bmatrix}
$$

The **president**

$$
\boxed{3}VP\begin{bmatrix} \text{PHON} & \langle \text{hate the Delft \textsc{china set}.}\rangle \\ \text{SYN} & \begin{bmatrix} \text{HEAD} & \textit{verb} \\ \text{SUBCAT} \langle \boxed{4} \quad \rangle \end{bmatrix} \\ \text{CONX} & \begin{bmatrix} \text{INFO-ST} \begin{bmatrix} \text{FOC} & \{\boxed{3}\} \\ \text{LINK} \end{bmatrix} \end{bmatrix} \end{bmatrix}
$$

$$
\boxed{2}V\begin{bmatrix} \text{PHON} & [\ \text{ACCENT} \quad U] \\ \text{SYN} & \begin{bmatrix} \text{HEAD} & \textit{verb} \\ \text{SUBCAT} \langle \boxed{4}, \boxed{1} \rangle \end{bmatrix} \\ \text{CONX} & \begin{bmatrix} \text{INFO-ST} \begin{bmatrix} \text{FOC} \\ \text{LINK} \end{bmatrix} \end{bmatrix} \end{bmatrix}
$$

hates

$$
\boxed{1}NP\begin{bmatrix} \text{PHON} & [\ \text{ACCENT} \quad A] \\ \text{SYN} & [\text{HEAD} \quad \textit{noun}] \\ \text{CONX} & \begin{bmatrix} \text{INFO-ST} \begin{bmatrix} \text{FOC} & \{\boxed{1}\} \\ \text{LINK} \end{bmatrix} \end{bmatrix} \end{bmatrix}
$$

the Delft \textsc{china set}

Note that (17) shows the CONX|INFO-ST value i.e., discourse is not only an independent level of linguistic representation but also interacts with the other grammatical levels, PHON(OLOGY) and SYN(TAX) simultaneously. To see how the value of INFO-ST follows from the principles above, consider the two interpretations of (13:B).

(18)   The president [$_{\text{foc}}$ hates [$_{\text{foc}}$the Delft china set]].   (Engdahl and Vallduví 1996:12, ex.16)

One advantage of the present analysis concerns the contextual ambiguity in (18). This sentence, with an A-accent on the object, can be interpreted either with focus on the object NP or with focus on the whole VP, depending on the context. The former interpretation is licensed by (16i) (focus inheritance), while the latter interpretation is licensed by (16ii) (focus projection).[7]

Another advantage of using the multi-dimensional representation concerns mismatches between informational partitioning and syntactic constituency. In (19) we could have cases where informational partitioning does not correspond to syntactic constituency:

(19)   Speaker A: What happened to the China set?

Speaker B: [$_{\text{foc}}$ The BUTLER BROKE] the set.   (Engdahl and Vallduví 1996:16, ex.24)

Constituency-based analysis (Selkirk, 1984, 1995) and other pure-syntax theories would have difficulties in predicting that the focus is constituted by the subject and the verb. Within the present analysis, even if the subject and the verb do not form a syntactic constituent, the instantiation of a FOC value on both DAUGHTERS will be inherited to their respective mother.

3.2   Instantiation of the Information Structure in Japanese

It has been observed that languages adopt different means to encode their information structure: English employs intonation while Catalan relies on word order (Engdahl and Vallduví, 1996). In addition to prosody and constituent order changes from the underlying SOV, Japanese also uses morphology directly in realizing information structure.

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[7]Fuller discussion will be presented in the Section 3.2 and since the *focus projection* is basically the same mechanism as an domain extension of restrictive focus in (9).

3.2.1 WA

A number of properties distinguish the three uses of *wa*, topic and (non-)restrictive focus ((N)RF):

(20)   a. The topic is restricted so as to be old information, while (N)RF can mark new information.

      b. The topic phrase goes unstressed, while NRF phrase receives a high pitch.

      c. A sentence is restricted to at most one topic phrase, which if present appears in sentence-initial position; however, multiple elements within the sentence can be marked in situ with NRF.

Though pitch accent assignment described in (20b) and (15) for English are different, the properties of topic and (N)RF in (20a) correspond with Vallduví's (1992) characterization of *link* and *focus*. (20c) also match the characterization, since under Vallduví's system the Information Structure of a sentence is restricted to at most one *link* but any number of *focus* and *tail* elements, and moreover the property of topic in (20c) is consistent with his original conception of *links* as exclusively sentence-initial. Therefore we conclude that topic *wa* and (N)RF *wa* function as *link* and *focus* marker, respectively.[8]

Let us consider how information structure, which is a crucial factor for topic/focus articulation, is formally represented in Japanese grammar under the framework of HPSG.

(20a) and (20b) can be captured by means of the following constraint from Engdahl and Vallduví (1996):

(21)   a. $\boxed{1}\begin{bmatrix} \text{MORPHON} & \begin{bmatrix} \text{MORPH} & \langle \text{X}, wa \rangle \\ \text{PHON} & [\text{ACCENT} \quad U] \end{bmatrix} \\ \text{INFO-ST} & [\text{LINK} \quad \{\boxed{1}\}] \end{bmatrix}$ b. $\boxed{1}\begin{bmatrix} \text{MORPHON} & \begin{bmatrix} \text{MORPH} & \langle \text{X}, wa \rangle \\ \text{PHON} & [\text{ACCENT} \quad A] \end{bmatrix} \\ \text{INFO-ST} & [\text{FOC} \quad \{\boxed{1}\}] \end{bmatrix}$

Notice that (21) characterizes phonological constraints for Japanese rather different from the constraints for English, as exemplified in (15).

Information structure in Japanese, as in Catalan, depends crucially on morphosyntactic devices such as *wa* marking. Furthermore, as in English, the prosodic phenomenon of sentence accent is also important. However, the formalization in (21) does not describe such phonological aspects and a certain morphological process that removes the case particles *-ga* and *-o* obligatorily and *-ni* optionally, and keeps any other case particles and postpositions intact. Whatever the correct characterization of the morphological and phonological feature of Japanese may be, it is irrelevant to the main subject of this paper.[9]

It is noteworthy that the skeletal signs in (21) show that the value of ACCENT and the value of INFO-ST constrain each other. This is expressed by means of structure-sharing between INFO-ST and the sign itself. The presence of an unmarked or A-accent is sufficient to identify the informational contribution of a lexical sign as *link* or *focal*. And vice versa, the *link* or *focal* status of a lexical sign is sufficient to determine the value of its ACCENT. This means that the constraints in (21) express a mutual constraint between ACCENT (phonology) and INFO-ST (discourse).

Now we need a mechanism to encode (20c). Following what is commonly accepted in the literature (Hoji, 1985; Saito, 1985), we assume that topicalization lexical rule is divided into two types: the topic *addition* type in (22a) and the topic *substitution* type in (22b):[10]

(22)   a. $\begin{bmatrix} \text{HEAD} & verb \\ \text{SUBCAT} & \boxed{1} \end{bmatrix} \rightarrow \begin{bmatrix} \text{HEAD} & verb \\ \text{VAL} & \begin{bmatrix} \text{TOPIC} & \langle \boxed{2}\text{NP} \begin{bmatrix} \text{MORPH} & \langle \text{X}, wa \rangle \\ \text{PHON} & [\text{ACCENT} \quad U] \\ \text{INFO-ST} & [\text{LINK} \quad \{\boxed{2}\}] \end{bmatrix} \rangle \\ \text{SUBCAT} & \boxed{1} \end{bmatrix} \end{bmatrix}$

     b. $\begin{bmatrix} \text{HEAD} & verb \\ \text{SUBCAT} \langle \ldots \boxed{1}\text{XP}[\text{MORPH} \langle \text{X} \rangle] \ldots \rangle \end{bmatrix} \rightarrow \begin{bmatrix} \text{HEAD} & verb \\ \text{SUBCAT} \langle \ldots \boxed{2}\text{XP} \begin{bmatrix} \text{MORPH} & \langle \text{X}, wa \rangle \\ \text{PHON} & [\text{ACCENT} \quad A] \\ \text{INFO-ST} & [\text{FOC} \quad \{\boxed{2}\}] \end{bmatrix} \ldots \rangle \end{bmatrix}$

---

[8]See the analyses of *focus* (Heycock, 1994), *link* (Portner and Yabushita, 1998) and *tail* (Kaiser, 1999) in Japanese.

[9]See Matsui (1996) for a constraint-based comprehensive study of Japanese Phonology.

[10]This is a reformulation of Fukushima's (1999) idea on lexical account for topicalization.

In (22), we introduce the feature TOPIC, with which we can state the co-occurrence restrictions for the heads that they select.[11] We make the value of TOPIC a list which is restricted to single item.

In addition, we posit the following rules to construct well-formed phrases.

(23) a. $\begin{bmatrix} phrase \\ \text{SUBCAT} \quad \langle \ \rangle \end{bmatrix} \rightarrow \begin{bmatrix} word \\ \text{SUBCAT} \quad \langle \boxed{1}, \ldots, \boxed{n} \rangle \end{bmatrix}, \boxed{1}, \ldots, \boxed{n}$

b. $\begin{bmatrix} phrase \\ \text{TOPIC} \quad \langle \ \rangle \end{bmatrix} \rightarrow \boxed{1}, \begin{bmatrix} phrase \\ \text{TOPIC} \quad \langle \boxed{1} \rangle \end{bmatrix}$

To see how these constraints do play a role in the topic/NRF function and distinction, consider the previous examples which are slightly modified and repeated here.

(24) [top Ken-*wa*] [foc KODOMOTATI-GA kaette-ki-ta].
 Ken-TOP   children-NOM   return-come-PAST

 'As for Ken, his children returned.'

(25) a. narrow: Kodomotati-*ga* [foc AMEDAMA-WA] tabe-ta.
  children-NOM   candy-NRF   eat-PAST

  'It is (at least) the candy which the children ate'

b. wide: [top Kodomotati-*wa*] [foc AMEDAMA-WA tabe-ta].
  children-TOP   candy-NRF   eat-PAST

  'It is (at least) eat the candy that the children did.'

The topicalization lexical rule in (22a) operates on a verb like *kaettekuru* 'return' in (26a), and give rise to corresponding topicalized verbs in (26b) which is responsible for (24):

(26) a. kaettakuru: $\begin{bmatrix} \text{HEAD} \quad verb \\ \text{SUBCAT} \quad \langle \text{NP-ga} \rangle \end{bmatrix}$ b. kaettakuru: $\begin{bmatrix} \text{HEAD} \quad verb \\ \text{TOPIC} \quad \langle \boxed{1}\,\text{NP-wa}\,[\text{LINK}\,\{\boxed{1}\}] \rangle \\ \text{SUBCAT} \quad \langle \text{NP-ga} \rangle \end{bmatrix}$

The tree in (27) shows how the value of INFO-ST of (24) follows from the principle in (16):

(27)
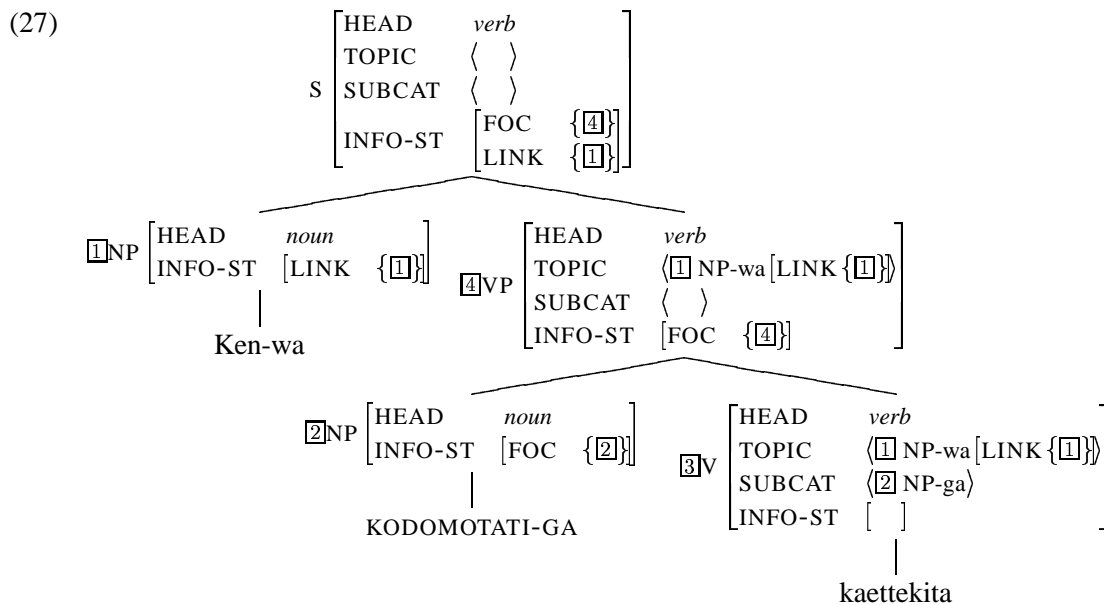
An instantiation of VP-focus is taken up in the next section. Since the LINK value of a given ☐ NP is instantiated, it propagates to the INFO-ST value of its mother. This propagation is ensured by (16i) which is an option of a disjunctive principle for information structure for not only English but also for Japanese.

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[11]Topic *wa* phrase requires modality at the sentential ending (Yamada, 1936). It is also prohibited from appearing in a relative clause and a conditional clause, (whereas NRF phrase is not). These characteristics can be straightforwardly explained by assuming that the specific heads have different valence specification for the feature TOPIC.

The topicalization lexical rule in (22b) also operates on a verb like *taberu* 'eat' in (28), and gives rise to corresponding topicalized verbs in (29a, b) which are responsible for (25a, and b), respectively.

(28) taberu: $\begin{bmatrix} \text{HEAD} & verb \\ \text{SUBCAT} & \langle \text{NP-ga, NP-o} \rangle \end{bmatrix}$

(29) a. taberu: $\begin{bmatrix} \text{HEAD} & verb \\ \text{SUBCAT} & \langle \text{NP-ga, } \boxed{1}\text{ NP-wa}\,[\text{FOC}\,\{\boxed{1}\}] \rangle \end{bmatrix}$ b. taberu: $\begin{bmatrix} \text{HEAD} & verb \\ \text{TOPIC} & \langle \boxed{1}\text{ NP-wa}\,[\text{LINK}\,\{\boxed{1}\}] \rangle \\ \text{SUBCAT} & \langle \text{NP-ga, } \boxed{2}\text{ NP-wa}\,[\text{FOC}\,\{\boxed{2}\}] \rangle \end{bmatrix}$

Notice that the two rules in (22) are applied to (29b). Since the output of the topicalization rules are still lexical items, it is reasonable to expect that other lexical rules are able to apply to the output. This is the reason why multiple elements within the sentence can be marked with NRF. It is also notice (22a) are not multiply applied to the output since topic addition is regulated by the single item of TOPIC.

Now let us see how focus is projected in the following tree:[12]

(30) a.

b.
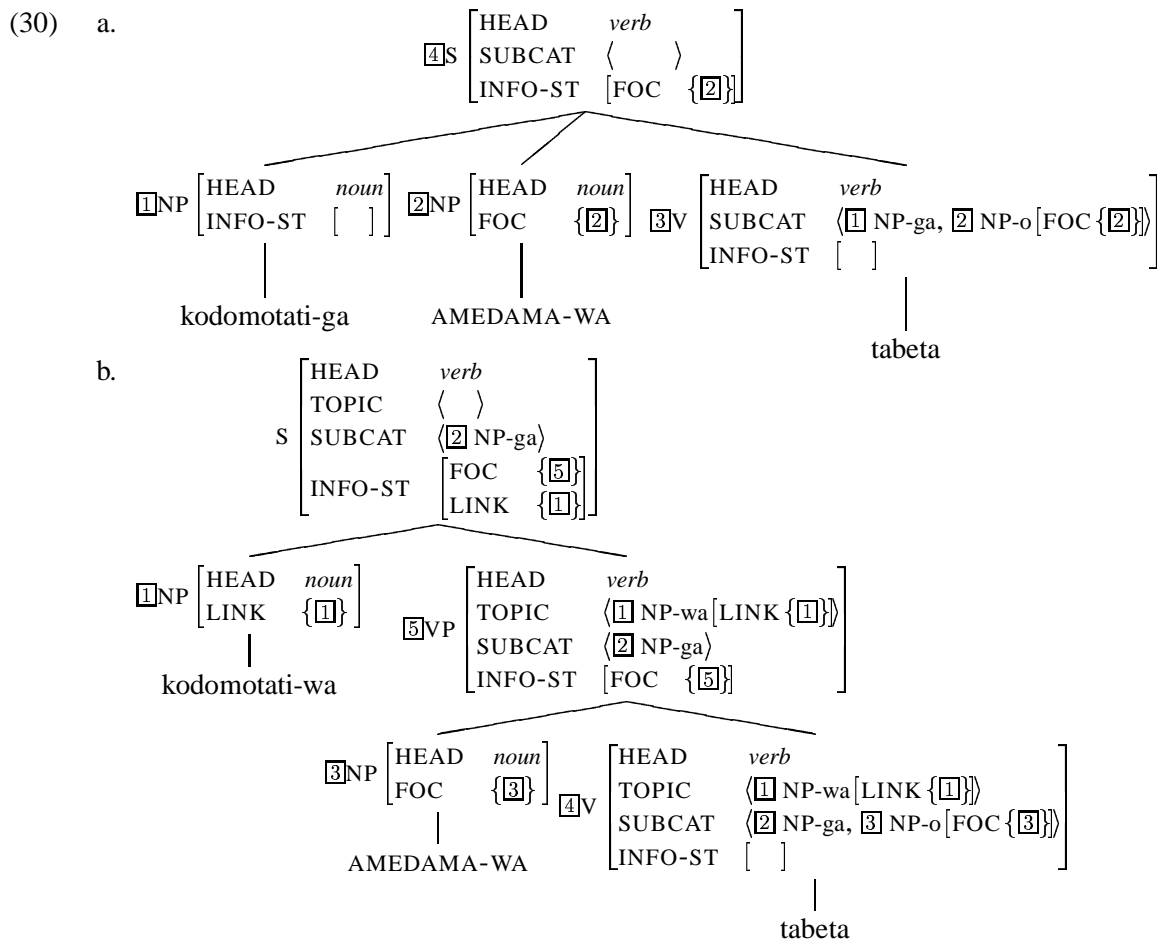
In (30a, b), the object NP AMEDAMA-WA is focused not only morphologically (*wa*-marking) but also phonologically (A-accent). This is sufficient to identify the informational contribution of such a NP as *focus*. Consequently two options are available within the principle in (16): (i) accounts for instructions with narrow focus in (25a): it requires a mother to inherit the INFO-ST value of its daughters, as represented by the structure-sharing using $\boxed{2}$ in (30a). (ii) accounts for instructions with wide focus in (25a): it allows a given phrase to be interpreted as focused, if its the most oblique daughter is focused (and, therefore, has its FOCUS value instantiated as specified by $\boxed{5}$ in (30a).

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[12]As shown in (30b), SUBCAT list is unsaturated since additional topic phrase does not cancel off the (logical) subject. We think this is a right prediction because topic sentences allow a resumptive pronoun which may cause cancellation, whereas NRF sentences do not. See Hoji (1985). The relation between topic element and unrealized element is the matter of pragmatics.

3.2.2 GA

The nominative case particle *ga* is often associated with new information and focus. We determine focus by utilizing question-answer pairs following Erteshik-Shir's (1997) work, and then show that there are at least two usages of particle *ga* i.e., restrictive focus (RF) and all focus.

However this ambiguity of *ga* is not always present. If the predicate is individual-level predicate (Kuroda, 1965) or stative predicate (Kuno, 1973), *ga*-marked subject can only be interpreted as RF:

(31) Speaker A: Who is smart?

      Speaker B: [$_{foc}$ Ken-ga]   kasikoi.   (Of all the people salient at this point in the discourse,)
                   Ken-NOM smart   'It is (only) Ken who is smart.'

Extensive past study also reveals that sentence-initial *ga*-marked phrase is the realization of focus. The so-called multiple nominative construction exemplified by (32) is one of these phenomena:[13]

(32) Speaker A: Who is it whose father is a teacher?

      Speaker B: [$_{foc}$ Ken-ga]   titioya-ga   sensee-da.
                   Ken-NOM father-NOM father-COP   'It is (only) Ken whose father is a teacher.'

The evidence that the sentence-initial *ga*-marked phrase is solely a focus comes from several phenomena. One obvious point we can observe here is that only the first *ga*-marked phrase can be wh–questioned as in (33a) while the second one cannot as in (33b).

(33) a. Dare-ga titioya-ga sensee-desu-ka?   b. * Ken-ga   dare-ga   sensee-desu-ka?
       WH-NOM father-NOM teacher-COP -Q   Ken-NOM WH-NOM teacher-COP -Q
       '(lit.) Who is it whose father is a teacher?   (lit.) Ken's 'who' is a teacher?'

As shown in (34), the second *ga*-marked phrase cannot be a focus.

(34) Speaker A: What did the children eat?

      Speaker B: [$_{foc}$ Amedama-*o*] kodomotati-*ga* tabe-ta.
               candy-ACC   children-NOM eat-PAST
               'It is (only) the candy which the children ate'

(34) also suggests that the sentence-initial *o*-marked phrase receives focus interpretation.

Given the examinations and observations here, it seems that the particle *ga* has two functions; in addition to its nominative case marker function, it serves as a focus marker. We thus suggest that there are at least three realizations of *ga* as following:

(35) a. $\begin{bmatrix} \text{ACCENT} & U \\ \text{HEAD} & nom \\ \text{INFO-ST} & [\quad] \end{bmatrix}$ b. $\boxed{1}\begin{bmatrix} \text{ACCENT} & A \vee U \\ \text{MARKING} & ga \\ \text{SPEC} & \langle[\text{TOPIC } X]\rangle \\ \text{FOC} & \{\boxed{1}\} \end{bmatrix}$ c. $\boxed{1}\begin{bmatrix} \text{ACCENT} & A \\ \text{FOC} & \{\boxed{1}\} \end{bmatrix}$

(35a) only specifies the nominative value of the head. The second unmarked *ga*-marked phrase in (32), (33) and (34) are constrained by (35a). The sentence-initial *ga*-marked phrase in (31) and (32) has obligatory RF interpretation whether it is A-accented or not. It is noteworthy that the subject *Ken* without the particle *ga* as shown in (36a) and (36b) is surely worse that the case of unaccusative in (36c):

(36) a. *Ken-ϕ kasikoi.   b. *Ken-ϕ titioya-ga sensee-da.   c. Kodomotatiϕ kaettekita.

These characteristics are described with the value of FOC, the disjunctive specification of the accent value, the value of MARKING, and value of SPEC X which is not the type *nil*(= $\langle\rangle$)[14] in (35b).

Like English, accented constituents in Japanese are also interpreted as *foci*. (35c) is the constraint for RF, as in (10).

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[13]There are several type of multiple nominative construction that we do not discuss in this paper.

[14]This does not mean the unification failure to the type, but the inequality to the type.

Now, we consider how the constraints in (35) interact with the other constraints in HPSG.

To begin with (35a). There is no need to go into details about it. It is a constraint for an ordinary nominative marked NP, which is not positively related to the instantiation of information structure, and is only subcategorized by the head, like a verb.

Next, (35b) is for the sentence-initial *ga*-marked phrase which is often analyzed as the subject even if it appears multiply. In Section 3.2.1, we have formalized the constraint on topic which if present appears in sentence-initial position. Let us see the ordering of RF and topic exemplified by (37):

(37) a. [$_{top}$ JR-wa] [$_{foc}$ tokkyuu-ga]   untin-ga   yasu-i.
         JR-TOP   superexpress-NOM fare-NOM low-PRES

         'As for JR, it is the superexpress whose fare is low. '

      b. * [$_{foc}$ JR-ga]   tokkyuu-wa   untin-ga   yasu-i.
             JR-NOM superexpress-TOP fare-NOM low-PRES

         *'It is JR, as for the superexpress, whose fare is low. '

(37) show that RF follows topic. Individual-level predicate subcategorizes for the RF phrases.

To account these phenomena, we assume the following rules to construct well-formed phrases.

(38) a. $\begin{bmatrix} \text{HEAD } verb \end{bmatrix} \rightarrow \begin{bmatrix} \text{HEAD} & verb \\ \text{SPR} & \langle \text{NP-ga}, \dots \rangle \end{bmatrix}$ b. $\begin{bmatrix} \text{TOPIC} & \boxed{3} \\ \text{FOCUS} & \boxed{2} \\ \text{SPR} & \boxed{5} \end{bmatrix} \rightarrow \boxed{4}\begin{bmatrix} \text{SPEC} & \langle \boxed{1} \rangle \\ \text{FOCUS} & \boxed{2} \end{bmatrix}, \boxed{1}\begin{bmatrix} \text{TOPIC} & \boxed{3} \\ \text{SPR} & \langle \boxed{4} \mid \boxed{5} \rangle \end{bmatrix}$

Lexical rule (38a) introduces multiple *ga*-marked phrases. Note that in (38b), the focus of the mother is identical not to the head daughter's one, but to the specifier daughter's one. This ensures that only the last adjunction becomes the focus of the whole sentence. (39) shows the structure of (37).

(39)
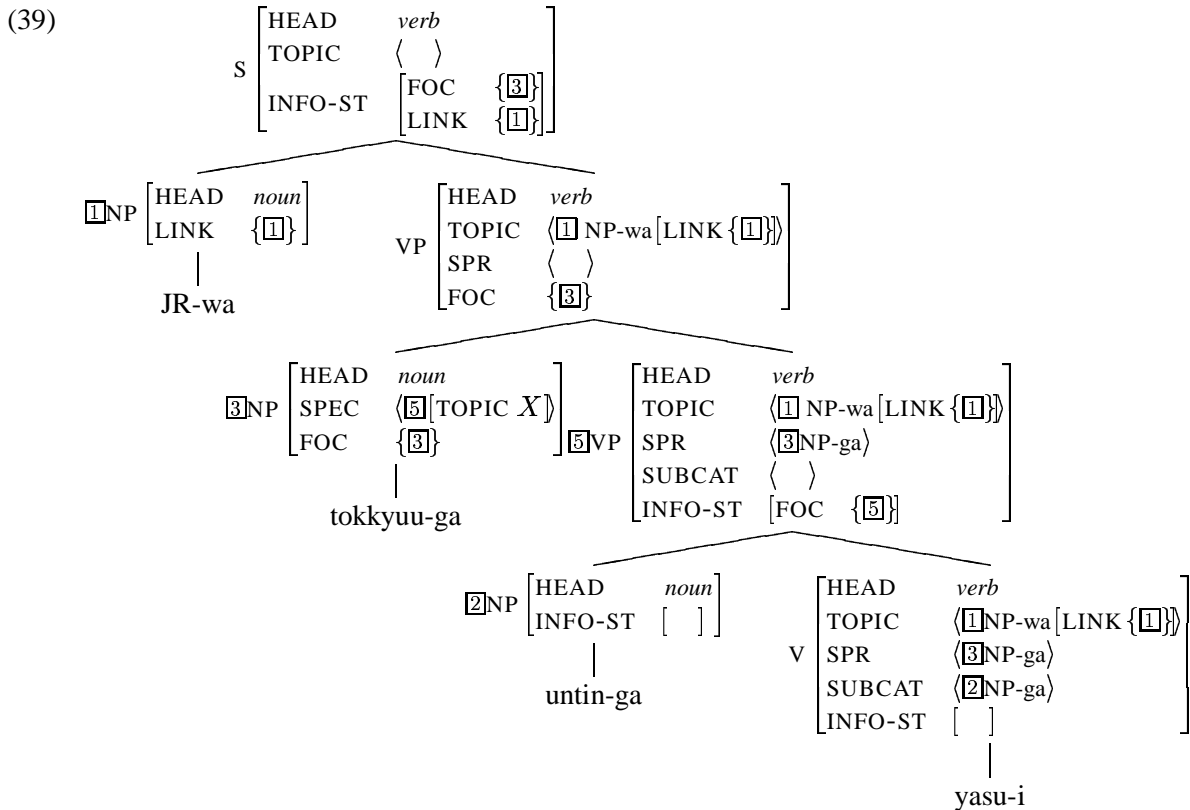
Note that *JR-wa* and *tokkyuu-ga* cannot be scrambled because of the constraints on the topic feature (X) within the SPEC feature of *JR-wa*.

Finally, let us see the issues on the so-called focus projection, where information structure interacts with phonology by means of (35c). However it is not sufficient to constrain the projection.

It is well known that an A-accent on the external argument in English cannot project the focus value up to the mother. Japanese also shows such a sensitivity as shown in below:

(40) Speaker A : What happened?

Speaker B$_1$: #[$_{foc}$ KODOMOTATI-GA] utat-ta.   'The children sang.'
children-NOM   sing-PAST

Speaker B$_2$: #[$_{foc}$ KODOMOTATI-GA] amedama-o tabe-ta.   'The children ate the candy.'
children-NOM   candy-ACC eat-PAST

Speaker B$_3$: [$_{foc}$[$_{foc}$ KODOMOTATI-GA] kaette-ki-ta].   'The children returned.'
children-NOM   return-come-PAST

The A-accent on the subject *kodomotati* on unergative verb in (40B$_1$) and transitive verb in (40B$_2$) cannot include a wide focus reading. This is confirmed by the unsuitability of the answer to an all-focus question in (40A). However focus on the subject of an unaccusative predicate like *kaettekuru* 'return' as in (40B$_2$) can be projected up to the mother.

This is not predicted by (16ii), repeated in (41a) below, so we revise it as (41b):

(41) a. if the most oblique DAUGHTER'S FOCUS is instantiated, then
the FOCUS of the mother is the *sign* itself.

b. the internal argument's FOCUS is instantiated, then
the FOCUS of the mother is the sign itself.

Though (41) captures the external/internal argument sensitivity, we will see a problem below:

(42) Speaker A : What did Ken do?

Speaker B$_1$: # Ken-wa   [$_{foc}$ KODOMOTATI-NI] amedama-o age-ta.
Ken-TOP   children-DAT   candy-ACC give-PAST

'Ken gave a candy to the CHILDREN.'

Speaker B$_2$: Ken-wa   [$_{foc}$ kodomotati-ni [$_{foc}$ AMEDAMA-O age-ta].
Ken-TOP   children-DAT   candy-ACC   give-PAST

'Ken gave a CANDY to the children.'

The position of an *o*-marked phrase and its interaction with possible domains of focus pose a problem. If we adopt the principle of (41b), these sentences should have the same possible focus domains: the *o*-marked phrase and its mother, VP. However, (42B$_1$) does not have an VP focus interpretation while (42B$_2$) does. (42B$_1$) cannot be a faithful representation of a VP-focus question like (42A) whereas (42B$_2$) can. Focus can only project wide from the object *amedama* as in (42B$_2$).

Even in scrambled examples like those in (43), this condition holds: it is only when the object *amedama* is focused that the VP can receive the wide focus reading.

(43) Speaker B$_1$: # Ken-wa   [$_{foc}$ amedama-o KODOMOTATI-NI age-ta.
Ken-TOP   candy-ACC children-DAT   give-PAST

Speaker B$_2$: Ken-wa   [$_{foc}$ AMEDAMA-O kodomotati-ni age-ta.
Ken-TOP   candy-ACC   children-DAT give-PAST

This is rather unexpected, considering the generally free constituent order properties of the language. However, (41b) requires only a minor revision:

(44) the most oblique internal argument's FOCUS is instantiated, then
the FOCUS of the mother is the sign itself.

Note that (44) is defined for Japanese. *ageta* 'gave' will look like the following:

(45) $\begin{bmatrix} \text{SUBCAT} & \langle \text{NP}[\text{EXT}], \text{NP}[\text{INT1}], \text{PP}[\text{INT2}] \rangle \end{bmatrix}$

Though the first NP is the most oblique argument, it cannot allow focus projection since it is an external argument. The most oblique internal argument is the Theme NP, thus allowing wide focus. However the Goal PP cannot induce wide focus since it is not the most oblique argument regardless of its syntactic positions.

The only difference form English is that it is the most oblique but not the least oblique.

4 Conclusion

This study has shown constraint-based analysis on so-called information structures in Japanese. Based on the examination of the distribution of topic/focus particles, we demonstrated how the focus-ground articulation for the mother may be computed from the articulation provided by the daughter constituents by means of the various constraint on syntax and phonology.

Acknowledgements

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