



**Verb***mobil*  
Verbundvorhaben

# Japanese Particles in an HPSG Grammar

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## Contents

<b>1</b>	<b>Introduction</b>	<b>1</b>
<b>2</b>	<b>The Japanese Particles</b>	<b>2</b>
2.1	<i>ga</i> . . . . .	2
2.2	<i>o</i> . . . . .	4
2.3	<i>ni</i> . . . . .	6
2.4	<i>de</i> . . . . .	7
2.5	<i>e</i> . . . . .	8
2.6	<i>kara, made, naNka</i> . . . . .	8
2.7	<i>no</i> . . . . .	9
2.8	<i>wa</i> . . . . .	10
2.9	<i>mo, koso</i> . . . . .	11
2.10	<i>to</i> . . . . .	11
2.11	Cooccurrence of particles . . . . .	12
<b>3</b>	<b>The Type Hierarchy of Japanese Particles</b>	<b>14</b>
<b>4</b>	<b>Case Particles</b>	<b>16</b>
<b>5</b>	<b>Modifying Particles</b>	<b>22</b>
5.1	Verb Modifying Particles . . . . .	23
5.1.1	Postpositions . . . . .	23
5.1.2	Adverbial Particles . . . . .	23
5.2	The Noun Modifying Particle <i>NO</i> . . . . .	25
5.3	The Utterance Modifying Particle <i>to</i> . . . . .	25
5.4	Particles of Topicalization . . . . .	26
5.4.1	Topic- <i>wa</i> . . . . .	26
5.4.2	Other topic particles . . . . .	27
<b>6</b>	<b>Omitted Particles</b>	<b>28</b>
<b>7</b>	<b>Exhaustivization</b>	<b>30</b>
<b>8</b>	<b>Conclusion</b>	<b>31</b>

## 1 Introduction

In Japanese, case markers and other particles occur after the phrases they mark. Particles can have various functions:

- Case particles mark subcategorized verbal arguments.
- Postpositions mark adjuncts and have semantic attributes.
- Topic particles mark topic or topicalized verbal adjuncts.
- *no* marks an attributive nominal adjunct.

A comprehensive investigation of Japanese particle was missing up to now. General implications were set up without the fact that a comprehensive analysis was carried out. [PS94] mention a manuscript that was written by Tomabechi in 1989 that seems not to be available any more. Two kinds of solutions have previously been proposed: (1) The particles are divided into case particles and postpositions. The latter build the heads of their phrases, while the former do not (cf. [Miy86]). (2) All kinds of particles build the head of their phrases (cf. [Gun87]). Both kinds of analyses lead to problems: If postpositions are heads, while case particles are nonheads, a sufficient treatment of those cases where two or three particles occur sequentially is not possible, as we will show. If on the other hand there is no distinction of particles, it is not possible to encode their different behaviour in subcategorization and modification.

We offer a lexicalist treatment of the problem. Instead of assuming different phrase structure rules we state a type hierarchy of Japanese particles. This makes a uniform treatment of phrase structure as well as a differentiation of subcategorization patterns possible.

Our analysis is based on a large amount of dialogue data. 800 Japanese dialogues concerning appointment scheduling were collected and transcribed in the Verbmobil project, which deals with English, German and Japanese machine translation<sup>1</sup>. These are the basis for the development of the Japanese syntax in Verbmobil. The HPSG<sup>2</sup> syntax that is described in this paper is used for the deep analysis of Japanese dialogues in the project. We clarify the questions which common characteristics and differences between the individual particles exist. A classification in categories was carried out. After that a model hierarchy could be set up for an HPSG grammar. The simple distinction into case particles and postpositions was proved to be as not sufficient.

## 2 The Japanese Particles

### 2.1 *ga*

In most cases the *ga*-marked noun phrase is the subject of the sentence:

- |     |       |       |    |          |        |     |
|-----|-------|-------|----|----------|--------|-----|
| (1) | naN   | nichi | ga | yoroshii | deshou | ka  |
|     | which | day   | GA | good     | COP    | QUE |
- (Which day would suit you?)

However, this is not always the case. Notably stative verbs subcategorize for *ga*-marked objects. An example is the stative verb *dekimasu*:

- |     |        |    |          |    |          |
|-----|--------|----|----------|----|----------|
| (2) | kanojo | ga | oyogi    | ga | dekimasu |
|     | she    | GA | swimming | GA | can      |
- (She can swim.)

These and other cases are sometimes called ‘double-subject constructions’ in the literature. But these *ga*-marked noun phrases do not behave like subjects. They

<sup>1</sup>see [Wah97] for further information

<sup>2</sup>[PS94]

are not subject to restrictions on subject honorification or reflexive binding. This can be shown by the following example:

- (3) gogo            no        hou    ga        yukkuri    hanashi    ga        dekimasu  
 afternoon    NO        side    GA        at ease    talking    GA        can  
 ne  
 SAP

(We can talk at ease in the afternoon.)

*hanashi* does not meet the semantic restriction [+animate] stated by the verb *dekimasu* for its subject. Nor is it constrained by subject honorification or subject binding of *jibun* in the following variants:

- (4) watashi        ga        yukkuri    hanashi    ga        dekite-orimasu  
 I                GA        at ease    talking    GA        can-HON

(I can talk at ease.)

The honorification of *dekite-orimasu* does not refer to *hanashi*, but to *watashi*.

- (5) jibun        ga        yukkuri    hanashi    ga        dekimasu  
 self         GA        at ease    talking    GA        can

(? can talk at ease.)

The antecedent of *jibun* in 5) is outside of the sentence.

There are even *ga*-marked adjuncts, as in example 3) and the following:

- (6) itsu        ga        go-tsugou                            ga        yoroshii    deshou    ka  
 when        GA        HON-circumstances                GA        good        COP        QUE

(When does it suit you?)

The first NP-*ga* in these examples (3 and 6) is not a subject. It is not subcategorized for by the verb. It is the interrogative word in 6) that is marked by *ga*. *dekimasu* in 3) subcategorizes for two *ga*-marked NPs, but *gogo no hou ga* can neither be the subject nor the object, as it does not fulfill the semantic restrictions for these. [Kur92] assumes these 'double-subject constructions' to be derived from genitive relations. This means that the following sentence from [Far84] is derived from one with a *no*-marked NP:

- (7) yama            ga        ki        ga        kirei        desu  
 mountain        GA        tree    GA        pretty    COP

(The mountains: Their trees are pretty.)

- (8) yama            no        ki        ga        kirei        desu  
 mountain        NO        tree    GA        pretty    COP

(The mountain's trees are pretty.)

But this analysis seems not to be true for example 3), because the following sentence is wrong:

- (9) \*gogo no hou no yukkuri hanashi ga dekimasu  
 afternoon NO side GA at ease talk GA can  
 ne  
 SAP

*ga* marks a verbal adjunct in this example.

To summarize, *ga* is a case particle that usually marks the sentence subject. Sometimes the object is marked by *ga*. This means that the grammatical function is not allocated by the case particle, but by the verbal valence. In some cases *ga* can even mark an adjunct.

## 2.2 *o*

The case particle *o* normally marks the direct object of the sentence:

- (10) Sawada no hou ga zasshi no intabyuu o  
 PN NO side GA journal NO interview O  
 ukemasu node  
 give SAP

(Sawada gives an interview to a journal.)

In contrast to *ga*, no two complements may be marked by *o*. This restriction is called 'Double-*o*-Constraint' in research literature (see, for example, [Tsu96]:249ff.). Consider the following examples from the Verbmobil corpus:

- (11) koNdou ni mo saido kakuniN o shite mimasu  
 PN NI too again confirmation O do try  
 keredomo  
 SAP

(I will confirm (it) with Mrs. Kondou again.)

- (12) koNdou no sukejuuru o kakuniN itashimasu  
 PN NO plan O confirmation HON-do

(I confirm Mrs Kondou's schedule.)

*suru* can occur with an *o* marked argument or with an unmarked argument. The argument *kakuniN* is marked with *o* in 11) and not marked in 12). The marking in 12) would not be possible, according to the 'double-*o* constraint', because there is already an *o*-marked argument in the sentence:

- (13) \*koNdou no sukejuuru o kakuniN o itashimasu  
 PN NO schedule O confirmation O tun

The restriction is not valid for embedded sentences:

- (14) koNdou keNkyuushitsu no hou de jitsueN o  
 PN institute NO side DE presentation O  
 suru to iu yotei o tatete iru N desu keredomo  
 do COMPL plan O built COP SAP

(There is a plan to perform the presentation at Mr Kondou's institute.)

Actually there are some violations of the restriction in the Verbmobil data corpus. Examples are:

- (15) kyou o-deNwa shita no wa (P) (h) /eto/ hoN  
today telephone did NO WA (P) (h) /eto/ book  
o shuppaN suru tame ni (P) sono geNkou o  
O publication tun because (P) that manuscript O  
itsu (P) kou issho ni uchiawase o shitara  
when (P) so joint NI appointment O do(Kond)  
yoroshii ka to iu koto de (P) o-deNwa  
good QUE COMPL NOM DE (P) telephone  
sashite itadaita N desu keredomo  
do HON COP SAP

(This is the reason, why I am calling today: When would it suit you to have a joint discussion of that manuscript?)

- (16) uchi no satou ga (P) /ano/ gakkaiishi no  
we NO PN GA (P) /ano/ academic journal NO  
tokushuu no shuppitsu keikaku o koNdou  
special edition NO article timetable O (P) (h) PN  
seNsei to uchiawase o shitai to moushite  
Prof. with appointment O want to do TO say  
orimashita keredomo  
AUX-Past SAP

(Our Mr. Satou said that he would like to agree upon an appointment to discuss the timetable for the article in the special edition of the academic journal.)

But these examples were described as not acceptable by Japanese native speakers. They are very complex. In both cases there are pauses between the *o* marked entities. The *o* marked nominal phrases *sono geNkou* and *gakkaiishi no tokushuu no shuppitsu keikaku* are not subcategorized by *uchiawase*. The examples become acceptable if one replaces *o* with *nitsuite* and thus marks the NPs as adjuncts. These exceptions of the 'double-*o*-constraint' are therefore rare effects of spoken language and shall not be introduced into the grammar.

Object positions with *o*-marking as well as subject positions with *ga*-marking can be saturated only once. There are neither double subjects nor double objects. It will be shown that this restriction is also valid for indirect objects. Found arguments must be assigned a saturated status in the subcategorization frame, so that they cannot be saturated again (as in German and English). The verbs subcategorize for at most one subject, object and indirect object. Only one of these arguments may be marked by *o*, while a subject and an object may both be marked by *ga*. These attributes are determined by the verbal valency.

The *o*-marked argument is not adjacent to the verb<sup>3</sup>. It is possible to reverse NP-*ga* and NP-*o* as well as to insert adjuncts between the arguments and the verb:

<sup>3</sup>For the notion of adjacency see [Gun91]

- (17) ikeN koukaN o shimazu no hou ga sashite  
 opinion exchange O PN NO side GA do  
 itadakitai to iu koto de o-deNwa sasete itadakimashita  
 HON-want COMPL NOM DE telephone do-HON-Past  
 (I've called today because Mr Shimazu would like to exchange opinions (with you))
- (18) paneru disukasshoN o koNdo okonau N desu kedomo  
 panel discussion O next time perform COP SAP  
 (Next time we will perform a panel discussion)

### 2.3 *ni*

The particle *ni* can have the function of a case particle as well as that of an adjunct particle modifying the predicate. [SK95] also identify homophonous *ni* that can mark adjuncts or complements. They use the notion of 'affectedness' to distinguish them. This is however not useful in our domain. [Ono94] suggest to test the possibility of passivization. This is helpful in many cases.

Some verbs subcategorize for a *ni*-marked object, as for example *naru*:

- (19) raigetsu ni naru N desu ga  
 next month NI become COP SAP  
 (It will become next month.)

As *ga*-marked subjects and *o*-marked objects *ni*-marked objects cannot occur twice in the same clause. The 'double-o constraint' is neither a specific Japanese restriction nor a specific peculiarity of the Japanese direct object. It is based on the wrong assumption that grammatical functions are assigned by case particles.

There are a lot of examples with double NP-*ni*. But these are adjuncts, as in the following one:

- (20) juuji ni keNkyuushitsu no hou ni o-ukagai  
 10 o'clock NI institute NO side NI come  
 itashimasu  
 AUX-HON  
 (I'll come to your institute at 10 o'clock.)

*ni* as a modifying particle can be found very often in temporal or locative expressions in the Verbmobil data.

- (21) saNji ni kaigi ga owarimasu  
 3 o'clock NI meeting GA end  
 (The meeting ends at three o'clock.)
- (22) watakushi ga sochira no keNkyuushitsu ni ukagawanai  
 I GA you NO institute NI not visit  
 to ikenai to omoimasu ga  
 TO must not do TO think SAP  
 (I think I'll have to come to your institute.)



2.4 *de*

*de* can be a verb modifying particle. It has a temporal, locative or instrumental meaning. The temporal meaning of *de* is restricted to stative verbs:

- (23) asa            juuji            gurai    kara        juuniji        made    no  
 morning    10 o'clock    ca.    KARA    12 o'clock    MADE    NO  
 aida        de        yaritai    to        omou    N desu    keredomo  
 interval    DE        want to do    TO        think    COP        SAP  
 ikaga    deshou    ka  
 good    COP        QUE

(I would like to do it between 10 and 12 o'clock in the morning. Would that suit you?)

The locative usage of *de* is non-directional:

- (24) keNkyuushitsu    de    jikkeN        no    jitsueN        o    shitai  
 institute            DE    experiment    NO    performance    O    want to do  
 N desu    keredomo  
 COP        SAP

(I would like to perform the experiment in the institute.)

An example for the instrumental usage is:

- (25) basu    de    kimasu  
 bus        DE    come

(I'll come by bus.)

*de* is not described as a case particle in literature on this subject. For example [Tsu96] assigns the particle to the class of postpositions. There are, however, examples in the Verbmobil-corpus that show that *de* can also mark verbal arguments:

- (26) Nouchi    seNsei    de    gozaimasu    ka  
 PN            Prof.    DE    HON-be        QUE

(Are you Professor Nouchi?)

- (27) ichiji            kara        saNji        gurai    no    aida        de  
 1 o'clock        KARA    3o'clock    ca.        NO    interval    DE  
 ikaga    deshou    ka  
 good    COP        QUE

(Would it suit you from one o'clock to three o'clock?)

The verb *irasshaimasu* can take a *de*-marked subject. Constructions with adjectival and copula also very often occur with a *de*-marked subject. The verb *aru* can also take a *de*-marked argument, but it is the object in this case. The meaning of such a construction is honorific: sentences with a *de*-marked argument signal subject honorification.

This indicates that *de* should also be treated as an ambiguous particle.

## 2.5 *e*

*e* is a non-ambiguous particle. It is verb modifying and has a directional function cooccurring with verbs of movement. *e* shares this function with *ni*:

- (28) ku ji            ni/\*e        sochira    ni/e        ukagaimasu  
 9 o'clock    NI/\*E       you        NI/E       go  
 (I'll come to you at 9 o'clock.)

## 2.6 *kara, made, naNka*

The postpositions *kara* and *made* mark verb modifying adjuncts. These are - as far as the Verbmobil data is concerned - mainly temporal and locative expressions:

- (29) seNsei    no    o uchi        kara    tooi    node    o hiru  
 Prof.    NO    HON-home    KARA    far    because    HON-noon  
 kara    ni    shimashou    ka  
 KARA    NI    shall do    QUE  
 (Shall we start from noon, because it's far from your home?)

Time periods are realized with *kara ... made*:

- (30) kaigi        ga    asa    no    juuichiji    kara    hiru    no  
 meeting    GA    a.m.    NO    11 o'clock    KARA    p.m.    NO  
 ichiji        made    arimasu    keredomo  
 1 o'clock    MADE    exist    SAP  
 (There is a meeting from 11 a.m. to 1 p.m.)

*kara* as well as *made* can be complements of *desu*:

- (31) saNji        kara    desu    ka  
 3 o'clock    KARA    COP    QUE  
 (Does it start at three?)

*kara* and *made* are non-ambiguous modifying particles, as *e* is. I will call them 'postpositions'. They subcategorize for nominal phrases. Another particle in this category is *naNka*. This word has one function as an adverb and one as a postposition. The postposition *naNka* marks a verb modifying adjunct. An example is:

- (32) gogo            naNka        o-jikaN        yoroshii    deshou    ka  
 afternoon    NANKA       HON-time    good        COP        QUE  
 (Would the time in the afternoon be good for you?)

Further postpositions are *to-shite* and *to-shimashite*.

2.7 *no*

*no* is a particle that modifies nominal phrases. This is an attributive modification and has a wide range of meanings, as the following examples indicate:<sup>4</sup>

- (33) hoka        no        hi  
 another    NO        day  
 (another day)
- (34) tsugi      no        hi  
 next        NO        day  
 (next day)
- (35) watakushi    no        keNkyuushitsu  
 I                NO        institute  
 (my institute)
- (36) niyuukunichi    no        gozenchuu  
 29th.                NO        afternoon  
 (the afternoon of the 29th.)
- (37) kyouto      daigaku      no        kawamura  
 Kyoto        university    NO        PN  
 (Kawamura of Kyoto university)

[Tsu96]:134ff. assigns *no* to the class of case particles. However, the criteria he sets up to distinguish between case particles and postpositions do not apply to this classification of *no*:

- Tsujimura's postpositions have their own semantic meaning. Case particles have a functional meaning. *no* however has a semantic, namely attributive meaning.
- Tsujimura's postpositions are obligatory in spoken language, case particles are optional. *no* is as obligatory as *kara* and *made*.
- Case particles can - as Tsujimura states - follow postpositions, but postpositions cannot follow case particles. According to this criterion, *no* behaves like a case particle.

*no* combines qualities of case particles with those of modifying particles (which Tsujimura calls 'postpositions'). This means that a special treatment of this particle is necessary.

The particle *no* subcategorizes for a noun, as the other particles do. It also modifies a noun. This separates it from the other modifying particles. NP-*no* is an adjunct to a nominal phrase. As a result, the analysis of multiple NP-*no* is possible:

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<sup>4</sup>See also [TH96]

- (38) seNsei no hou no daigaku no keNkyuushitsu  
 Prof. NO side NO university NO institute  
 ni ukagaeba ii N desu ne  
 NI go (COND.) good COP SAP

(It would be good to come to your institute, wouldn't it?)

Besides the function of a particle, the word *no* can also have the function of a nominalizer<sup>5</sup>. In this case, it subcategorizes for a verbal head and builds an NP (and can thus be followed by any particle):

- (39) o-deNwa sasete itadaita no wa koNdo no  
 HON-telephone do HON NOM WA next NO(PART)  
 koueNkai naN desu kedo  
 talk COP SAP

(I am calling because of the next talk.)

## 2.8 *wa*

The topic particle *wa* can mark arguments as well as adjuncts. In the case of argument marking it replaces the case particle (see example 40). In the case of adjunct marking it can replace the verb modifying particle (see example 41) or it can occur after it (see example 42):

- (40) gogo wa aite orimasu node  
 afternoon WA be free HON-AUX SAP

(The afternoon is free.)

- (41) nijuuuhachinichi no getsuyoubi wa kaigi ga gogo  
 28th NO Monday WA meeting GA afternoon  
 ni haitte orimasu  
 NI be inserted HON-AUX

(On Monday the 28th there is a meeting in the afternoon.)

- (42) koNgetsuchuu ni wa zehi o-ai shitai to omou  
 in this month NI WA certainly want to meet TO think  
 N desu ga  
 COP SAP

(I would certainly like to meet you within the month.)

The main problem in the syntactic analysis of *wa* is to decide whether the topic particle marks an argument or an adjunct, when it occurs without a verb modifying particle. This is difficult because of the optionality of verbal arguments in Japanese. If it marks an argument, it has to be decided which grammatical function this argument has. This problem can often not be solved on the purely syntactic level. Semantic restrictions for verbal arguments are necessary:

<sup>5</sup>See [Nig96] for a detailed description of this function of *no*

- (43) basho no hou wa dou shimashou ka  
 place NO side WA how shall do QUE  
 (How shall we resolve the problem of the place?)

Subject and object of the verb *shimashou* are suppressed in this example. The sentence can be interpreted as having a topic adjunct, but no surface subject and object, when using semantic restrictions for the subject (*agentive*) and the object (*situation*).

## 2.9 *mo, koso*

*mo* is similar to *wa* in some aspects. It can mark a predicative adjunct and can follow *de* and *ni*. But it can also follow *wa*, an adjective and a sentence with question mark:

- (44) gogo de mo kekkou desu  
 afternoon DE MO good COP  
 (It would also be good in the afternoon)

- (45) isogashii mo node ...  
 busy MO because ...  
 (Because I am busy...)

- (46) dekiru ka mo shiremaseN  
 can QUE MO do not know  
 (I don't know if I can)

*koso* is another topic particle that can occur after nouns, postpositions or adverbial particles.

## 2.10 *to*

*to* fulfills a series of extremely different tasks.

Firstly, *to* marks complement sentences that are subcategorized for by verbs like *omou*, *iu* or *kaku*. These complement sentences are adjacent:

- (47) sochira ni ukagaitai to omoimasu node  
 you NI visit TO think SAP  
 (I would like to visit you.)

- (48) sore no hou ga ii to omoimasu  
 that NO side GA good TO think  
 (I think that would be better.)

Secondly, there are intransitive verbs that only subcategorize for the *to* argument:

- (49) uchiawase o shinai to ikemaseN ne  
 meeting WO do not TO not go SAP  
 (We have to meet.)

The complement sentence is an utterance that can be marked with sentence particles:

- (50) sorosoro uchiawase o shiyou ka to omou  
soon meeting WO let's do QUE TO think  
no desu ga  
NOM COP SAP

(I think we should soon arrange a meeting.)

Other verbs subcategorize for a *to* marked object:

- (51) kono hi mo chotto hito to au yotei  
that day too somewhat people TO meet plan  
ga gozaimasu  
GA exist

(That day too, there is a plan to meet some people.)

This object can be optional (as in example 51) or obligatory with verbs like *kuraberu*. The particle behaves like a case particle.

The fourth possibility is that *to* marks an adjunct to a predicate:

- (52) shimizu seNsei to teNjikai o go-issho sasete  
Shimizu Prof. TO exhibition WO together do  
itadaku  
HON

(I would like to organize an exhibition with Prof. Shimizu.)

In this case, the adjunct is a PN. But *to* can also mark utterances that are adjuncts to other utterances:

- (53) niyuukunichi desu to kaigi ga haitte orimasu  
29th COP TO meeting GA inserted HON

(If it is the 29th, I have a meeting.)

[Shi98] as well as [IG98] describe the relation as a conditional or temporal relation, and not as a conjunctive one.

*to* can finally be an NP conjunction (which will not be considered at the moment):

- (54) saNjuunichi to saNjuuichinichi wa chotto mou  
30th TO 31st WA somewhat already  
yotei ga haitte orimasu  
plan GA inserted HON

(On the 30th and 31st there are already plans inserted.)

## 2.11 Cooccurrence of particles

The discrimination of particles is motivated by their modificational behaviour and by the fact that a Japanese noun phrase can be modified by more than one particle at a time. We carried out an empirical analysis, based on our dialogue data and a questionnaire with Japanese native speakers<sup>6</sup>. Table 1 shows the possibilities for

<sup>6</sup>Thanks to Atsuko Shimada and Akira Shintani

cooccurrence of some particles.

left↓/right→	ga	wo	ni	de	e	kara	made	no	wa	mo	naNka
ga	-	-	-	-	-	-	-	-	-	-	-
wo	-	-	-	-	-	-	-	-	-	-	-
ni	+	+	+	+	-	-	-	-	+	+	-
de	+	+	+	+	-	-	-	+	+	+	-
e	+	+	+	+	-	-	-	+	+	+	-
kara	+	+	+	+	-	-	-	+	+	+	-
made	+	+	+	+	-	-	-	+	+	+	-
no	-	-	-	-	-	-	-	-	+	-	-
wa	-	-	-	-	-	-	-	-	-	+	-
mo	-	-	-	-	-	-	-	-	-	-	-
naNka	+	+	+	+	-	-	-	-	+	+	-

Table 1: Cooccurrence of Particles

*ga* can follow the particles *ni*, *de*, *e*, *kara*, *made* and *no*, but not *o* and *wa*. Concerning *ni* and *de*, it has to be said that they can be followed by *ga* only in their modifying function, but not in their case marking function:

- (55)    juuji            ni      ga      ikaga    deshou    ka  
           10 o'clock    NI    GA    good    COP      SAP  
           (Would 10 o'clock suit you?)

- (56)    \*raigetsu        ni      ga      naru  
           next month    NI    GA    become

The reason is obvious: *ga* in combination with another case marking particle would lead to a conflict concerning case marking.

*o* behaves like *ga*.

*ni* can follow *de*, *e*, *kara*, *made* and *no*. It cannot follow case particles. Here is an example for *kara-ni*:

- (57)    naNji            gurai      kara      ni      shimasu    ka  
           what time    about    KARA    NI    do            QUE  
           (At about what time shall we start?)

*de* also cannot follow case particles. It can follow verb modifying particles in its case marking function:

- (58)    saNji            gurai      kara      de      yoroshii    deshou    ka  
           3 o'clock    about.    KARA    DE    good      COP      QUE  
           (Would about 3 o'clock suit you?)

In their modifying function *de* and *ni* can follow postpositions, in their case marking function they can follow all kinds of verb modifying particles. It is even possible to have the cooccurrence of the case particle *de* (respectively *ni*) with its modifying counterpart:

- (59) Tokyo de de ikaga deshou ka  
Tokyo DE DE good COP QUE

(Would it suit you (to meet in) Tokyo?)

*kara* as well as *made* and *e* cannot follow any other particles. *no* can follow some modifying particles, such as *de*, *e*, *kara* and *made*, but not *ni*. *wa* cannot follow case particles or *mo*, but all other kinds of (analyzed) particles. *mo* behaves like *wa*, except that it can follow it.

In some case three particles occur in a row, as for example:

- (60) gojigoro made ni wa odeNwa sashiagemasu  
about 5 o'clock MADE NI WA telephone do  
node  
SAP

(I will phone you before about 5 o'clock.)

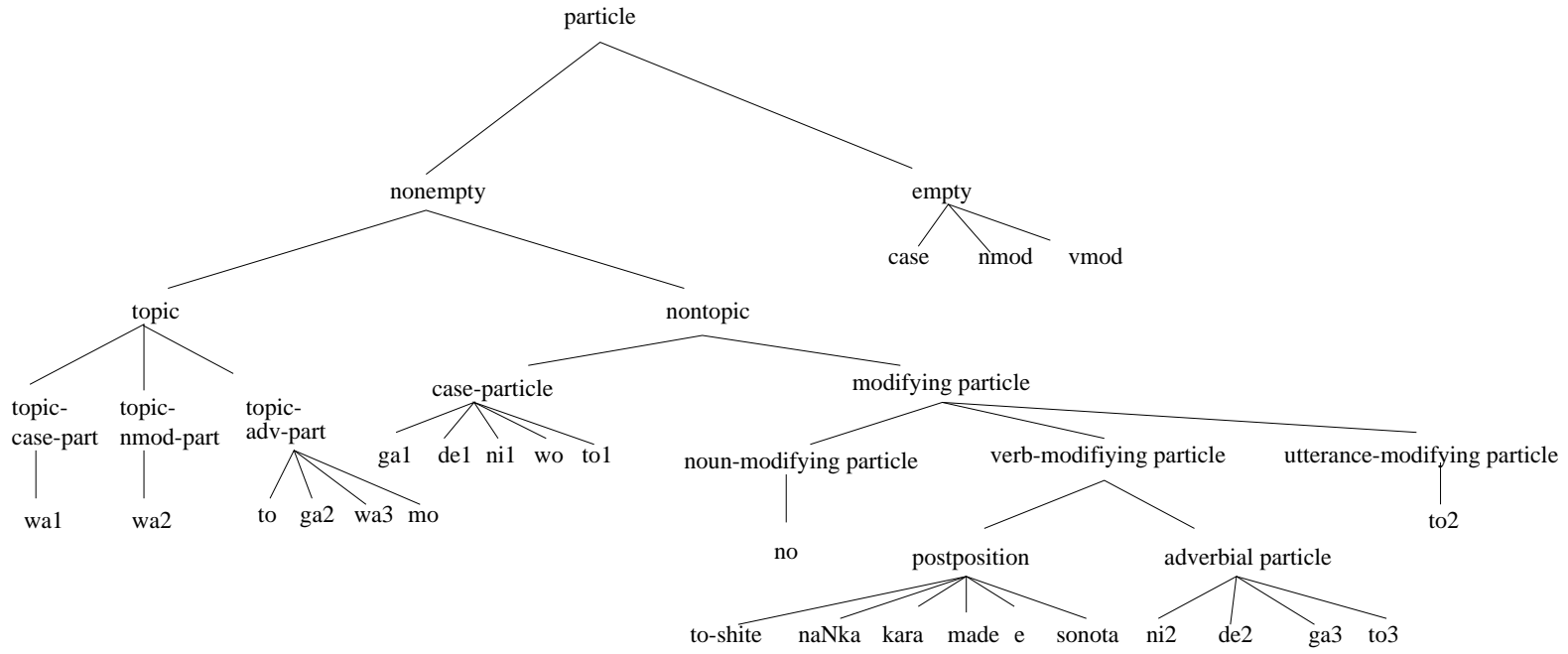
The reason is that *wa* can follow an adverbial particle *ni*. This again can follow a postposition. Another linearization like e.g. *made-wa-ni* or *ni-made-wa* would not be possible.

### 3 The Type Hierarchy of Japanese Particles

After considering the individual particles, it is now possible to set up a type hierarchy. We shall then feature the individual types of particles.

Firstly, the Japanese particles have to be divided into empty and nonempty particles. Nonempty particles are those with topic function and without topic function. Non-topic particles are further divided into case particles and modifying particles. Case particles receive an entry for case that makes it possible to be subcategorized for by the verbs. Modifying particles get an entry for MOD, specifying the head they can be adjuncts to. The modifying particles separate into noun modifying, verb modifying and utterance modifying ones. Verb modifying particles are postpositions and adverbial particles:





## 4 Case Particles

There is no number nor gender agreement between noun phrase and verb. The verbs assign case to the noun phrases. This is marked by the case particles. Therefore these have a syntactic function, but not a semantic one. Different from English the grammatical functions cannot be assigned through positions in the sentence or c-command-relations, since Japanese knows no fixed word position for verbal arguments. Hence, the following variations are possible, for example:

- (61) Hanako ga hon o kaimasu  
Hanako GA book O buy

- (62) hon o Hanako ga kaimasu  
book O Hanako GA buy

(Hanako buys a book.)

The assignment of the grammatical function is not achieved by the case particle alone but only in connection with the verbal valency. There are verbs that require *ga*-marked objects, while in most cases the *ga*-marked argument is the subject:

- (63) nantoka yotei ga toreru N desu ga  
somehow time GA can take COP SAP

(Somehow (I) can find some time.)

Japanese is described as a head-final language. [Gun87] therefore assumes only one phrase structure rule:  $M \rightarrow DH$ . However, research literature questions whether this also applies to nominal phrases and their case particles. [PS94]:45 also assume Japanese case particles to be markers.

[Miy86] has two arguments for the assumption that the NP is the head in a phrase NP+case particle. He first finds that a distinction between case particles and 'postpositions' is semantically necessary. The reason is that the case particles assign no  $\theta$ -role to the marked NPs. The second argument concerns the numeral classifiers. They can occur within or outside the NP+case particle (called 'NP' by Miyagawa) which they classify. But they cannot occur outside of an NP+'postposition' (called 'PP' by Miyagawa):

- (64) gakusei sannin ga hon o yoNda  
students 3-NK GA book O read(PAST)

(Exmpl. of [Miy86]: 162):

- (65) \*hito ga chiisai mura kara futatsu kita  
people GA small village from 2 come(PAST)

- (66) hito ga futatsu no chiisai mura kara kita  
people GA 2 NO small village from come(PAST)

(People came from two small villages.)

([Miy86]:157):

- (67) sensei      ga      sannin      kita  
 teacher    GA      3-CL      come(PAST)

(Three teachers came.)

The restriction that [Miy86]:162 sets up is based on phrase structure:

Definition: X is *bijacent* to NP, iff:

- X is a sister to NP, or
- X is immediately dominated by a sister of NP.

This restriction for numeral classifiers says that the classifier must be *bijacent* to the antecedent. Thus, every structure in which the antecedent of the numeral classifier is embedded in a PP is excluded.

*Bijacency* is however not a sufficient restriction for numeral classifiers, as the following example from [GH98] shows:

- (68) kyoneN      wa      Amerikajin      ga      Nihon      o      3,000-nin  
 last year    WA      Americans      GA      Japan      O      30.000 persons  
 otozureta  
 visit (PAST)

(Last year 30.000 Americans visited Japan.)

It is not possible to set up adequate restrictions on an (exclusively) syntactic base. The phrase-structural distinction between case marked nominal phrases and nominal phrases marked with modifying particles does not further help here. [GH98] show that instead of syntactic restrictions for numeral classifiers semantic ones should be used. They use the notions of measurability, coercion, contrastivity and incremental theme in order to explain the phenomena of connection of numeral classifiers and discover two conditions ([GH98]:71):

- a *Coercion* Coerced quantification caused by an adverbial measurement.
- b *Intervention* Intervention of an adverbially measurable NP in an NP-MP pair.

When both conditions are fulfilled, the sentence is assigned as not acceptable.

On the one hand, there are several reasons to distinguish case particles and modifying particles, as has been shown. On the other hand, I doubt whether it is necessary to assume different phrase structures for NP+case particle and NP+modifying particle.

[Yos97]:35 argues that Japanese case particles cannot function as heads, because they can be omitted in spoken language. Ellipsis would be universally seen as a criterion to divide heads and non-heads. However, the ellipsis of heads also often occurs in other languages, as for example in German:

- (69) Wen      hat      Klaus      geküßt?  
 whom      has      PN      kissed

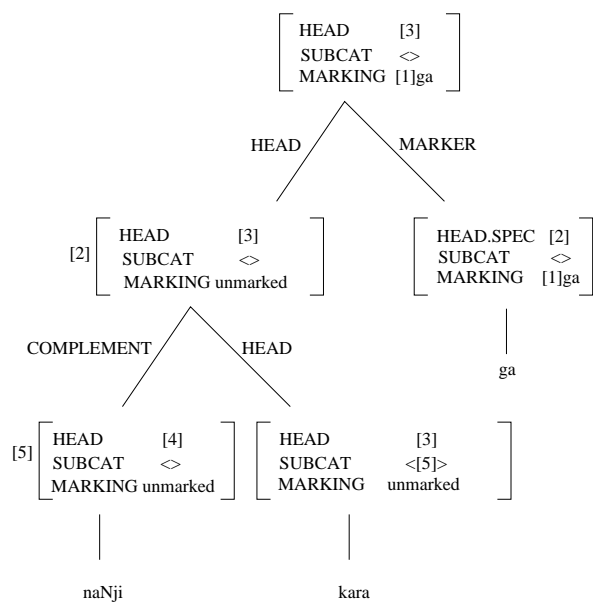
Maria  
 PN

(Who did Klaus Kiss? - Maria.)

The following example comes from the Verbmobil corpus:

- (70) naNji            kara    ga    yoroshii    desu    ka  
 what time    from    GA    good        COP    QUE  
 (At what time would you like to start?)

If one now assumes that the modifying particle *kara* is head of *naNji* as well as of the case particle *ga*, the following results for *naNji kara ga* with the head-marker structure described in [PS94]:<sup>7</sup>



The case particle *ga* would have to allow nouns and modifying particles in SPEC. The latter are however normally adjuncts that modify verbal projections, as the following example shows:

- (71) kochira    kara    seNsei    no    hou    no    keNkyuushitsu  
 we            from    professor    NO    side    NO    institute  
 ni    o-ukagai    suru    to iu    katachi    de    yoroshii  
 NI    HON-visit    do    COMPL    way    DE    good  
 deshou    ka  
 COP      QUE  
 (Would it suit you if we come to your institute?)

Therefore the head of *kara* entails the information that it can modify a verb. This information is inherited to the head of the whole phrase by the Head-Feature

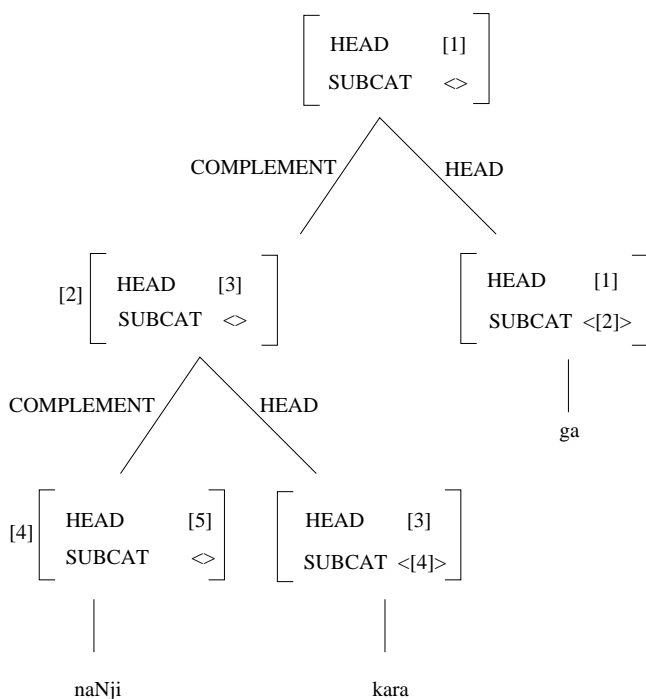
<sup>7</sup>The Marking Principle says: *In a headed phrase, the MARKING value is token-identical with that of the MARKER-DAUGHTER if any, and with that of the HEAD-DAUGHTER otherwise*[PS94].

Principle as is to be seen in the tree above.<sup>8</sup> As a result, this is also admitted as an adjunct to a verb, which leads to wrong analyses for the following sentences:

(72) \*naNji      kara      ga      sochira      ga      jikaN      ga      toremasu  
 what time    from      GA      you          GA      time      GA      can take  
 ka  
 QUE

(73) \*seminaa    GA      naNji          kara      ga      haitte      irasshaimasu  
 seminar    GA      what time    from      GA      inserted    AUX-HON  
 ka  
 ?

If, on the other hand, case particles and topic markers are heads, one receives a consistent and correct processing of this kind of example too. This is because the head information [MOD none] is given from the particle *ga* to the head of the phrase *naNji kara ga*. Thus this phrase is not admitted as an adjunct:



[PS94] describe english complementizers as markers. However, a problem results, if *to* is described as a marker. Let's have a look at the following sentence:

(74) sou      narimasu      to      daibu      saki      ni      natte shimau  
 so      become      TO      a lot      earlier      NI      become  
 N desu      ga  
 COP      SAP

<sup>8</sup>The Head Feature Principle says: *The HEAD value of any headed phrase is structure-shared with the HEAD value of the head daughter.*[PS94].

(If it is like this, it will be a lot earlier.)

The complement sentence *sou narimasu* cannot be adjunct to a sentence or a VP. Therefore its head contains the entry [MOD none]:

- (75) \*sou narimasu daibu saki ni natte shimau N desu  
 so become a lot earlier NI become COP  
 ga  
 SAP

The complement sentence with *to* – on the other hand – can modify a sentence, as example 74) shows. It must therefore have the information [MOD utterance] in his head. The modification could not be realized, if *to* would be marker and *sou narimasu* would be head. Thus, we view *to* as the head of its phrase<sup>9</sup>.

Instead of assuming different phrase structure rules, a distinction of the kinds of particles can be based on lexical types. HPSG offers the possibility to define a common type and to set up specifications for the different types of particles.

We assume Japanese to be head-final in this aspect also. All kinds of particles are analysed as heads of their phrases.

The relation between case particle and nominal phrase is a 'Complement-Head' relation. The complement is obligatory and adjacent, as the following examples show:

- (76) \*ga  
 GA
- (77) ie ga  
 house GA
- (78) ookii ie ga  
 large house GA  
 (the large house)
- (79) sono ookii ie ga  
 that large house GA  
 (that large house)
- (80) \*ie ookii ga  
 house large GA
- (81) \*ie sono ookii ga  
 house that large GA

Normally the case particle *ga* marks the subject, the case particle *o* the direct object and the case particle *ni* the indirect object. There are, however, many exceptions. We therefore use predicate-argument-structures instead of a direct assignment of grammatical functions by the particles (and possibly transformations).

<sup>9</sup>See [Mue97] and [Kis95] for an argumentation against analyzing German complementizers as markers, which is similar to ours.

The valency information of the Japanese verbs does not only contain the syntactic category and the semantic restrictions of the subcategorized arguments, but also the case particles they must be annotated with<sup>10</sup>.

As in other languages, there are transitive, intransitive and ditransitive verbs in Japanese. However, ditransitive verbs are rare in the processed domain, so none occur in the lexicon up to now. The transitive verbs have to be distinguished depending upon which kind of case particles they require for their subcategorized arguments. The Japanese arguments which are subcategorized for by the verb are optional, unlike the German or English ones. This requires a fundamentally different treatment of subcategorization. We will not address this point here, however.

- intransitive: NP-ga, e.g.

(82) watashi ga ichinichi aite-imasu  
 I GA the whole day be free  
 (I have the whole day free.)

- ga-o-transitive: NP-ga NP-o, e.g.:

(83) watashitachi wa sanjikan gurai jikaN o torimasu  
 we WA 3 hours ca. time O take  
 (We will take about three hours.)

- ga-ga-transitive: NP-ga NP-ga, e.g.

(84) nantoka yotei ga toreru N desu ga  
 somehow time GA can take COP SAP  
 (I can find some time somehow.)

- aru-transitiv: NP-ni NP-ga or NP-ga NP-ga or NP-ni NP-de or NP-ga NP-de, e.g.

(85) watakushi ga niiji kara goji made kaigi  
 I GA 2 o'clock from 5 o'clock till meeting  
 ga arimashite  
 GA have  
 (I have a meeting from 2 o'clock to five o'clock.)

- naru-intransitiv: NP-ni, e.g.

(86) itsumo o sewa ni natte orimasu  
 always endeavour NI become AUX(HON)  
 (Always at your disposal.)

The lexicon entries of case particles get a case entry in the HEAD. Possible values are *ga*, *o*, *ni*, *de* and *to*. They are neither adjuncts nor specifiers and thus get the entries [MOD none] and [SPEC none]. They subcategorize for an adjacent object. This can be a noun.

<sup>10</sup>[Ono94] investigates the particles *ni*, *ga* and *wo* and also states that grammatical functions must be clearly distinguished from surface cases

$$\left[ \begin{array}{l} \text{HEAD} \\ \text{SUBCAT} \end{array} \left[ \begin{array}{l} \text{MAJ } p \\ \text{CASE } case \\ \text{MOD } none \\ \text{SPEC } none \\ \text{SAT.OBJ} \\ \text{VAL.OBJ.LOC.CAT.HEAD } \end{array} \right] \begin{array}{l} \\ \\ \\ \\ adjacent \\ noun \end{array} \right]$$

*ga* and *o* can, in addition, subcategorize for a verb modifying particle. The case particle *de* can additionally subcategorize for a *ni*-marked phrase, *to* can additionally subcategorize for a VP.

## 5 Modifying Particles

An essential problem is to find criteria for the distinction of case particles and modifying particles. On the semantic level they can be distinguished in that modifying particles introduce semantics, while case particles have a functional meaning. According to this distinctive feature the particle *no* is a modifying one, because it introduces attributive meaning, as opposed to ([Tsu96]:134), who classifies it as a case particle. Another criterion for distinction that is introduced by [Tsu96]:135 says that modifying particles<sup>11</sup> are obligatory in spoken language, while case particles can be omitted. Case particles are indeed suppressed more often, but there are also cases of suppressed modifying particles. These occur mainly in temporal expressions in our dialogue data:

(87)	soredewa	juuyokka	no	gogo	∅	niji	∅
	then	14th	NO	afternoon	∅	2 o'clock	∅
	robii	no	hou	de	o machi	shite	orimasu
	lobby	NO	side	DE	HON-wait	do	AUX-HON

(I will then wait in the lobby at 2 o'clock on the 14th.)

Finally Tsujimura gives the criterion that case particles can follow modifying particles while modifying particles cannot follow case particles. This criterion in particular implies that a finer distinction is necessary, as we have shown that it is not that easy. This can be realized with HPSG types. According to this criterion, *no* behaves like a modifying particle, while according to the criterion on meaning, it behaves like a case particle. Our first distinction is thus a functional one: Modifying particles differ from case particles in that their marked entities are not subcategorized for by the verb. Case particles get the head information [CASE case] that controls agreement between verbs and their arguments. Modifying particles do not get this entry. They get the information in MOD that they can become adjuncts to verbs (verb modifying particles) or nouns (the noun modifying particle *no*) and semantic information. They subcategorize for a noun, as all particles do. The modifying particles share the following features in their lexical entries:

<sup>11</sup>He calls them 'postpositions'.



$$\left[ \begin{array}{l} \text{HEAD} \\ \text{SUBCAT} \end{array} \left[ \begin{array}{l} \text{MAJ } p \\ \text{MOD } \textit{synsem} \\ \text{SPEC } \textit{none} \\ \text{SAT.OBJ } \textit{adjacent} \end{array} \right] \right]$$

## 5.1 Verb Modifying Particles

The verb modifying particles specify the modification of the verb in SYNSEM/LOC/CAT/HEAD/MOD.

### 5.1.1 Postpositions

The postpositions are *e*, *kara* and *made*. They modify a (nonauxiliary) verb as an adjunct and subcategorize for a nominal object.

$$\left[ \begin{array}{l} \text{HEAD} \\ \text{SUBCAT} \end{array} \left[ \begin{array}{l} \text{MAJ } p \\ \text{MOD.LOC.CAT.HEAD } \textit{nonaux} \\ \text{SPEC } \textit{none} \\ \text{SAT.OBJ } \textit{adjacent} \\ \text{VAL.OBJ.LOC.CAT.HEAD } \textit{noun} \end{array} \right] \right]$$

### 5.1.2 Adverbial Particles

[Nig96] treats *ni* and *de* as the infinitive and the gerund form of the copula. To account for this, it has to be clarified what the qualities of an infinitive and a gerundive form, a copula and a verb modifying particle are in our type system. Let us first consider the infinitive form. In our syntax, it has the following peculiarities:

- not honorific concerning addressee
- present tense
- indicative
- possible to use with *n desu* (*jikan ga toreru n desu ka*)
- possible as a relative sentence (*V-ru koto/N*)
- possible as a complement sentence (*V-ru to omou/iu*)
- can be modified by an adverb

This is clearly distinct from the characteristics of *ni*.

The gerundive form, a copula and a verb modifying particle are defined as follows:

- A gerundive form is not finite, it can modify a verbal phrase and be specifier of an auxiliary.
- A copula is a nonauxiliary verb. It subcategorizes for an oblique object, which is an unmarked noun, a postpositional phrase or an adjective. It further subcategorizes for an optional subject, which is marked with *ga*.
- A verb modifying particle is a particle that modifies a nonauxiliar verbal phrase, subcategorizes for an oblique object. I would define adverbial particles as subcategorizing for a noun or a postposition.

The adjunctive form 'de' has both qualities of a gerundive copula and qualities of a particle:

- Subcategorizing for an unmarked noun or a postposition
- Being adjunctive to a verbal head
- Its semantic behaviour (see [Nig96])

There are arguments for treating it as a copula:

- Historical derivation (see [Nig96])
- *de arimasu* behaves like *desu*
- The form *deshite* exists

But there is some data that shows different behaviour of *de* and other gerundives. Firstly, it concerns the cooccurrence possibilities of *de* and other particles, compared to gerundive forms and particles:

- *de wa* - *V-te wa*
- *de mo* - *V-te mo*
- *de ga* - *\*V-te ga*
- *de wo* - *\*V-te wo*
- *de ni* - *\*V-te ni*
- *de de* - *\*V-te de*
- *de no* - *\*V-te no*

Secondly, a gerund may modify auxiliaries, e.g. *shite kudasai*, *shite orimasu*, but *de* may not.

Additionally there is something which distinguishes *de* of a copula: It may not subcategorize for a subject.

A word that is an adjunct to verbs, subcategorizes for an unmarked noun or a phrase with a postposition and is subcategorized for by several particles (see above) fits well into the description of a verb modifying particle.

The adverbial particles *ni*, *de* and *to* subcategorize for a noun or a postposition:

$$\left[ \begin{array}{l} \text{HEAD} \\ \text{SUBCAT} \end{array} \left[ \begin{array}{ll} \text{MAJ} & p \\ \text{MOD.LOC.CAT.HEAD} & \textit{nonaux} \\ \text{SPEC} & \textit{none} \\ \text{SAT.OBJ} & \textit{adjacent} \\ \text{VAL.OBJ.LOC.CAT.HEAD} & \textit{noun/postposition} \end{array} \right] \right]$$

## 5.2 The Noun Modifying Particle *NO*

The particle *no* modifies a noun phrase and occurs after a noun or a verb modifying particle.

$$\left[ \begin{array}{l} \text{HEAD} \\ \text{SUBCAT} \end{array} \left[ \begin{array}{ll} \text{MAJ} & p \\ \text{MOD.LOC.CAT.HEAD} & \textit{noun} \\ \text{SPEC} & \textit{none} \\ \text{SAT.OBJ} & \textit{adjacent} \\ \text{VAL.OBJ.LOC.CAT.HEAD} & \textit{noun/vmod - p} \end{array} \right] \right]$$

## 5.3 The Utterance Modifying Particle *to*

*to* can mark utterances that are adjuncts to other utterances. Thus, HEAD and SUBCAT look as follows:

$$\left[ \begin{array}{l} \text{HEAD} \\ \text{SUBCAT} \end{array} \left[ \begin{array}{ll} \text{MAJ} & p \\ \text{MOD.LOC.CAT.HEAD} & \textit{utterance} \\ \text{SPEC} & \textit{none} \\ \text{SAT.OBJ} & \textit{adjacent} \\ \text{VAL.OBJ.LOC.CAT.HEAD} & \textit{utterance} \end{array} \right] \right]$$

## 5.4 Particles of Topicalization

### 5.4.1 Topic-*wa*

[Gun91] analyses Japanese topicalization with a trace that introduces a value in SLASH and the 'Binding Feature Principle' that unifies the value of SLASH with a *wa*-marked element<sup>12</sup>. This treatment is similar to the one introduced by [PS94] for the treatment of English topicalization. There as well a trace introduces a SLASH value which is bound by the topicalized element. However, Japanese topicalization is fundamentally different from English one. Firstly, it occurs more frequently. Up to 50% of the sentences are concerned ([Yos97]). Secondly, there are examples where the topic occurs in the middle of the sentence, unlike the English topics that occur sentence-initially. [Yos97] gives the example:

- (88) Bill    ga    Tookyou    e    wa    iku  
 PN    GA    Tokyo    E    WA    go  
 (Bill goes to Tokyo.)

There are also examples in the Verbmobil dialogue corpus:

- (89) raishuuchuu    ni    uchiawase    wa    shitai    N desu    keredomo  
 next week    NI    meeting    WA    want to do    COP    SAP  
 (I would like to hold a meeting in the next week.)

Thirdly, Japanese verbal arguments are optional. Suppressing of verbal arguments could be called more a rule than an exception in spoken language. The SLASH approach would introduce traces in almost every sentence. This, in connection with scrambling and suppressed particles, could not be restricted in a reasonable way. If one follows Gunji interpretation of those cases, where the topic-NP can be interpreted as a noun modifying phrase, a genitive gap has to be assumed. But this leads to assuming a genitive gap for every NP that is not modified. Further, genitive modification can be iterated.

Fourth, two or three occurrences of NP-*wa* are possible in one utterance:

- (90) go-yotei    no    hou    wa    raishuu    wa    seNsei    wa  
 HON-plan    NO    side    WA    next week    WA    Prof.    WA  
 ikaga    deshou    ka  
 good    COP    QUE  
 (Concerning your plans: Would next week suit you?)

Thus, we decided to assign topicalized sentences the same syntactic structure as non-topicalized sentences and to resolve the problem on the lexical level.

The topic particle gets three lexical entries, because it is ambiguous. The first one is for the verb modifying variant. Its head is the same as the one of all verb modifying particles. Its subcategorization frame is like the one of adverbial particles.

<sup>12</sup>The Binding Feature Principle says:

The value of a binding feature of the mother is identical to the union of the values of the binding feature of the daughters minus the category bound in the branching.  
 [Gun91]

$$\left[ \begin{array}{l} \text{HEAD} \\ \text{SUBCAT} \end{array} \left[ \begin{array}{ll} \text{MAJ} & p \\ \text{MOD.LOC.CAT.HEAD} & \text{nonaux} \\ \text{SPEC} & \text{none} \\ \text{SAT.OBJ} & \text{adjacent} \\ \text{VAL.OBJ.LOC.CAT.HEAD} & \text{noun/postposition} \end{array} \right] \right]$$

The second entry is for the case marking variant of *wa*. It gets the same head as the other case marking particles, but the CASE entry is underspecified. It subcategorizes for a nominal complement or a complement with a verb modifying particle.

$$\left[ \begin{array}{l} \text{HEAD} \\ \text{SUBCAT} \end{array} \left[ \begin{array}{ll} \text{MAJ} & p \\ \text{CASE} & \text{case} \\ \text{MOD} & \text{none} \\ \text{SPEC} & \text{none} \\ \text{SAT.OBJ} & \text{adjacent} \\ \text{VAL.OBJ.LOC.CAT.HEAD} & \text{noun/vmod - } p \end{array} \right] \right]$$

The third one is for the noun modifying variant of the topic particle.

$$\left[ \begin{array}{l} \text{HEAD} \\ \text{SUBCAT} \end{array} \left[ \begin{array}{ll} \text{MAJ} & p \\ \text{MOD.LOC.CAT.HEAD} & \text{noun} \\ \text{SPEC} & \text{none} \\ \text{SAT.OBJ} & \text{adjacent} \\ \text{VAL.OBJ.LOC.CAT.HEAD} & \text{noun/vmod - } p \end{array} \right] \right]$$

#### 5.4.2 Other topic particles

As we have already shown, *mo* is a particle that has the head of a topic-adverbial particle, but a different subcategorization frame as *wa*:

HEAD	<table style="border-collapse: collapse;"> <tr> <td style="padding: 2px 10px;">MAJ</td> <td style="padding: 2px 10px;"><i>p</i></td> </tr> <tr> <td style="padding: 2px 10px;">MOD.LOC.CAT.HEAD</td> <td style="padding: 2px 10px;"><i>nonaux</i></td> </tr> <tr> <td style="padding: 2px 10px;">SPEC</td> <td style="padding: 2px 10px;"><i>none</i></td> </tr> </table>	MAJ	<i>p</i>	MOD.LOC.CAT.HEAD	<i>nonaux</i>	SPEC	<i>none</i>
MAJ	<i>p</i>						
MOD.LOC.CAT.HEAD	<i>nonaux</i>						
SPEC	<i>none</i>						
SUBCAT	<table style="border-collapse: collapse;"> <tr> <td style="padding: 2px 10px;">SAT.OBJ</td> <td style="padding: 2px 10px;"><i>adjacent</i></td> </tr> <tr> <td style="padding: 2px 10px;">VAL.OBJ.LOC.CAT.HEAD</td> <td style="padding: 2px 10px;"><i>noun/vmod – p/ i – adj/ utt(modusque)</i></td> </tr> </table>	SAT.OBJ	<i>adjacent</i>	VAL.OBJ.LOC.CAT.HEAD	<i>noun/vmod – p/ i – adj/ utt(modusque)</i>		
SAT.OBJ	<i>adjacent</i>						
VAL.OBJ.LOC.CAT.HEAD	<i>noun/vmod – p/ i – adj/ utt(modusque)</i>						

Another topic particle is *koso*:

HEAD	<table style="border-collapse: collapse;"> <tr> <td style="padding: 2px 10px;">MAJ</td> <td style="padding: 2px 10px;"><i>p</i></td> </tr> <tr> <td style="padding: 2px 10px;">MOD.LOC.CAT.HEAD</td> <td style="padding: 2px 10px;"><i>nonaux</i></td> </tr> <tr> <td style="padding: 2px 10px;">SPEC</td> <td style="padding: 2px 10px;"><i>none</i></td> </tr> </table>	MAJ	<i>p</i>	MOD.LOC.CAT.HEAD	<i>nonaux</i>	SPEC	<i>none</i>
MAJ	<i>p</i>						
MOD.LOC.CAT.HEAD	<i>nonaux</i>						
SPEC	<i>none</i>						
SUBCAT	<table style="border-collapse: collapse;"> <tr> <td style="padding: 2px 10px;">SAT.OBJ</td> <td style="padding: 2px 10px;"><i>adjacent</i></td> </tr> <tr> <td style="padding: 2px 10px;">VAL.OBJ.LOC.CAT.HEAD</td> <td style="padding: 2px 10px;"><i>noun/ postposition/ adv – p/ noun</i></td> </tr> </table>	SAT.OBJ	<i>adjacent</i>	VAL.OBJ.LOC.CAT.HEAD	<i>noun/ postposition/ adv – p/ noun</i>		
SAT.OBJ	<i>adjacent</i>						
VAL.OBJ.LOC.CAT.HEAD	<i>noun/ postposition/ adv – p/ noun</i>						

## 6 Omitted Particles

Some particles can be omitted in Japanese spoken language. Here are two examples from the Verbmobil corpus:

- (91) rokugatsu     $\emptyset$     juusaNnichi    no    kayoubi     $\emptyset$     gogo  
 June             $\emptyset$     13th            NO    Tuesday     $\emptyset$     afternoon  
 kara        wa    ikaga    deshou    ka  
 KARA        WA    good    COP        QUE

(Would the 13th of June suit you?)

- (92) seNsei         $\emptyset$     go-tsugou                    no    hou    wa    ikaga  
 Prof.             $\emptyset$     HON-circumstances    NO    side    WA    good  
 deshou        ka  
 COP            QUE

(Would that suit you?)

This phenomenon can be found frequently in connection with pronouns and temporal expressions in the domain of appointment scheduling. [Hin77] assumes that exclusively *wa* can be suppressed. [Yat93] however shows that there are contexts, where *ga*, *o* or even *e* can be omitted. He assigns it as 'phonological deletion'.

[Kur92] analyses omitted *o* particles and explains these with linearization: A particle *o* can only be omitted, when it occurs directly before a verb. [Yat93] however gives examples to prove the opposite. One of these shall be shown here. He assigns it as 'slightly awkward but acceptable':

- (93) dono      gakusei    Ø    ore    ga    nagutta    ka      oboeteru  
       which    student    Ø    I     GA    hit        QUE    remember

(Do you remember which student I have hit?)

The Verbmobil data of Japanese dialogues does not contain information about phonological phenomena of pitch. It is therefore not possible at this stage to include this kind of information into our analysis. However, it is peculiar that quite often pauses occur instead of particles. This hints at a phonological phenomenon.

Therefore we propose a phonological-lexical treatment. The empty particle is analyzed as a lexical underspecified particle with empty phonetics. It inherits the features of a particle. It can get the functions of a case particle (as in example 93), of an adverbial particle (as in example 94) or of a noun modifying particle (as in the examples 91 and 92). In any case, it subcategorizes for a noun. It is necessary to distinguish empty and overt particles by a feature called 'PTYPE'. PTYPE can have 'overt' or 'empty' as its value. This is in order to prevent an interpretation with empty particle in, for example, NP+wa as NP+empty-nmod-particle+wa. Therefore, all particles get this additional feature.

- (94) ima      no      tokoro    Ø    gogo      wa      nanimo    yotei  
       now     NO     time      Ø    afternoon WA     no        plan  
       ga      haitte    orimaseN    node  
       GA     inserted HON-NEG    SAP

(Up to now I have no plans for the afternoon.)

<i>PHON</i>	<>											
<i>SYNSEM.LOC.CAT</i>	HEAD	<table style="border-collapse: collapse; margin-left: auto; margin-right: auto;"> <tr><td style="padding: 2px 10px;"><i>MAJ</i></td><td style="padding: 2px 10px;"><i>p</i></td></tr> <tr><td style="padding: 2px 10px;"><i>PTYPE</i></td><td style="padding: 2px 10px;"><i>empty</i></td></tr> <tr><td style="padding: 2px 10px;"><i>CASE</i></td><td style="padding: 2px 10px;"><i>case</i></td></tr> <tr><td style="padding: 2px 10px;"><i>MOD</i></td><td style="padding: 2px 10px;"><i>none</i></td></tr> <tr><td style="padding: 2px 10px;"><i>SPEC</i></td><td style="padding: 2px 10px;"><i>none</i></td></tr> </table>	<i>MAJ</i>	<i>p</i>	<i>PTYPE</i>	<i>empty</i>	<i>CASE</i>	<i>case</i>	<i>MOD</i>	<i>none</i>	<i>SPEC</i>	<i>none</i>
<i>MAJ</i>	<i>p</i>											
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$\langle \rangle$  $PHON$   $SYNSEM.LOC.CAT$	$\langle \rangle$  $HEAD$  $SUBCAT$	<table style="border-collapse: collapse; width: 100%;"> <tr> <td style="padding: 2px;"><math>MAJ</math></td> <td style="padding: 2px;"><math>p</math></td> </tr> <tr> <td style="padding: 2px;"><math>PTYPE</math></td> <td style="padding: 2px;"><math>empty</math></td> </tr> <tr> <td style="padding: 2px;"><math>MOD.LOC.CAT.HEAD</math></td> <td style="padding: 2px;"><math>verbal</math></td> </tr> <tr> <td style="padding: 2px;"><math>SPEC</math></td> <td style="padding: 2px;"><math>none</math></td> </tr> <tr> <td style="padding: 2px;"><math>SAT.OBJ</math></td> <td style="padding: 2px;"><math>adjacent</math></td> </tr> <tr> <td style="padding: 2px;"><math>VAL.OBJ.LOC.CAT.HEAD</math></td> <td style="padding: 2px;"><math>noun</math></td> </tr> </table>	$MAJ$	$p$	$PTYPE$	$empty$	$MOD.LOC.CAT.HEAD$	$verbal$	$SPEC$	$none$	$SAT.OBJ$	$adjacent$	$VAL.OBJ.LOC.CAT.HEAD$	$noun$
$MAJ$	$p$													
$PTYPE$	$empty$													
$MOD.LOC.CAT.HEAD$	$verbal$													
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$\langle \rangle$  $PHON$   $SYNSEM.LOC.CAT$	$\langle \rangle$  $HEAD$  $SUBCAT$	<table style="border-collapse: collapse; width: 100%;"> <tr> <td style="padding: 2px;"><math>MAJ</math></td> <td style="padding: 2px;"><math>p</math></td> </tr> <tr> <td style="padding: 2px;"><math>PTYPE</math></td> <td style="padding: 2px;"><math>empty</math></td> </tr> <tr> <td style="padding: 2px;"><math>MOD.LOC.CAT.HEAD</math></td> <td style="padding: 2px;"><math>noun</math></td> </tr> <tr> <td style="padding: 2px;"><math>SPEC</math></td> <td style="padding: 2px;"><math>none</math></td> </tr> <tr> <td style="padding: 2px;"><math>SAT.OBJ</math></td> <td style="padding: 2px;"><math>adjacent</math></td> </tr> <tr> <td style="padding: 2px;"><math>VAL.OBJ.LOC.CAT.HEAD</math></td> <td style="padding: 2px;"><math>noun</math></td> </tr> </table>	$MAJ$	$p$	$PTYPE$	$empty$	$MOD.LOC.CAT.HEAD$	$noun$	$SPEC$	$none$	$SAT.OBJ$	$adjacent$	$VAL.OBJ.LOC.CAT.HEAD$	$noun$
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$VAL.OBJ.LOC.CAT.HEAD$	$noun$													

## 7 Exhaustivization

One can find several examples with *ga* marked adjuncts in the Verbmobil data. This phenomenon is called 'exhaustivization' in research literature (c.f. [Gun87]), because the meaning of those NP+*ga* is 'only the NP'. Gunji analyses these syntactically in the same way as he analyzes his 'type-I topicalization'. They build adjuncts that control gaps or reflexives in the sentence. He designs *ga* marked adjuncts without control relations as relying on a very specialized context. Gunji's lexicon entries for exhaustive *ga* are:

- a) POS P; PFORM *ga*; SUBCAT PP [PFORM *pf*; SEM  $\alpha$ ];  
 ADJUNCT V [SLASH PP [PFORM *pf*; SEM  $\alpha$ ]]  
 where *pf* is not *ga*, *wo*, *ni* or *no*.
- b) POS P; PFORM *ga*; SUBCAT NP [SEM  $\alpha$ ];  
 ADJUNCT V [SLASH PP [PFORM *pf*; SEM  $\alpha$ ]]  
 where *pf* is *ga*, *wo*, *ni* or *no*.
- c) POS P; PFORM *ga*; SUBCAT NP [SEM  $\alpha$ ];  
 ADJUNCT V [REFL PP [SBJ; SEM  $\alpha$ ]]

However, this treatment leads to the following problems:



1. In all cases, where *ga* marks a constituent that is subcategorized as *ga*-marked by the verb, a second reading is analyzed that contains a *ga* marked adjunct controlling a gap. This is not reasonable. The treatment of the different meaning of *ga* marking and *wa* marking belongs to the semantics and not into the phrase structure.
2. This treatment assumes gaps. We already criticized this in connection with topicalization.
3. The Verbmobil dialogue data contains virtually no reflexives. Therefore, we do not need reflexive control at the moment. However, it contains mostly examples with *ga* marked adjuncts without syntactic control relation to the rest of the sentences.

The examples of the Verbmobil dialogues can be classified into two kinds:

a) The NP describes a temporal entity:

(95)	watakushi	no	hou	no	tsugou	wa	nijuuhachinichi
	I	NO	side	NO	circumstances	WA	28th
	ga	gogo	ni	kaigi	ga	ikkeN	haitte
	GA	afternoon	NI	meeting	GA	at first	inserted
	orimasu						
	HON-AUX						

(On our side, there is at first a meeting inserted at the afternoon of the 28th.)

(96)	kochira	wa	getsuyoobi	ga	chotto	sukejuuru
	we	WA	Monday	GA	somewhat	schedule
	ga	ippai	naN desu	keredomo		
	GA	full	COP	SAP		

(On our side, the schedule is full on Monday.)

b) The NP describes a personal entity:

(97)	watakushi	ga	juuniji	ni	kaigi	ga	owarimasu
	I	GA	12 o'clock	NI	meeting	GA	end

(As far as I am concerned, the meeting ends at 12 o'clock.)

All these cases are predicate modifying. To further restrict exhaustivizational interpretations, we introduced selectional restrictions for the marked NP. Only NPs of the sorts 'time' or 'person' are allowed.

## 8 Conclusion

The syntactic behaviour of Japanese particles has been analyzed using the Verbmobil dialogue data. It has been possible to set up a type hierarchy of Japanese particles. We have therefore adopted a lexical treatment instead of a syntactic treatment based on phrase structure. This is based on the different kinds of modification and subcategorization that occur with the particles. It is necessary to have a finer distinction than just the distinction into case particles and postpositions. The assignment of the grammatical function is done by the verbal valency and not directly by the case particles. The topic particle is ambiguous. Its binding is done

by ambiguity and underspecification in the lexicon and not by the Head-Filler Rule as in the HPSG for English ([PS94]). Empty particles are also inserted into the lexicon underspecified, similar to the topic particle. The approach presented here is implemented in the PAGE system [UBB<sup>+</sup>94]. It is part of the syntactic analysis of Japanese in Verbmobil.

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