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Zero-Pronominals, Point-of-View, Empathy Perspective, and Context-Parameters

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April, 1989

1 Introduction

Japanese is a language in which 'zero anaphora' (Kameyama[1985]) is extensively used[1], especially in discourse. Yoshimoto[1988] reports that in their simulated inter-terminal dialogues (94 sentences, 2 dialogue sequences), out of 53 occurrences of personal pronouns in the English translation, 51 corresponded to zero-pronouns in the original Japanese text. As Kameyama[1985/ms a] observed, syntactic constraints and discourse functions are both involved in the identification of the zero anaphoric references. In this paper, we will be referring to 'zero anaphora' as zero-pronouns (Hasegawa[1984]) which represent pronouns with no phonetic realizations. The nuclear grammatical functions that can be morphologically unrealized are SUBJ, OBJ, or OBJ2, (Abaitua[1988]). Normally in a sentence, only one NP representing a person is zero-pronominalized and it is identified either with the 'backward-looking center' (*Cb*, Grosz, *et al*[1985]) or the speaker of the utterance. However, with sentences which involve the 'empathy perspective' (Kuno&Kaburagi[1975/1977] and Kuno[1987]), two NPs (both representing persons) may be zero-pronominalized at the same time. The identity of the two pronominals can be determined by the point-of-view of the speaker as well as other discourse-parameters.

In this paper, we would like to propose a discourse-parameter based analysis which connects *the theory of attentional structures* (i.e., Grosz, *et al*) and *the theory of logophoricity* (Sells[ms]) by proposing constraints that specify the interaction between discourse parameters including *Cb*, *source*, and *pivot*. Specifically, the main hypothesis presented in this paper is the following: If *source* is realized (overt or non-overt), then *pivot* is equal to *source*, and if *source* is not realized (overt or non-overt), then *pivot* is equal to *Cb*. We will also adopt the constraint proposed by Grosz, *et al* that 'if there are any pronouns then one must be the *Cb*' and will see that this constraint also plays a significant role in determining the referent of zero-pronouns combined with other discourse-parameter based constraints and lexical requirements.

As a framework for analysis we will be using HPSG[2] (Head-driven Phrase Structure Grammar, Pollard&Sag[1987]). However, we will be simply using HPSG as a representational method for providing sample lexical entries and specific formulations of constraints . The hypothesis presented in this paper is independent of the HPSG theory.

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[1]There are other 'no phonetic realization' phenomena in Japanese; however, we will be concentrating on 'zero anaphora' in this paper.

[2]With an extension of a scheme to keep track of discourse-parameters such as PIVOT and CENTER (*Cb*), as parts of the semantic contents of signs.

2 ZERO-Pronouns in Japanese

2.1 An existential test

We would like to apply the following simple test to verify that a zero-pronoun indeed exists in a sentence:

zero-pronoun test (necessary[3] and sufficient): If a contextually salient referent exists for an NP position which is subcategorized for by a main verb and that NP is morphologically (phonetically) unrealized then it is a zero-pronoun.

In the sentences below[4]:

(1) Speaker A: ∅   *yushoku   tabeta?*   [with rising intonation]
             SUBJ dinner   eat-PAST
             'Did [you] eat dinner?'

   Speaker B: ∅   ∅   *tabeta.*
             SUBJ OBJ eat-PAST
             '[I] ate [dinner]'

In the first sentence, the subject is zero-pronominalized and contextually, it is referring to the hearer of the sentence. The verb *taberu* subcategorizes for the NP corresponding to the agent of the action and it is clear that the subject position was zero-pronominalized. In the second sentence, the object position is also zero-pronominalized. One NP refers to 'the eater' and the other refers to 'the object that is being eaten', which are both contextually salient. There is no ambiguity by zero-pronominalizing both positions.

Now with English:

(2) a. *Did you eat this apple?*

    b.#*Yes, I ate.*

In (2)a, *ate* subcategorizes for a nominative position and an accusative position. However, the illformedness of (2)b as a response to (2)a indicates that *ate* cannot have a zero-object. This shows that *ate* does not meet our zero-pronoun test. It is a clear contrast with *taberu* which always requires two overt or non-overt NPs (unlike *ate, taberu* cannot be used intransitively.)

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[3]Although, it seems that there is some evidence that in Chinese, a quantifier can be the antecedent of a zero-anaphor, we have not found any such evidence in Japanese.

[4]∅ represents a zero-pronoun (case-markings are omitted).

3 Discourse Parameters for Zero-Pronoun Identity

Because a zero-pronoun is non-overt, even if syntactic constraints for licensing zero-pronouns are shared with overt-pronouns (as in GB's Binding Theory and Kameyama[ms b.]'s F-COMMAND), we will have less information (such as agreement features) to limit the candidates for referents of zero-pronouns.

We would like to show that we can analyze reference of zero-pronouns using discourse-parameters in a fairly simple and straight-forward manner. The simplicity of the representation is due, to a large extent, to the nature of HPSG where the identities of variables can be specified through structure-sharing in the lexicon. However, the essential contribution to the simplicity of our hypothesis comes from the uniform use of context-parameters regardless of the types of functionalities they provide and the uniform application of constraints as constraints of unification operations.

The discourse (context) parameters we are using are as follows:

- **SOURCE:** Represents the one who makes the report (e.g., the speaker – Sells[ms]).

- **ADDRESSEE:** Represents the addressee of the report.

- **CURRENT:** A list containing entities that are realized in the current sentence ordered according to their obliqueness.

- **CENTER:** Represents the backward-looking center (*Cb*) of an utterance.

- **PIVOT:** Represents the entity with the current point-of-view.

CURRENT is equal to the forward-looking center (*Cf*, Grosz, *et al*[1986]) except that it is ordered according to the obliqueness of the grammatical functions of the main verb (of the current sentence). As noted by Brennan, *et al*[1987], this corresponds to Sidner[1983]'s 'potential foci'. The backward-looking center (*Cb*, Grosz, *et al*) represents an entity that has been introduced into the discourse which the utterance "centrally concerns" and which is realized in the immediately preceding utterance. We will adopt Brennan, *et al*'s ranking (which encompasses Grosz, *et al* and Kameyama[1986]s' priority in subjecthood and also Yoshimoto[1988]'s priority on topic) scheme that we rank the NPs occurring in the immediately preceding utterance by obliqueness of grammatical relations of the subcategorized functions of the main verb. Thus *Cb* is the highest ranking entity in terms of obliqueness order in the immediately preceding sentence (i.e., the first element (or the closest to the first element) of the previous sentence's

CURRENT) which is realized in the current sentence. Note that CENTER represents
Cb, and not *Cf*, and therefore, it is not a list but a singleton parameter that rep-
resents the most oblique element in the immediately preceding utterance (which
roughly corresponds to Sidner's 'discourse focus').

PIVOT is as defined by Sells[ms][5] which represents the one from whose point-
of-view the report is made. This discourse parameter was originally introduced by
Kuno&Kaburagi[1975] to represent situations where the speaker identifies with
the person who is represented by an NP in a sentence. Kuno&Kaburagi[1977]
and Kuno[1987] use the term *empathy perspective* and represent this information
through a binary comparison of varying degrees of *empathy values*. Since we
will be keeping track of 'where the view-point is' as a singleton parameter, we
will be using the term PIVOT instead of *empathy perspective*.

There are some other discourse-parameters that are discussed elsewhere (such
as in DRS); however, we will see that the above parameters are generally sufficient
for the resolution of zero-pronouns in Japanese. Also, our framework allows for
introduction of any further types of discourse-parameters and we are not limiting
the possibilities of the parameters to only five (especially to handle other discourse
phenomena not discussed in this paper).

4 Discourse-Parameters and Lexical Zero-Pronouns

In this section, we will take a close look at our scheme for handling the pro-
posed analysis of zero-pronouns using discourse-parameters. We will be using
HPSG specific representations because under this formalism, the parameters are
accessible at the lexical level.

4.1 Discourse-Parameters

First we would like to add the attributes SEM|CONTEXT|INITIAL-CONTEXT and
SEM|CONTEXT|fiNAL-CONTEXT in order to keep track of parameters (indices)
that are relevant to the current utterance. SEM|CONTEXT|INITIAL-CONTEXT con-
tains the parameters at the end of the immediately preceding utterance and
SEM|CONTEXT|fiNAL-CONTEXT will contain the parameters at the end of the cur-
rent sentence.

The following rule then should capture our parameter-based discourse con-
straints:

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[5]Also, Katagiri[ms] under the situation theory framework.

Discourse-Parameter Constraint (Rule):

ISEM ICONTEXT IINITIAL-CONTEXT I1I
| IFINAL-CONTEXT I2I
| IINDICES I3I {...}
Constraint on Unification: *assign-parameters*(I1I,I2I,I3I).

We will be keeping track of all the NP indices that have been introduced within a phrase by collecting these indices (variables) into the SEMICONTEXTIINDICES attribute from the same attribute in each of the daughters of the phrase. (This attribute was shown as SEMIINDICES in Pollard&Sag[1987]).

The predicate *assign-parameters* in the Discourse-Parameter rule is defined as below:

Predicate *assign-parameters*

Takes three arguments and the second argument contains the attribute-value pairs meeting the following constraints:

1. Values (variables) are members of the third argument (given as a set).

2. Attributes are as follows with values meeting the restrictions given:

   - **SOURCE:** the variable representing the one who makes the report.
   - **ADDRESSEE:** the variable representing the addressee of the report.
   - **CURRENT:** the set of currently realized variables ordered by obliqueness of the grammatical functions of the main verb.
   - **CENTER:** the variable with the most oblique grammatical function of the main verb of the previous sentence which is realized (overt or non-overt) in the current sentence.
     If there is no previous sentence then it is the **SOURCE** for declarative sentences
     and the **ADDRESSEE** for interrogative sentences (DP-Constraint-Center3)
   - **PIVOT:** the variable meeting the following constraints:
     If **SOURCE** is realized, overt or non-overt, then **PIVOT** is equal to **SOURCE**.
     If **SOURCE** is not realized then **PIVOT** is equal to **CENTER**.

The **PIVOT** constraint is central to our analysis. It is our new proposal for providing a connection between Grosz, *et al's centering theory* and Sells' *logophoricity theory*.

With the above addition of the Discourse-Parameter (DP) rule, semantics of a sign will include the values as below:

```
SEM ICONTEXT IINITIAL-CONTEXT { ... }
  I            IFINAL-CONTEXT   ISOURCE I1I
  I            I                IADDRESSEE I2I
  I            I                ICURRENT I3I
  I            I                ICENTER I4I
  I            I                IPIVOT I5I
  I            IINDS {I1I, I2I, I3I, I4I, I5I, ... }
  I            ICONDITIONS {[ state of affairs], [state of affairs] ... }
```

In [state of affairs] we store information about relations between the variables such as conventional implicatures, presuppositions, stating for example that I1I and I2I have to have certain social relations, etc..

4.2 Lexical ZERO-Pronouns and Zero-Pronoun Constraint

Now we would like to add our lexical entry for zero-pronouns as below:

```
PHON //
SYN ILOC IHEAD IMAJ N
          ISUBCAT <>
          IMARKING <wa> V <ga> V <wo> V <ni>
SEM ICONTEXT IINDS { IVAR []              I}
                     IREST []             I
                     IREF-TYPE zero-pro I
```

As specified above[6], zero-pronouns share the features of overt pronouns except for the fact that they are phonetically unrealized and the value of their

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[6]In our example lexical specifications using HPSG framework, we are assuming that a modification is made to HPSG to handle Japanese post-positions as markers as described in Tomabechi[ms]. To briefly summarize the method here, it has the advantage of having the NPs as heads instead of post-positions as heads (as done in JPSG framework, Gunji, *et al*[1987], Sirai[1988]) for the case-marked NPs so that a uniform analysis is possible in the cases where case-markers are dropped (other advantages are described in Tomabechi[ms]). The approach is to treat post-positions as markers utilizing the head-marker structure of HPSG (Pollard[1988]). This structure is a sub-type of a headed-structure and the Head Feature Principle and Subcategorization Principle apply just like they do with the head-complement-structures and head-filler-structures described in Pollard&Sag[1987].

marking attribute is a disjunction of all possible marking values. Now we would like to add one more rule for zero-pronouns. We would like to capture the fact that a zero-pronoun in a sentence (SUBJ or OBJ) refers to the current CENTER of the discourse: (this is a formalization of Grosz, *et al*'s constraint that nothing is pronominalized unless the *Cb* is).

Zero-Pronoun Constraint

```
ISEM ICONTEXT IFINAL-CONTEXT ICENTER I1I
   I              IINDICES I2I
```
Constraint on Unification: *zero-center*(I1I,I2I).

Predicate *zero-center*

Takes two arguments and the following constraint holds true between the first argument and the second argument.

All signs would have the feature SYNILOCIMARKING whose value is filled by 1) the name of marking, 2) NONE, or 3) any disjunction of the preceding (including no specification at all, which is equivalent to the disjunction of all possible values).

For example, the entry for the post-position *ga* is as below:

```
PHON <ga>
SYN ILOC IHEADI MAJ marker
        IMARKING <ga>
        ISUBCAT < ISYN ILOC IHEAD IMAJ N >
                        ISUBCAT < >
                        IMARKING none
```

and the verbs will subcategorize for NP[SYNILOCIMARKING: ga] (I will abbreviate as NP[MRKG: ga]) as an element of its SUBCAT list.

Also, we add a rule to combine markers with the heads that they mark:

```
SYN    ILOC IMARKING I1I
DTRS   IHEAD-DTR I2I
        IMARKER-DTR ISYN ILOC I HEAD IMAJ marker
                        ISUBCAT < I2I >
                        IMARKING I1I
```

This way, the semantic information of the NP head is passed up with a marking by a post-position without changes in the Semantics Principle. In lexical Ns, we do not specify the value of ISYNILOCIMARKING attribute because we want the verbs to simply subcategorize for NP[MRKG:ga] which should unify with both case marked NPs and unmarked (i.e. *ga* omitted) NPs.

1. If an element of the second argument satisfies the following constraint:

   INDEX|REF-TYPE zero-pro[7]

   then, the first element must also satisfy this constraint[8].

5 A few simple examples:

With our Discourse-Parameter (DP) Constraint, Zero-Pronoun (ZP) Constraint, and the lexical entry for zero-pronouns, let us analyze a simple example in the HPSG framework. Consider the data below:

(3) Speaker A: *Ø   sono   hon   yon-da?*
                SUBJ that   book   read-PAST
                'Did [you] read that book?'

   Speaker B: *Ø   Ø   yon-da.*
               SUBJ   OBJ   read-PAST
               '[I] read [it]'

In the first sentence, with our DP-Constraint, the CENTER is the addressee of the utterance (assigning a parameter that represents the hearer of the utterance in a given discourse situation). With the second sentence, the ZP-Constraint assumes that the CENTER of the discourse can be either the subject or the object of the verb. Semantics of the 'read' relation in this case will reject the object of reading as the hearer, so zero-pronoun resolution can be correctly handled.

Now, we would like to see how zero-pronoun resolution can be handled when three pronouns (two pronouns representing people) are zero-pronominalized. This happens when a sentence introduces a point-of-view or the 'empathy' of the

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[7]This constraint assumes the extension to the object of type *indexed-object* as discussed in Pollard[1988]. This object now has the REF-TYPE attribute (referential-type) whose value is filled with values such as 1) ANA, 2) PRO, 3) NPRO, and 4) ZERO-PRO to indicate different referential types. By specifying this value to be ZERO-PRO, we can assure that the index was introduced as a zero-pronoun. The index introduced by a zero-pronoun looks like:

|VAR
|REST []
|REF-TYPE zero-pro

[8]This is another way of saying that when there are zero-pronouns, at least one has to be the CENTER.

speaker of the sentence. Some Japanese verbs such as giving verbs have a built-in mechanism for specifying the point-of-view of the speaker and distinguishing two pronouns when both represent persons by the location of the view-point (or the amount of empathy using Kuno's[1987] analysis). Observe the sentences below:

(4) a. *Taro-ga*   *Hanako-ni*   *hon-o*   *kure-ta*
         -NOM   -DAT   book-AC   give-PAST
         'Taro gave Hanako (a) book' [view-point on Hanako]

     b. *Taro-ga*   *Hanako-ni*   *hon-o*   *age-ta*
         -NOM   -DAT   book-AC   give-PAST
         'Taro gave Hanako (a) book' [view-point on Taro]

In (4)a, the giving verb *kureru* is introducing an empathy perspective which indicates that the speaker is putting his view-point on Hanako, i.e., the point-of-view is put on the receiver of the giving relation. On the other hand, in (4)b, the speaker is putting his point-of-view on the giver of the giving relation. These empathy perspectives are lexically introduced as properties of giving verbs *ageru* (also *yaru*) and *kureru*. The analysis using empathy perspective was introduced by Kuno&Kaburagi with further development in Kuno. Under Kuno's framework:

yaru (*ageru*) requires that $\mathcal{E}(subject) \geq \mathcal{E}(dative)$
kuretu requires that $\mathcal{E}(subject) < \mathcal{E}(dative)$

where $\mathcal{E}(x)$ represents the degree of feeling of closeness (empathy) of the speaker toward the entity corresponding to x.

Kameyama[1986] also analyzes the phenomena using the notion of 'identity' (which corresponds to 'empathy' and 'point-of-view'). Although we follow their basic analysis of the giving verbs based upon empathy of the speaker (or the view-point of the speaker), we would like to analyze this phenomenon as a part of discourse-parameter constraints. In other words, we would like to treat these verbs as members of a class of verbs that have a built-in constraint on the PIVOT parameter which is one of the discourse-parameters that participate in discourse. This way, our analysis of 'empathy phenomena' needs no special rule or principle. The same DP-Constraint and ZP-Constraint that handle CENTER and zero-pronouns can be applied uniformly. The PIVOT constraint only needs to be

specified in the lexicon[9] of the giving verbs[10]. In other words, our approach in this paper is to treat the phenomenon known as 'empathy perspective' as one aspect of lexically specified discourse-parameter constraints which shares the same underlying mechanism with all other discourse-parameter based phenomena (including zero-pronominalizations).

Now below is our lexical entry for *kureru* ('to give' [view-point on receiver]):

```
PHON kureru
SYN |LOC |HEAD |MAJ V
         |SUBCAT< NP|1|[MK:wo],
                  NP|2|[MK:ni],
                  NP|3|[MK:ga]>
SEM |CONT |RELN give
          |GIVER |3|
          |RECEIVER |2|
          |GIVEN |1|
     |CONTEXT |FINAL-CONTEXT |PIVOT |2|
```

Also there will be a semantic knowledge (constraint) that the giver and the receiver cannot be the same person (by default).

Thus, only the constraint (i.e., structure-sharing with 'receiver') for PIVOT needs to be specified in the lexical entry for *kureru*. CENTER and SOURCE may be specified in our DP-Constraint and can be applied if necessary during unification. The lexical entry for *ageta* ('to give' [view-point on giver]) will simply have the PIVOT parameter co-indexed with the 'giver' instead of the 'receiver'. With these lexical entries[11] and the DP-Constraint, sentences in (4) can be correctly handled

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[9]The PIVOT location for each specific giving verb usage is lexically determined. Thus, it should be noted, it is not a pragmatic constraint in the sense that the location of the PIVOT is always fixed and does not change in context. The choice of which specific giving verb a speaker uses is a pragmatic consideration because the speaker has an option to choose different giving verbs depending on where the speaker wants to put his point-of-view. It is important to note that once a choice for the point-of-view (PIVOT) location is determined (by speaker's intention or by other factors), i.e., once the intended meaning is determined, then the sentence that does not meet the lexically specified PIVOT constraint is not grammatical, instead of simply pragmatically unfounded. The lexical constraint on the PIVOT location cannot be pragmatically overruled. In other words, our ungrammaticality judgement includes the violation of the discourse-parameter constraints.

[10]We may want to group the empathy verbs and make individual verbs inherit their PIVOT constraint, but in this paper, we are assigning the constraint to each verb.

[11]As Saito[1981] suggests, it is well-known that TOPIC (i.e., *wa*) marked NP may fill an empty position in a sentence. Especially, the *ga* marked positions are most often replaced with *wa* marked NPs. Our analysis does not preclude a further addition of constraints for usage of *wa* replacing other markers. We have not specified the disjunction of *ga* and *wa* (i.e., NP|3|[MK:ga ∨ wa]) as

and the acceptability/unacceptability of the sentences below can also be handled (with the addition of one more constraint to follow).

(5) a. *boku-ga Hanako-ni hon-o   kure-ta
        I-NOM   -DAT   book-ACC give-PAST
        'I gave Hanako (a) book.' [view-point on Hanako]

   b. *Taro-ga   boku-ni hon-o   age-ta
        -NOM   I-DAT   book-ACC give-PAST
        'Taro gave me (a) book.' [view-point on Taro]

   c. Taro-ga   otouto-ni   hon-o   kure-ta
        -NOM   brother-DAT book-ACC give-PAST
        'Taro gave brother (a) book.' [while brother = speaker's brother]

   d. *Taro-ga   otouto-ni   hon-o   kure-ta
        -NOM   brother-DAT book-ACC give-PAST
        'Taro gave brother (a) book.' [while brother = Taro's brother]

   e. *Taro-ga   otouto-ni   hon-o   age-ta
        -NOM   brother-DAT book-ACC give-PAST
        'Taro gave brother (a) book.' [while brother = speaker's brother]

   f. Taro-ga   otouto-ni   hon-o   age-ta
        -NOM   brother-DAT book-ACC give-PAST
        'Taro gave brother (a) book.' [while brother = Taro's brother]

We would like to add following constraint to the DP-Constraint to capture the contrasts between
(5)c,d,e,f:

Relation-Term constraint

If a relation-holder of a relation term is unspecified (i.e., who's brother it is is not specified), then the relation holder has to be PIVOT. If PIVOT cannot be the relation holder (for example, one cannot be a relation-holder of oneself), then it has to be SOURCE. Or, in other words, only PIVOT or SOURCE can be a relation-holder when it is not specified, and PIVOT is given priority.

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the content of the SUBCAT simply because we would like another mechanism to capture such usage of *wa*. In other words, we are assuming that some other constraints are specified for usage of *wa* marking in a sentence. We are using *ga* marked sentences throughout as our data simply because of this reason.

5.1 Point-of-View and Zero-Pronouns

Now, let us see how our ZP-Constraint can also participate to assign correct referents for zero-pronouns in empathy sentences.

(6) a. *Tohru-wa shourai yubou   na   sugakusha   da*
          -TOP future   promising COMP mathematician is
          'Tohru is a promising mathematician'

    b. *Zaidan-ga   ∅   shougakkukin-o   kure-ta*
          foundation-NOM OBJ   scholarship-ACC give-PAST
          '(The) foundation gave [him] (a) scholarship.' [Tohru = close friend]

The sentences in (6) are parts of one discourse. With (6)b, CENTER is *Tohru* with the first constraint on CENTER in the DP-Constraint. The lexical requirement for the point-of-view verb *kureta* stipulates that PIVOT = 'receiver'. By ZP-Constraint, the zero-object = CENTER. Now, the second constraint on PIVOT in the DP-Constraint requires that PIVOT = CENTER. Therefore, the zero-object ('receiver') in (6)b is determined to be *Tohru*.

(7) a. ∅   *Masaru-no kurasu-o   tot-ta.*
          SUBJ   -POS   class-ACC take-PAST
          '[I] took Masaru's class.'

    b. ∅   ∅   *ei-o   kure-ta*
          SUBJ OBJ   A-ACC give-PAST
          '[He] gave [me] (an) A.'

With (7)a, the second constraint on CENTER in the DP-Constraint assigns CENTER to be SOURCE (since there's no preceding utterance). Now the ZP-Constraint assigns the zero-subject to be the CENTER which is anchored to SOURCE (i.e., the speaker).

With (7)b, CENTER is SOURCE which was anchored to the zero-NP with the highest obliqueness in (7)a (the first constraint on CENTER in the DP-Constraint). Since the subject and object positions are both zero-pronominalized, the CENTER (= SOURCE) can fill either position (ZP-Constraint assinging the value of SEM|CONTEXT|fiNAL-CONTEXT|CENTER to be a disjunction of the indices for both 'giver' and 'receiver').

Now, the first constraint on PIVOT in the DP-Constraint assigns PIVOT to be the SOURCE. Since the lexical requirement of *kureta* requires the 'receiver' to be the PIVOT, we now know that 'receiver' is the SOURCE (the speaker). Because the only other candidate is *Masaru*, the 'giver' is *Masaru*. This way, the sentence with

the two zero-pronominalized persons can be analyzed through the interactions of the DP-Constraint, ZP-Constraint, and the lexical discourse-parameter constraint on *kure-ta*.

6 Analysis with Verb Compounds

Verbs with the built-in point-of-view constraints can be combined with other verbs to add point-of-view to their descriptions. With *ageru* and *kureru*, they can be combined with almost any verb having the marker *de* (*te*) inserted and taking the *renyou* form. Kuno[1987] uses the notion of varying degrees of *empathy* values that are assigned to NPs in the sentence (he introduces the constraints as binary relations between empathy values of NPs in the subject position and the dative position). In our analysis, we are not using the notion of varying degrees of *empathy* values. Instead, the discourse parameter PIVOT is used to keep track of the current location of view-point in the sentence. Constraints are determined through the interaction of the rules introduced in this paper and the requirements for identity of specific parameters specified in the lexicon. In this paper, we use the term *empathy perspective* and the term *point-of-view* interchangeably and they both refer to the parameter-based location of the PIVOT in the discourse[12].
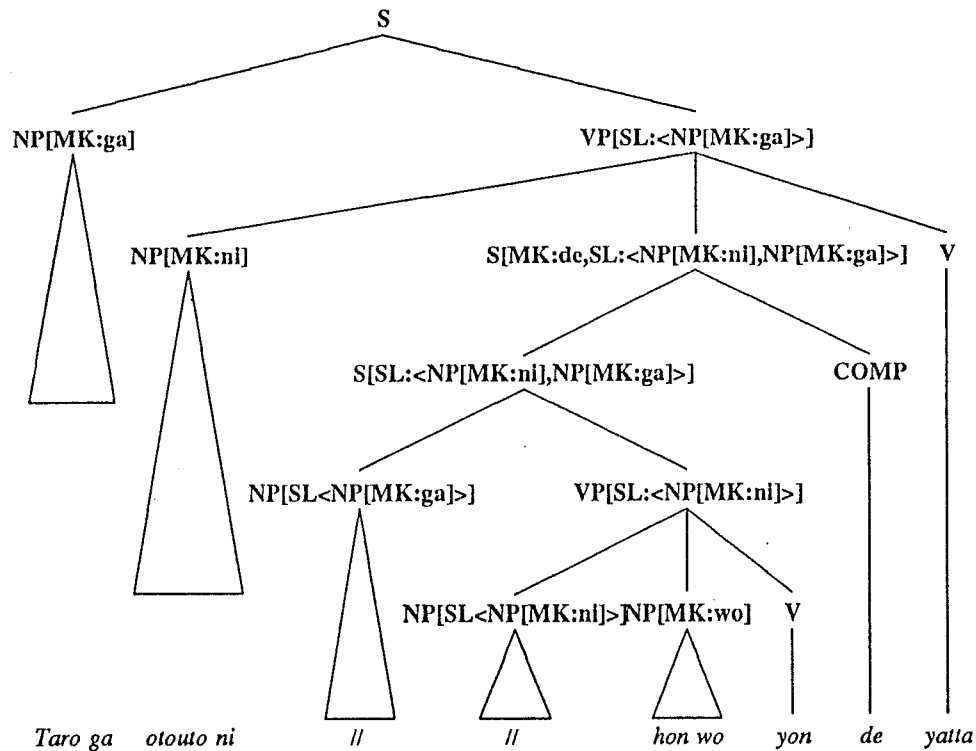
Examples of sentences with point-of-view verbs are as below:

(8) a. *Taro-ga   otouto-ni   hon-o   yon   de   kure-ta*
          -NOM brother-DAT book-ACC read COMP give-PAST
          'Taro read brother (a) book.' [while brother = speaker's brother]

    b. **Taro-ga   otouto-ni   hon-o   yon   de   kure-ta*
          -NOM brother-DAT book-ACC read COMP give-PAST
          'Taro read brother (a) book.' [while brother = Taro's brother]

    c. **Taro-ga   otouto-ni   hon-o   yon   de   age-ta*
          -NOM brother-DAT book-ACC read COMP give-PAST
          'Taro read brother (a) book.' [while brother = speakers' brother]

    d. *Taro-ga   otouto-ni   hon-o   yon   de   age-ta*
          -NOM brother-DAT book-ACC read COMP give-PAST
          'Taro read brother (a) book.' [while brother = Taro's brother]

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[12]The the term *empathy* in this paper means 'assignment of the PIVOT parameter', and should not be confused with Kuno[1987] use of the term, although our analysis is originally motivated by his analysis.

The acceptability/unacceptability of the above sentences is predictable from our DP-Constraint and our lexical entries for *kureru* and *ageru*. Specifically, we would like to propose our analysis of this type of verb compound involving the discourse-parameters.

One method to analyze (8) would be to use a slash category (such as done by Gunji[1987]) for complements of the embedded verb *yomu* ('to read') and apply the Binding Inheritance Principle as below:

S
NP[MK:ga]   VP[SL:<NP[MK:ga]>]
        NP[MK:ni]   S[MK:de,SL:<NP[MK:ni],NP[MK:ga]>]   V
                      S[SL:<NP[MK:ni],NP[MK:ga]>]   COMP
                NP[SL<NP[MK:ga]>]   VP[SL:<NP[MK:ni]>]
                              NP[SL<NP[MK:ni]>]NP[MK:wo]   V

Taro ga   otouto ni   //   //   hon wo   yon   de   yatta

However, we would like to avoid the use of the slash category whenever possible due to the possible over-generation that such usage may result in. For example, if there is another rule that uses the slash category then that may trigger the over-generation[13] interacting with this analysis (and vice versa).

Another approach would be to analyze the sentences in (8) without using slash categories by having *yatta* subcategorizing for an unsaturated VP. It is similar to the way controlled XCOMPs in English can be handled in the unification-based

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[13]An example of such an over-generation would be *Taro ga otouno ni [won o yon da to] omotte yatta.

framework. In such an analysis, we may make the subcategorization list of *yatta* explicitly contain the *de*[14] (*te*) marked $\bar{S}$[15].

In this type of analysis, the object that is GIVEN in *yatta* is the relation that the compound verb introduces With *Taro-ga otouto-ni hon-o yon de yatta* ('Taro read brother a book' [brother = Taro's brother]), the semantic content of the final result should be as shown below with structure sharing attained with the appropriate variables collected in the SEM|CONTEXT|INDICES

```
SEM |CONT |RELN give
          |GIVER |3|
          |RECEIVER |2|
          |GIVEN |RELN read
          |        |READER |3|
          |        |OBJECT |1|
     |CONTEXT |FINAL-CONTEXT |PIVOT |3|
```

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[14]Lexical entry for *de* may be something like below:

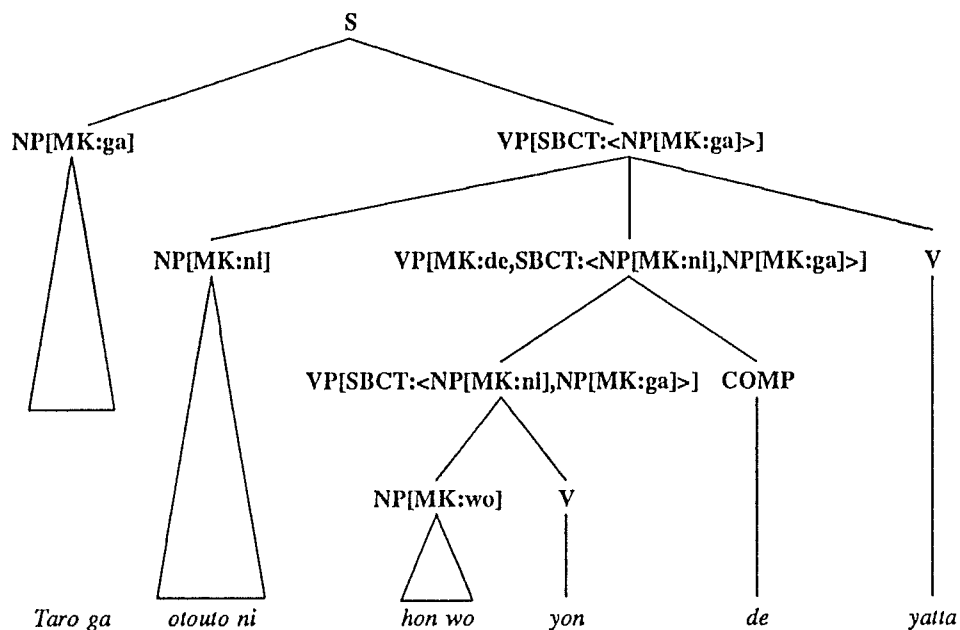PHON de
SYN |LOC |HEAD |MAJ marker
         |MARKING <de>
         |SUBCAT <V[VFORM:renyou SUBCAT<NP[MK:ni],NP[MK:wa]>]>

[15]For example, the lexical entry for *yatta* may contain syntax and semantics specified as below for such a construct. (We would also need an entry for uncompounded use of *yatta*).

SYN |LOC |HEAD|MAJ V
         |SUBCAT<VP[MK:de,
                    SUBCAT<NP|2|[MK:ni],NP|3|[MK:ga]
                    SEM|CONT: |1|
                    ]>,
              NP|2|[MK:ni],
              NP|3|[MK:ga]>
SEM |CONT |RELN GIVE
          |GIVER |3|
          |RECEIVER |2|
          |GIVEN |1|
     |CONTEXT |FINAL-CONTEXT |PIVOT |3|

Also there will be a semantic knowledge (constraint) that the giver and the receiver cannot be the same person (by default).

```
                                      S
                          _____/ _____
                         /                          \
                 NP[MK:ga]                      VP[SBCT:<NP[MK:ga]>]
                    /\                    _____/    |    _____
                   /  \                  /             |            \
                  /    \          NP[MK:ni]   VP[MK:de,SBCT:<NP[MK:ni],NP[MK:ga]>]   V
                 /      \            /\            _____/     _____             |
                /        \          /  \          /                     \           |
               /          \        /    \   VP[SBCT:<NP[MK:ni],NP[MK:ga]>]  COMP    |
              /            \      /      \      _____/    \                 |       |
             /              \    /        \    /            \                |       |
            /                \  /          \ NP[MK:wo]       V               |       |
           /                  \/            \   /\           |               |       |
          /                   /\            /  /  \          |               |       |
         /                   /  \          /  /    \         |               |       |

       Taro ga            otouto ni        hon wo          yon              de      yatta
```

The problem with this type of analysis, however, is that the three case-marked NPs in *Taro-ga otouto-ni hon-o yon de yatta* can be reordered in any combinatorial manner, meaning that the NPs subcategorized for by *yatta* can be occurring inside the embedded *yomu*'s subcategorization as below:

(9) a. *Taro-ga   Hanako-ni hon-o   yon de   kure-ta*
         -NOM   -DAT   book-ACC read COMP give-PAST
         'Taro read Hanako (a) book.' [view-point on Hanako]

     b. *Taro-ga   hon-o   Hanako-ni yon de   kure-ta*
         -NOM   book-ACC -DAT   read COMP give-PAST
         'Taro read Hanako (a) book.' [view-point on Hanako]

     c. *Hanako-ni Taro-ga   hon-o   yon de   kure-ta*
         -DAT   -NOM   book-ACC read COMP give-PAST
         'Taro read Hanako (a) book.' [view-point on Hanako]

     d. *Hanako-ni hon-o   Taro-ga   yon de   kure-ta*
         -DAT   book-ACC -NOM   read COMP give-PAST
   'Taro read Hanako (a) book.' [view-point on Hanako]

e. *hon-o*   *Taro-ga Hanako-ni yon de   kure-ta*
   book-ACC   -NOM book-DAT   read COMP give-PAST
   'Taro read Hanako (a) book.' [view-point on Hanako]

f. *hon-o*   *Hanako-ni Taro-ga   yon de   kure-ta*
   book-ACC   -DAT   book-ACC   read COMP give-PAST
   'Taro read Hanako (a) book.' [view-point on Hanako]

This is contrasting with *Taro-ga [Hanako-ga hon-o yomu] to omou* ('Taro thinks that Hanako reads book') where *Taro-ga* can be put after the embedded S, but not inside it[16] (i.e., not after *Hanako-ga* nor after *hon-o*).

The analysis we adopt in this paper is to view *yon de yatta* as a result of a type of a lexical incorporation process. The argument structure of the main verb *yomu* was merged with the subcategorization of the empathy verb *yaru* which takes NPs anchored to a 'reader' and an 'object'. The resulting verb has 'giver/reader', 'receiver', and 'object'. In other words, it inherits the argument structure of a giving verb. One important phenomenon is that it inherits the PIVOT constraint of a giving verb as well.

A similar lexical incorporation process in Japanese for motion and manner verbs is reported in Levin, *et al*[ms] and Mitamura[ms]. We would like to analyze empathy verbs as triggers of lexical merger processes requiring *de* (*te*) markers and the verbs to be incorporated to take *renyou* morphology. It is our claim that any verb whose subject is a human (intentional being) can be merged with the giving verbs to provide empathy perspective. By such a merger, the dative position is supplied (by the giving verb) who is a receiver of the action specified by the verb that is mergered with the giving verbs. The meaning of a sentence as a result of this type of merger is that a person is *giving* a favor of doing some *action* which is specified by the verb which is merged. Since this incorporation process is performed at a lexical level, we will be analyzing the compound verb as one verb at the syntactic level. So the syntactic configuration would simply be as below:

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[16]Without changing the meaning.
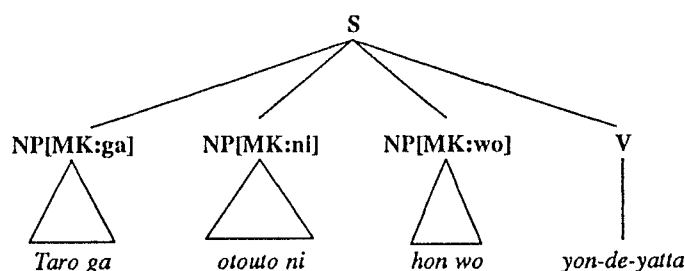
Note that our verb subcategorization list is, following HPSG analysis, representing an obliqueness order and not surface order, and therefore, free-ordering of the constituents is captured by the subcategorization list.

Sentences with zero-pronouns can be handled no differently from the way non-empathy compound (lexically merged) verbs can be handled. Below is Kameyama[1986]'s example (glosses modified):

(10) a. *Masao-wa Arabiago-o narat-te-iru*
              -NOM Arabic-ACC study-COMP-is
          'Masao is learning Arabic.'

      b. *aruhi   ∅   Arabiajin-no zyosei-ni at-ta*
          one-day SUBJ Arabian-GEN lady-DAT meet-PAST
        . 'one day [he] met an Arabian lady.'

      c. *∅   ∅   iroiro   sinsetu-ni   site-kure-ta*
          SUBJ OBJ various kind-GOAL do-give-PAST
          '[The lady] gave various kinds of favors to [Masao]'

At the beginning of (10)a, SOURCE = CENTER because there is no previous sentence (the second CENTER constraint of the DP-Constraint). In (10)b, CENTER is *Masao* (the first CENTER constraint of the DP-Constraint). Also by the ZP-Constraint, the zero-subject must be the CENTER, so it is *Masao*. In (10)c, *sitekureta* is a compound of *suru* ('to do') and *kureru* ('to give' [view-point on receiver]). The CENTER in this sentence is *Masao* (DP-Constraint). Therefore, either the zero-subject or the zero-object must be *Masao* (ZP-Constraint). Now the lexical empathy requirement of *kureta* requires the PIVOT to be the NP in the object position. Given that SOURCE is not realized (overtly or non-overtly), by the second PIVOT constraint of the DP-Constraint, PIVOT = CENTER. Therefore, it is *Masao*. Thus, the NP referents for the zero-subject and the zero-object can be correctly assigned.

6.1 Some more analysis on *Yaru* (*Ageru*), *Kureru*

Observe the data below:

(11) a. *Taro-ga   Hanako-o   home-te-yat-ta*
           -NOM   -ACC praise-give-PAST
          'Taro praised Hanako.'

    b. *Taro-ga   Hanako-o   home-te-kure-ta*
           -NOM   -ACC praise-give-PAST
          'Taro praised Hanako.'

    c. *boku-ga   Hanako-o   home-te-yat-ta*
          ·I-NOM   -ACC praise-give-PAST
          'I praised Hanako.'

    d. **boku-ga   Hanako-o   home-te-kure-ta*
          I-NOM   -ACC praise-give-PAST
          'I praised Hanako.'

In the sentences above, we have no overt dative position (receiver of 'giving'). However, the unacceptability of (11)d suggests that the empathy of the compounded giving verbs is providing the point-of-view that is affecting the acceptability of the sentences. Since the NPs in these sentences are in the subject positions and the accusative positions, we may hypothesize that the PIVOT parameter is imposing the restrictions on the values in (the subject position and) the accusative position. This hypothesis immediately breaks down because in the sentences below, (12)b is acceptable, although the unacceptability of (12)d is still consistent with that hypothesis.

(12) a. *Taro-ga   Hanako-o   nagu-te-yat-ta*
           -NOM   -ACC hit-give-PAST
          'Taro hit Hanako.' [view-point on Taro]

    b. *Taro-ga   Hanako-o   nagu-te-kure-ta*
           -NOM   -ACC hit-give-PAST
          'Taro hit Hanako.' [view-point on *Hanako/speaker]

    c. *boku-ga   Hanako-o   nagu-te-yat-ta*
           -NOM   -ACC hit-give-PAST
          'I hit Hanako.' [view-point on speaker]

d. *boku-ga   Hanako-o   nagu-te-kure-ta
   -NOM   -ACC   hit-give-PAST
'I hit Hanako.' [view-point on *Hanako/*speaker]

The anomaly of the data in (12) is that *yatta* and *kureta* are the 'giving favor of' verbs when combined with other verbs; however, *Taro* is not giving favor to *Hanako* in these sentences[17]. The 'empathy perspective' states that the speaker puts his[18] point-of-view on some person (overt or non-overt) described in the discourse. Since *kureta* requires that the receiver of the action represented by the main verb to be the PIVOT, the speaker is putting his view-point on *Hanako* in (12)b and (12)d. While this may explain the ungrammaticality of (12)d, still the grammaticality of (12)b is unexplainable. It is because *Hanako* is adversely affected and if the speaker has the view-point on *Hanako* then the use of 'receiving a favor' verb is inconsistent.

We would argue in the analysis of (12) that the sentences have a hidden dative position (or a 'receiver' argument) which was introduced by the lexical merger of *naguru* and the giving verbs. This hidden argument position represents the referent who is receiving the favor of the verb (*naguru*) action. Our analysis is as below:

(13) a. *Taro-ga*   ∅   *Hanako-o   nagu-te-yat-ta*
          -NOM DAT   -ACC   hit-give-PAST
          'Taro hit Hanako.' [view-point on Taro]

      b. *Taro-ga*   ∅   *Hanako-o   nagu-te-kure-ta*
          -NOM DAT   -ACC   hit-give-PAST
          'Taro hit Hanako.' [view-point on speaker]

      c. *boku-ga*   ∅   *Hanako-o   nagu-te-yat-ta*
          -NOM DAT   -ACC   hit-give-PAST
          'I hit Hanako.' [view-point on speaker]

      d. *boku-ga*   ∅   *Hanako-o   nagu-te-kure-ta*
          -NOM DAT   -ACC   hit-give-PAST
          'I hit Hanako.' [view-point on *speaker/*Hanako]

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[17]If *naguru* ('to hit') was indeed a favor to Hanako (for example, she was a masochist) then the sentence must be acceptable. However, 1) if the speaker did not know the fact she was a masochist then the sentence is still illformed for his part. 2) Our claim is that there is a hidden dative position in these sentences and if Hanako was a masochist, it simply means that the hidden dative position also happens to be Hanako and it is consistent with our claim that there is a 'receiver of a favor' which is hidden in the dative position.

[18]For the sake of simplicity, male pronouns are used throughout in this paper.

Now, the above analysis seems consistent with the data below in which the receiver of the favor is overtly specified by *no-tame* ('for'). In the data below, *nagu-te-yatta* is optionally subcategorizing for the *no-tame-ni* marked NP.

(14) a. *Taro-ga   Hanako-no-tame-ni   Hanako-o   nagu-te-yat-ta*
         -NOM   -FOR_THE_SAKE_OF   -ACC   hit-give-PAST
         'Taro hit Hanako for Hanako.' [view-point on Taro]

    b. *Taro-ga   boku-no-tame-ni   Hanako-o   nagu-te-kure-ta*
         -NOM I-FOR_THE_SAKE_OF   -ACC   hit-give-PAST
         'Taro hit Hanako for me.' [view-point on speaker]

    c. *boku-ga Hanako-no-tame-ni   Hanako-o   nagu-te-yat-ta*
         I-NOM   -FOR_THE_SAKE_OF   -ACC   hit-give-PAST
         'I hit Hanako for Hanako.' [view-point on speaker]

    d. **boku-ga boku-no-tame-ni   Hanako-o   nagu-te-kure-ta*
         I-NOM   I-FOR_THE_SAKE_OF   -ACC   hit-give-PAST
         'I hit Hanako for me.' [view-point on speaker]

The semantic content of (14) is roughly equal to that of (12) except for the fact that it is clearer with the sentences in (14) that the person specified by *no-tame-ni* ('for the sake of') is receiving the favor. This supports our claim that (12) has the hidden argument position as in our analysis in (13) represents the person (goal) receiving the favor (theme) and it is zero-pronominalized. The unacceptability of (14) should be due to the semantic knowledge that the 'giver' and the 'receiver' cannot be the same person to constitute a 'giving' relation.

7   Other Point-of-View Effects

7.1   *Morau*

morau ('receive') is another verb that has a similar property as *yaru* and *kureru*. One crucial difference is that *morau* represents a receiving action. Therefore, the subject of a sentence is the receiver of an object (or a verb action), instead of being the giver of the action.

(15) a. *boku-ga Hanako-ni hon-o   yon-de-morat-ta*
         I-NOM   -DAT   -ACC read-receive-PAST
         'Hanako read me (a) book' [view-point on speaker]

b. *Hanako-ga boku-ni hon-o   yon-de-morat-ta*
      -NOM I-DAT   -ACC read-receive-PAST
  'I read Hanako (a) book' [view-point on Hanako]

As seen above, and as originally analyzed by Kuno, *morau* also introduces the speaker identity into the sentences. The discourse-parameter constraint[19] for *morau* is that the GIVER in the 'giving' relation is whatever the PIVOT is co-indexed with[20].

Thus, similar to *kureta*, PIVOT is co-indexed with the receiver, however it is a receiving action (i.e., the grammatical subject is not a giver but a receiver). Thus, only the giver and the receiver of the 'giving' relation are reversed. Our analysis for *yatta* for compounded verbs applies equally to *morau* as well (both for overt-pronouns and zero-pronouns).

The option of having a receiving verb that provides point-of-view in a manner similar to that of the giving verbs is a significant addition to the expressiveness of the Japanese language in terms of giving and receiving actions in that a speaker can show (report) empathy for both the giver and the receiver on either the subject position or on the dative position.

7.2 Shimatta

Finally, I would like to introduce another verb that can benefit from our addition of discourse-parameters to the analysis of the data. The verb *shimatta*[21] ('have done regretfully') is only used as a compound verb to express regret[22] of the

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[19]In Kuno[1987]'s analysis it is given as the empathy constraint for *morau*:
$\mathcal{E}$(subject) > $\mathcal{E}$(*ni*-marked NP).

[20]Specifically our HPSG lexical entry for *moratta* before merger with other action verbs would be like below:

PHON moratta
SYN |LOC |HEAD |MAJ V
      |SUBCAT< NP|1|[MK:wo],
            NP|2|[MK:ni],
            NP|3|[MK:ga]>
SEM |CONT |RELN give
        |GIVER |2|
        |RECEIVER |3|
        |GIVEN |1|
     |CONTEXT |FINAL-CONTEXT |PIVOT |3|

[21]It does not seem that this verb is discussed as an empathy verb elsewhere so far; however, it seems clear as in the data in this section that this verb is indeed an empathy verb.

[22]Well, not exactly regret. We can say *takarakuji-ni attat te shimatta* ('I won a lottery') which is not a regrettable situation. However, in this case also, *te shimatta* is providing an empathy

SOURCE (speaker). We analyze[23] the lexical requirement of *shimatta* to be that SOURCE = PIVOT (specified through structure-sharing in our lexicon).

Since *shimatta* is only used as a compound verb, it seems that its sole purpose[24] is to provide a point-of-view. Also, it is to be noted that *shimatta* is a commonly used verb in a conversational use (and of course almost never used in newspapers and journals as is the case with other point-of-view verbs).

Observe the sentences below:

(16) a. *Hanako-ga chikoku si te shimat-ta*
     -NOM be_late_for do COMP done_regretfully-PAST
     'Hanako was late (I am sorry to say).'

  b. *∅ chikoku si te shimat-ta*
     SUBJ be_late_for do COMP done_regretfully-PAST
     '[I] was late (to my regret).'

  c. *bideo-ga koware te shimat-ta*
     VCR-NOM break_down COMP done_regretfully-PAST
     'VCR broke down (to my regret).'

This way, *shimatta* is combined the verb *si* (root: *suru* 'to do') and is showing the regret of the speaker (i.e., the view-point of the speaker is expressed).

The data below is consistent with our analysis as well:

(17) a. *Hanako-ga boku-ni uso-o tui te shimat-ta*
     -NOM I-DAT lie-ACC tell COMP done_regretfully-PAST
     'Hanako lied to me (to my regret).'

  b. *∅ Hanako-ni uso-o tui te shimat-ta*
     SUBJ Hanako-DAT lie-ACC tell COMP done_regretfully-PAST
     '[I] lied to Hanako (to my regret).'

---

perspective.

[23]In our analysis of *shimatta*, we are analyzing *te* as *comp*; however, we are neutral in our position as to whether these sentences should be analyzed as *S̃* + COMP + *shimatta* or *shimatta* as a result of lexical incorporation that we have adopted in our analyses of giving verbs.

[24]It is to be noted that *shimatta* comes from *shimouta* not (directly) from *shimau*. *Shimouta* is essentially the same as *shimatta* except that it is archaic, whereas *shimau* is an aspectual verb meaning 'to finish something' and has no implication of 'have done regretfully'.

8 Conclusion

We have seen that zero-pronominals can be identified through the use of DP and ZP-Constraints and discourse-parameter constraints in the verb entries. We have seen that the speaker-identity phenomena known as *empathy perspective* can be handled straight-forwardedly as a part of our framework through keeping track of discourse parameters and applying lexically specified constraints. Actually, the only addition we needed to handle the empathy phenomena was a coindexing of specific argument positions anchored to NPs with the discourse parameter specified as PIVOT. Thus, the otherwise problematic phenomenon of empathy verbs in Japanese can be uniformly handled as a part of conditions that accompany the discourse parameters of utterances. By the same token, phenomena such as honorific expressions should be handled equally well through our framework.

Additionally, our introduction of the context-parameter constraints to unification-based grammars extend the scope of the theories to make the coverage of some of the extra-sentential phenomena possible.

Acknowledgments

References

[1] Abaitua, J. (1988) *Complex Predicates in Basque from Lexical Forms to Functional Structures*. Doctoral dissertation. University of Manchester.

[2] Brennan, E., Friedman, W., and Pollard, C. (1987) A Centering Approach to Pronouns. In *Proceedings of the 25th Annual Meeting of the Association for Computational Linguistics (ACL-87)*.

[3] Grosz, B, Joshi, K, and Weinstein, S. (1986) Towards a computational theory of discourse interpretation. Preliminary draft.

[4] Gunji, T., Sirai, H., Hashida, K., and Harada, Y. (1987) Grammatical Description with Local Constraints, In *Proceedings of the US-Japan AI Symposium 87*.

[5] Gunji, T. (1987) *Japanese Phrase Structure Grammar* D. Reidel Publishing Co..

[6] Kameyama, M. (1985) Zero Anaphora: The Case of Japanese. Doctoral dissertation. Stanford University.

[7] Kameyama, M. (ms. a) Manuscript. Japanese Zero Pronominal Binding: Where Syntax and Discourse Meet. Department of Computer and Information Science, University of Pennsylvania.

[8] Kameyama, M. (ms. b) Manuscript. Functional Precedence Conditions on Overt and Zero Pronominals. Microelectronics and Computer Technology Corporation (MCC).

[9] Kameyama, M. (1986) A Property-Sharing Constraint in Centering. In *Proceedings of the 24th Annual Meeting of the Association for Computational Linguistics (ACL-86)*.

[10] Katagiri, Y. Manuscript. Point of View in Situation Semantics CSLI Research Paper.

[11] Kuno, S. (1973) *The Structure of the Japanese Language*. The MIT Press.

[12] Kuno, S. (1983) *Shin Nihon Bumpou Kenkyu (New Japanese Grammatical Study)*. Taishu-kan Pub.

[13] Kuno, S. (1987) *Functional Syntax*. University of Chicago Press.

[14] Levin, L., Mitamura, T., and Mahmoud, A. Manuscript. Lexical Incorporation and Resultative Secondary Predicates. Carnegie Mellon University and University of Pittsburgh.

[15] Mitamura, T. Manuscript. Organization of Predicate Conceptual Frames and Mapping Rules for Natural Language Processing. Linguistics Department, University of Pittsburgh.

[16] Pollard, C. and Sag, I. (1987) *An Information-based Syntax and Semantics*, Volume I. CSLI.

[17] Pollard, C. (1988) Lecture Notes, 'Advanced Syntax Seminar'. Joint-Program in Computational Linguistics, Carnegie Mellon University. Spring, 1988.

[18] Saito, M. (1981) A case of lexically induced topic in Japanese. Department of Linguistics and Philosophy. Massachusetts Institute of Technology.

[19] Sells, P. Manuscript. On the Nature of 'Logophoricity'. Center for the Study of Language and Information, Stanford University.

[20] Sirai, H. (1988) Natural Language Grammatical Theories In *Natural Language Understanding*, ed. Tanaka, H. and Tsujii, J.. Ohm Pub..

[21] Sidner, C. (1983) Focusing in the comprehension of definite anaphora. In M. Brady and R. Berwick, ed., *Computational Models of Discourse*, MIT Press.

[22] Tomabechi, H. Manuscript A Uniform Treatment of Japanese Post-Positions Using the Head-Marker Structure in HPSG. Joint-Program in Computational Linguistics, Carnegie Mellon University.

[23] Yoshimoto, K. (1988) Identifying Zero Pronouns in Japanese Dialogue. In *Proceedings of the COLING'88*.