

Complex Predicates in HPSG

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1 Introduction

The properties of complex predicate have been intensively studied. Among those studies, Shibatani (1973), Sugioka (1984), and Miyagawa (1989) discuss the interaction of Japanese aspectual verbs and passivization. Miyagawa (1989) observed that the passive suffix (*rare*) can be attached to an aspectual verb, as in (1).

- (1) a. hon ga John niyotte yomi-tuzuke-rare-ta
book NOM by read-continue-PASS-PAST
(The books were continuously read by John)
- b. kono hon wa ooku no sakusha niyotte youyaku kaki-oe-rare-ta
this book TOP many GEN author by finally write-finish-PASS-PAST
(This book was finally finished to be written by many authors)

The peculiar property of (1) is that the embedded theme (*hon*) is passivized and becomes the subject of the sentence in spite of the fact that the passive suffix is attached to the aspectual verb *tuzuke* and *oe*. The grammaticality of (1) cannot be explained naturally unless some sort of complex predicate formation is assumed, by which the verb sequence *yomi-tuzuke* and *kaki-oe* can be treated as a single predicate so that the embedded theme can be passivized.

There are some complicating facts in complex predicate formation. For example, Nishigauchi and Takahashi (ms) observe that sentences like (2) are ungrammatical. (2) is minimally different from (1) in that the aspectual verb *tuzuke* in (1) is a Control aspectual verb (e.g. V_A assigns an external θ -role) while the aspectual verb *sugi* in (2) is a Raising aspectual verb (e.g. V_A does not assign an external θ -role).

- (2) a. *hon ga John niyotte yomi-sugi-rare-ta
book NOM by read-excess-PASS-PAST
(Books were excessively read by John)
- b. *dorobou ni korosi-kake-rare-ta
thief DAT kill-be about to-PASS-PAST
((I) was almost killed by the thief)

There is a similar contrast in a causative sentence, namely, a Control aspectual verb can be causativized (as in (3a)), while a Raising aspectual verb cannot (as in (3b)).

- (3) a. sensei wa seito ni hon o yomi-tuzuke-sase-ta
 teacher TOP student DAT book ACC read-continue-cause-PAST
 (The teacher made the students continue to read books)
- b. ?* sensei wa seito ni hon o yomi-sugi-sase-ta
 teacher TOP student DAT book ACC read-excess-cause-PAST
 (The teacher made the students read books too much)

In addition, it is well known that, in Japanese causative-passive verb (e.g. *yom-ase-rare* ‘to be forced to read’), the causee can be passivized (4a), but the embedded theme cannot (4b).

- (4) a. seito wa (sensei ni) hon o yom-ase-rare-ta
 student TOP teacher DAT book ACC read-cause-PASS-PAST
 (The students were forced to read the books (by the teacher))
- b. * sono hon wa (sensei niyotte) seito ni yom-ase-rare-ta
 that book TOP teacher by student DAT read-cause-PASS-PAST
 (The books were forced to be read by the students (by the teacher))

In this paper, I will propose a formalization for complex predicate formation based on HPSG (Pollard and Sag (1987), Pollard and Sag (forthcoming)), which explains the above contrast.

2 Complementation in HPSG

Before explaining the complex predicate formation, I will first review the complementation in HPSG.

(5) shows the simplified lexical entries of the English Control and Raising verbs *try* and *tend*.

- (5) a. *try*

$$\left[\begin{array}{l} \text{CAT} \mid \text{SUBCAT} \langle \text{NP}_{[1]\text{ref}}, \text{VP}[\text{inf}, \text{SUBCAT} \langle \text{NP}_{-[2]} \rangle] : [3] \rangle \\ \text{CONTENT} \left[\begin{array}{ll} \text{REL} & \text{try} \\ \text{TRYER} & [1][\text{INDEX} [2]] \\ \text{SOA-ARG} & [3] \end{array} \right] \end{array} \right]$$

- b. *tend*

$$\left[\begin{array}{l} \text{CAT} \mid \text{SUBCAT} \langle [1]\text{NP}, \text{VP}[\text{inf}, \text{SUBCAT} \langle [1] \rangle] : [2] \rangle \\ \text{CONTENT} \left[\begin{array}{ll} \text{REL} & \text{tend} \\ \text{SOA-ARG} & [2] \end{array} \right] \end{array} \right]$$

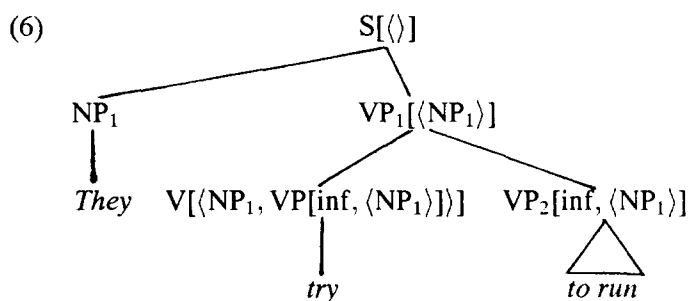
The lexical entries only show two features SUBCAT and CONTENT. A SUBCAT list is a list of subcategorized constituents, which are ordered in the increasing obliqueness. The CONTENT feature express the semantic content of each word. Thus the lexical entry in (5a) shows that the

Control aspectual verb *try* subcategorizes a noun phrase (NP_[1]) and an infinitive verb phrase. The noun phrase (NP_[1]) is the least oblique complement (i.e., the subject) and it is the TRYER of *try* event, and the INDEX ([2]) of the subject is identical to the INDEX of the subject of the embedded verb phrase. Also, the semantic contents ([3]) of the complement VP is identical to the state of affair argument (SOA-ARG) of the *try* event.

The subscript *ref* of NP_[1] means that it must be a referential object, namely non-dummy object. Thus, *try* does not allow an expletive subject, such as *it* or *there*. On the other hand, the subject of *tend* does not have the constraint, thus it does not have subscript *ref*.

(6) shows how the complementation is done in an English example *They try to run*. The heart of the complementation is the *unification* and the *cancellation*. When the head verb *try* is combined with the complement VP₂ (*to run*), the VP element of SUBCAT list in the head daughter is unified with the complement, and it is cancelled out in the SUBCAT list in the mother node. Thus, the SUBCAT list of the mother has one less elements than the head daughter.

Similarly, when the VP *try to run* is combined with the subject *They*, NP₁ in the SUBCAT list is unified with the subject NP, and it is cancelled out in the mother node S, whose SUBCAT list is an empty list.



3 Complex Predicate Formation

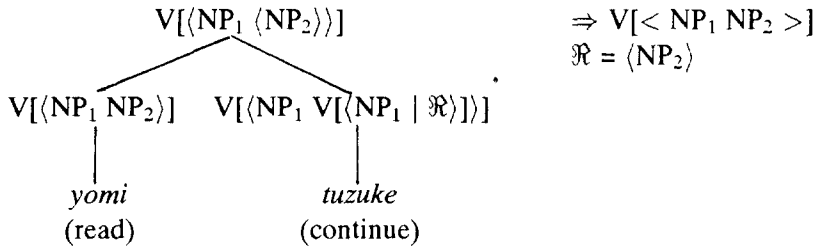
3.1 Aspectual Verbs

To achieve the complex predicate formation, I propose a concept called *substitution*, instead of *cancellation*. (7) shows the lexical entry of the Control aspectual verb *tuzuke*, and how the complex predicates *yomi-tuzuke* (continue to read) is formed.

(7) Control Aspectual Verb *tuzuke* (continue)

$$(a) \left[\begin{array}{l} \text{CAT} \mid \text{SUBCAT} \langle \text{NP}_{[1]}, \text{V}[\text{SUBCAT} \langle \text{NP}_{-[2]} \mid \mathfrak{R} \rangle] : [3] \rangle \\ \text{CONTENT} \left[\begin{array}{ll} \text{REL} & \text{continue} \\ \text{AGENT} & [1][\text{INDEX}[2]] \\ \text{SOA-ARG} & [3] \end{array} \right] \end{array} \right]$$

(b) *yomi-tuzuke*
read-continue

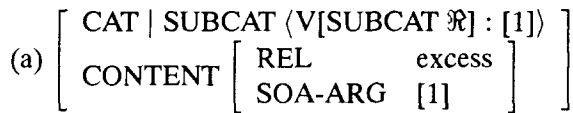


When the head verb *tuzuke* is combined with the subpredicate *yomi*, the second element $\langle NP_1 \ | \ \mathfrak{R} \rangle$ in the SUBCAT list of the head daughter is unified with the subpredicate. Here, \mathfrak{R} is a newly-introduced special variable, and the bar ‘|’ before \mathfrak{R} means that the variable \mathfrak{R} is unified with the rest of the list. Thus, in this case, the \mathfrak{R} is assigned the list $\langle NP_2 \rangle$.

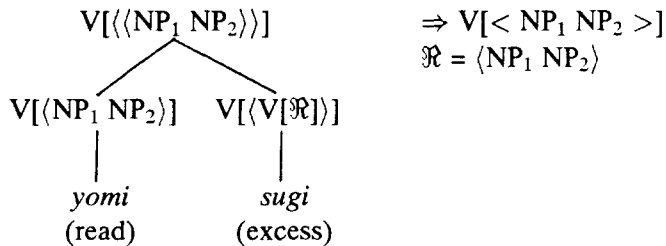
In the proposed framework, after the unification, the second element of the head daughter’s SUBCAT list is not cancelled, but is substituted by the value of \mathfrak{R} . Thus, the mother node has the SUBCAT list $\langle NP_1 \ \langle NP_2 \rangle \rangle$. If no further complex predicate formation should be applied, the embedded brackets are erased (the *bracket erasure*), and the SUBCAT list of the complex predicate *yomi-tuzuke* is $\langle NP_1 \ NP_2 \rangle$.

(8) shows the lexical entry of the Raising aspectual verb *sugi* (excess), and how the complex predicate *yomi-sugi* is formed. By the similar process to the previous example, the SUBCAT list of the mother node is $\langle \langle NP_1 \ NP_2 \rangle \rangle$, and after the embedded bracket is erased, the final SUBCAT list is $\langle NP_1 \ NP_2 \rangle$. Note that although it is the same as the final result of *yomi-tuzuke*, it is produced through a different intermediate SUBCAT list, i.e., $\langle NP_1 \ \langle NP_2 \rangle \rangle$ in *yomi-tuzuke* and $\langle \langle NP_1 \ NP_2 \rangle \rangle$ in *yomi-sugi*. I will show in the later sections how the difference of the intermediate SUBCAT list results in different behavior in more complicated complex predicate formation.

(8) Raising Aspectual Verb *sugi* (excess)



(b) *yomi-sugi*
read-excess



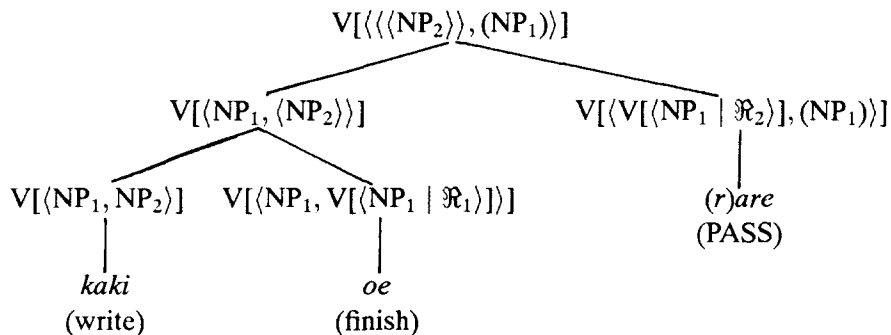
3.3 Aspectual Verb and Passive

Next, I will explain the contrast of the grammaticality of the passivized Control and Raising aspectual verbs. The generalization, which was mentioned in the section 1, is stated as follows.

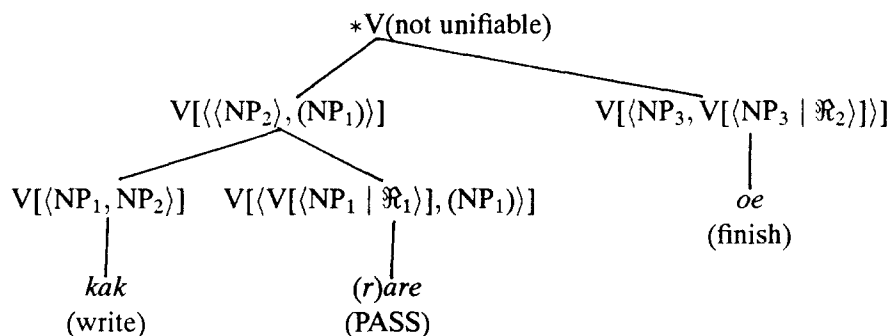
Generalization 1 *The passive form of a complex predicate V-V_a (where V_a is an aspectual verb) is V-V_a-rare if V_a is a Control aspectual verb, or V-rare-V_a if V_a is a Raising aspectual verb. (Nishigauchi and Takahashi (ms))*

The generalization can be explained in the following way. (11) shows complex predicates that includes the Control aspectual verb *-oe* (to finish).

- (11) a. *kaki-oe-rare*
write-finish-PASS



- b. * *kak-are-oe*
write-PASS-finish



In the grammatical *kaki-oe-rare* (11a), the second element of the SUBCAT list of *oe* is unified with the entry of *kaki*, and the variable \mathfrak{R}_1 is set to the list $\langle NP_2 \rangle$. Thus, the mother node of *kaki* and *oe* has the SUBCAT list $\langle NP_1, \langle NP_2 \rangle \rangle$. It is then unified with the first element of the SUBCAT list of *(r)are*, and the variable \mathfrak{R}_2 is set to the list $\langle\langle NP_2 \rangle\rangle$. The topmost mother node has the SUBCAT list $\langle\langle\langle NP_2 \rangle\rangle, (NP_1) \rangle$, as expected.

On the other hand, in the ungrammatical *kak-are-oe* (11b), the mother node of *kak* and *(r)are* has the SUBCAT list $\langle\langle NP_2 \rangle\rangle, (NP_1) \rangle$. It is incompatible with the second element of the SUBCAT

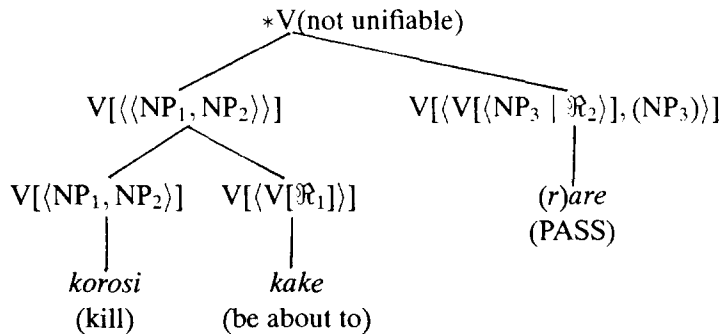
list of *oe*, because the first element of the formar is a list ($\langle\langle NP_2 \rangle\rangle$), while the latter is an entry of a noun phrase (NP_3). Thus, the unification fails, and *kak-are-oe* does not form a proper complex predicate.

(12) shows complex predicates that involves a Raising aspectual verb *kake* (be about to). In (12a) where the Raising aspectual verb precedes the passive suffix (*r*)*are*, the innermost subpredicate *koros* (kill) is combined with the aspectual verb *kake* (be about to), forming a complex predicate whose SUBCAT list is $\langle\langle NP_1, NP_2 \rangle\rangle$. However, the intermediate complex predicate *korosi-kake* cannot be unified with the first element of the SUBCAT list of the passive suffix for the same reason as the previous example (11b). Namely, the first element of the SUBCAT list of the formar is a list $\langle NP_1, NP_2 \rangle$, while the first element of the SUBCAT list of the latter is a noun phrase NP_3 , and the unification fails. Thus, *korosi-kake-rare* is ungrammatical.

On the other hand, in (12b) where the Raising aspectual verb follows the passive suffix, the unification succeeds in all the stages in the complex predicate formation. The result is a grammatical complex predicate which subcategorizes NP_2 and, optionally, NP_1 .

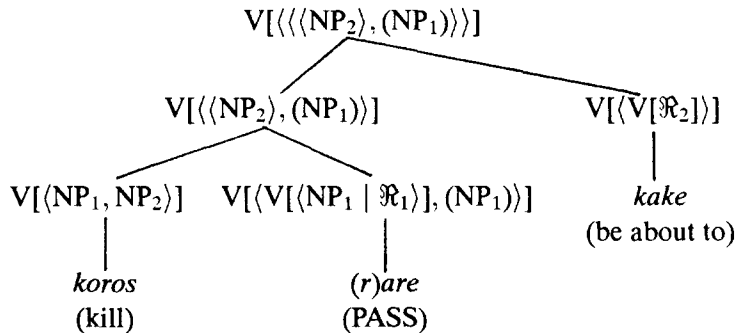
(12) a. * *korosi-kake-rare*

kill-be about to-PASS



b. *koros-are-kake*

kill-PASS-be about to

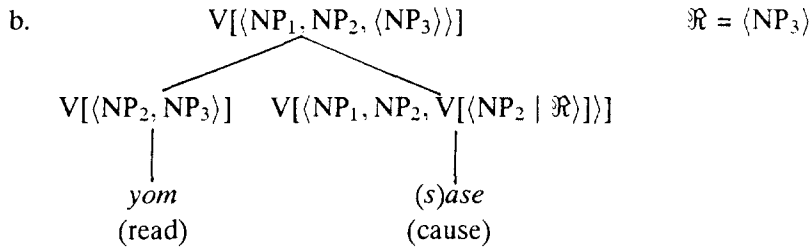
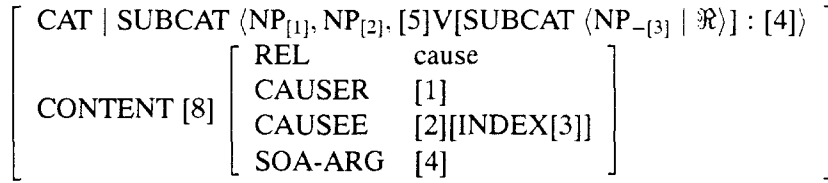


3.4 Aspectual Verb and Causative

Next, I will explain the interaction between a aspectual verb and a causative predicate. Here, I assume that the causative predicate (*s*)*ase* has the lexical entry shown in (13a). It subcategorizes

three elements: the causer NP₁, causee NP₂, and the caused event which are expressed by the embedded predicate. (13b) shows the complex predicate *yom-ase* (cause to read).

(13) a. *(s)ase* (cause)



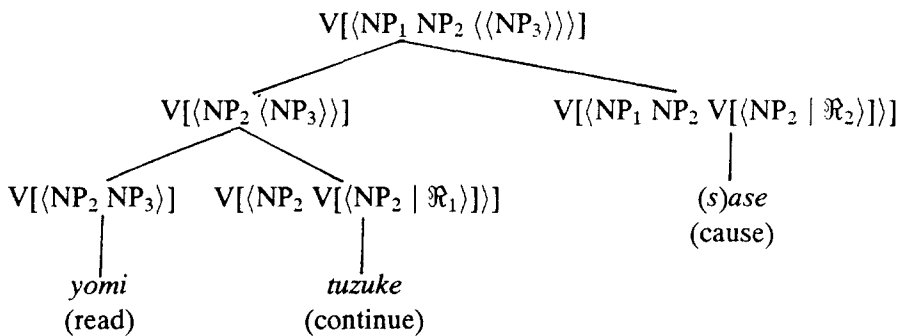
As mentioned in section 1, the generalization of the interaction between an aspectual verb and the causative predicate is stated in the following.

Generalization 2 *A Control aspectual verb may be causativized, but a Raising aspectual verb may not.*

(14a) is an example that uses a Control aspectual verb *tuzuke*, and (14b) is an example that uses a Raising aspectual verb *kake*. The contrast of the Control and Raising aspectual verbs can be explained in the similar manner as the previous aspectual verbs and passivization. Namely, the causativization of Control aspectual verb is grammatical because the unification succeeds in all the stages of the complex predicate formation. On the other hand, in (14b), when the complex predicate *yomi-kake* is combined with the causative suffix *(s)ase*, the unification of the third element $\text{V}[\langle \text{NP}_2 \mid \mathcal{R}_2 \rangle]$ of the SUBCAT list of *(s)ase* and the mother of *yomi* and *kake* fails because the first element of the SUBCAT list of the former is a noun phrase, while the first element of the SUBCAT list of the latter is a list. Thus, the causativization of Raising aspectual verb is ungrammatical.

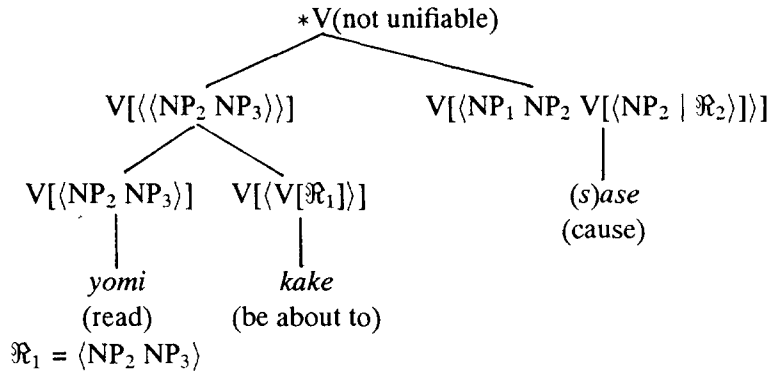
(14) a. Control Aspectual Verb and Causativization

yomi-tuzuke-sase (cause to continue reading)
read-continue-cause



$\mathfrak{R}_1 = \langle \text{NP}_3 \rangle$
 $\mathfrak{R}_2 = \langle \langle \text{NP}_3 \rangle \rangle$

- b. Raising Aspectual Verb and Causativization
 yomi-kake-sase (cause to be about to read)
 read-be about to-cause

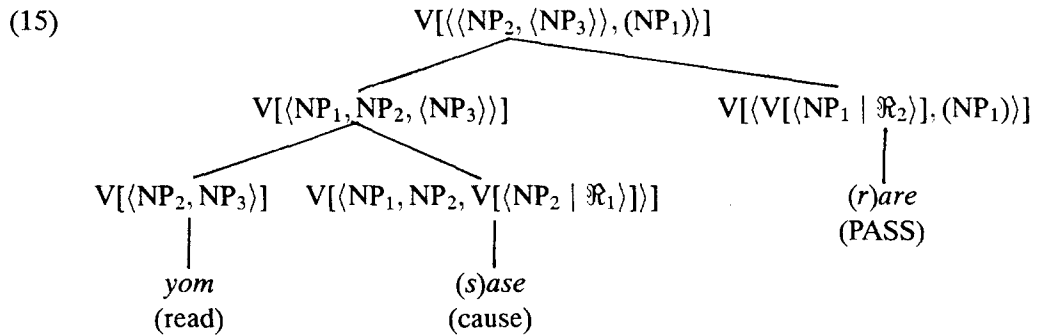


3.5 Causative-Passive

The generalization of causative-passive construction is stated in the following.

Generalization 3 *In Japanese causative-passive construction, the causee can be passivized, but the embedded theme cannot.*

An example of the causative-passive construction based on a transitive verb *yom* (read) is shown in (15). In the example, the unification succeeds in all the stages in the complex predicate formation, and the final SUBCAT list of the complex predicate (after the bracket erasure) is $\langle \text{NP}_2, \text{NP}_3, (\text{NP}_1) \rangle$, where the subject is NP_2 , which is the causee. In this case, (15) is the only grammatical combination of the complex predicate *yom-ase-rare*, and there is no way to derive a complex predicate in which the embedded theme (NP_3) becomes the subject. In this way, the above generalization is explained.



$\mathfrak{R}_1 = \langle \text{NP}_3 \rangle$
 $\mathfrak{R}_2 = \langle \text{NP}_2, \langle \text{NP}_3 \rangle \rangle$

4 Summary

In this paper, I have proposed a framework for the complex predicate formation in HPSG. Then, I have shown that the proposed framework accounts for the generalizations concerning the interaction between aspectual verbs and passive/causative suffixes.

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