Constraints and Type Hierarchies for Korean Serial Verb Constructions - An Analytic Study within the HPSG Framework -*

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Abstract. This paper provides a fine-grained analysis of Korean serial verb constructions within the HPSG framework, and covers major descriptive characteristics of the phenomena. This paper discusses constraints on serial verb constructions in terms of four aspects; transitivity, argument structure, semantic properties, and complementizers. As a result, 17 constraints have been built, which support the type hierarchies for Korean serial verb constructions. This paper also presents a sample derivation on the basis of on the constraints and the type hierarchies.

Keywords: serial verb, SVC, KSVC, HPSG, constraint, type hierarchy

1. Introduction

Sohn (1999:380) offers a general explanation to Korean Serial Verb Constructions (henceforth KSVCs) as the following.

(1) Serial predicate constructions consist of two or more predicate (flanked by a complementizer) which denote sequential actions or states that denote a single coextensive or extended event.

From a cross-linguistic perspective, Serial Verb Constructions (hereafter SVCs) are well-known for productivity. Dixon (2006:338) claims that 'a SVC is a clearly recognizable, robust grammatical constructions type which carries a considerable functional and semantic load.' Since the same goes for Korean, SVCs frequently appear in Korean, too. For example, (2) are extracted from the *Sejong POS-tagged Corpora*,[1] which take *mek-* 'eat' as V2 within the frame of 'V1 + *e* + V2.'

(2) *nanwu-e mek-ta* 'divide and eat', *kkulhi-e mek-ta* 'boil and eat', *mandul-e mek-ta* 'make and eat', *cap-a mek-ta* 'catch and eat', *cip-e mek-ta* 'pick up and eat', *ssip-e mek-ta* 'chew and eat', *kwu-e mek-ta* 'broil and eat', *ppal-a mek-ta* 'suck and eat',…

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[1] I extracted all data from these resources (morpheme-tagged corpora which cover ten million *eojeol*). According to inquiry into the corpora, 27% of verbs marked with 'vv' can be used as members in SVCs.

The purpose of this study is to provide an overall picture of KSVCs within the framework of the unification-based grammar[2], in particular, Head-driven Phrase Structure Grammar (HPSG)[3]. This paper makes a fine-grained analysis of constraints on KSVCs, and also proposes the type hierarchies for KSVCs within the HPSG framework.

2. Basic data

The expression form that this paper deals with is like (3), and examples that Sohn (1999:380) provides are given in (4).

(3) V1 + COMP[*e/a*, *ko*, *eta*] + V2

(4) a. *Cihwan.i-nun* *ttek-ul* *son-ulo* ***cip-e*** ***mek**-ess-e.*
Cihwan-TOPIC cake-ACC hand-with pick up-INF eat-PST-INT
'Cihwan (picked up and) ate the rice cake with his fingers.'

b. *mulkoki-ka* *kom-eykey* ***cap-hi-e*** ***mek-hi**-ess-ta.*
fish-NOM bear-by catch-PAS-INF eat-PAS-PST-DC
'The fish was (caught and) eaten by the bear.'

c. *Milan.i-nun* *kapnag-ul* *an* ***tul-ko*** ***ka**-ss-e.*
Milan-TOPIC bag-ACC not hold-and go-PST-INT
'Milan didn't take her bag with her.'

d. *wuli-nun* *tongkwul* *sok-ul* ***tuli-eta*** ***po**-ass-ta.*
we-TOPIC cave inside-ACC put in-TR see-PST-DC
'We looked into the cave.'

Though the KSVC is a productive operation as aforesaid, yet there are selectional restrictions between V1 and V2. The constraints on how to combine with are exemplified below.

(5) a. *mek-* 'eat', *masi-* 'drink', *cip-* 'pick up', *chayngki-* 'take care of, collect'
b. **masi-e mek-ta*, **mek-e masi-ta*
c. *cip-e mek-ta*, **mek-e cip-ta*
d. *chayngki-e mek-ta* 'take meals', *mek-e chayngki-ta* 'profiteer'

Verbs in (5b) cannot combine with each other regardless of their ordering. (5c) shows that the verb which denotes a manner is followed by the other verb, and the reversed order cannot be accepted. Both orders in (5d) are possible, but they have different meanings respectively. This paper gives an account of these restrictions with the typed feature structure of HPSG.

While other researches generally have not regarded *-ko* and *-eta* as complementizers[4] (hereafter COMP) which is used to form KSVCs, Sohn (1999) says that *-ko* and *-eta* as well as *-e/a* are used for KSVCs. Accepting his idea, I suppose constructions such as (4c-d) to be a sort of KSVCs. To be sure, if *-ko* in (4c) is regarded as a COMP for SVCs, it should be differentiated from its homonym, *-ko* 'and,' which is used for coordination constructions.

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[2] Sag and Wasow (1999:52) defines unification as below.

Unification, then, is just a general method for allowing two compatible descriptions to amalgamate the information they contain into a single (usually larger) description.

The function of unification implies that HPSG can provide a more superior solution to SVCs, because SVCs basically stand for the process that two or more verbs are unified into one single unit.

[3] I find few studies have been done on KSVCs in HPSG. An overview of Korean grammar within the HPSG framework is given in Chang (1995) and Kim (2004), but they do not deal with KSVCs.

[4] This term may be rather controversial because KSVCs are not complex clauses in a general sense. I tentatively define the suffix that attach to V1 as COMP in this paper, which is similar to a COMP of Chang (1995:16) or a complementizer affix of Kim (2004:52).

(6) *Mia-ka phathi-eyse mek-ko masi-ess-ta.*
Mia-NOM party-LOC eat-and drink-PST-DC
'Mia ate and drank at the party.'

Despite a superficial resemblance, there is an obvious difference between *-ko* in (4c) and *-ko* in (6). A tense marker such as *-ess* can attach to V1 *mek-* in (6), while it can not attach to V1 *tul-* in (4c). I treat the construction like (4c) as KSVCs on the ground of this difference. In the case of *-eta*, I think it is a variation of *-e*/*a*, which has been formed through a historical development.

Aikhenvald (2006) suggests that SVC functions like a single predicate to represent 'One Event.' Building upon her claim, I assume that two verbs combine with each other before anything else to be a single predicate. I also consider V2 the head of SVCs, because tense or aspect makers should attach to V2, which is similar to Chung (1995)'s structure.

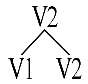

Figure 1: The structure of KSVCs (Chung 1995:70)

3. Constraints

In this section, I will inspect the constraints on KSVCs in terms of four aspects; transitivity, argument structure, semantic properties, and COMPs. In order to make this study based on more synthetic approach, I tried to collect relevant data in a systematic way from large corpora. To tell in the concrete, I made practical application of the *Sejong POS-tagged Corpora*. Implementing some programs which aim to extract the form 'X/vv + X/ec + X/vv' from the corpora, I could obtain first data. After that, I excluded problematic forms from the list in conformity to criteria for distinguishing between KSVCs and others. From now on, all analyses to constraints are grounded upon these demonstrative data.

3.1.Transitivity

After investigating the data, I discover the forms that the transitivity of V1 is smaller than that of V2 or equal to are more common. However, there are also the cases that the transitivity of V1 is bigger than that of V2. For instance, *cip-e ka-ta* 'pick up and go' is made up of transitive V1 *cip-* and intransitive V2 *ka-*. In this case, it is interesting that V2 is a deictic verb almost invariably.[5] This analysis is also applicable to the constructions which take *-ko* as a COMP; for example, *tul*[transitive]-*ko ka*[intransitive, DEIXIS +]-*ta* 'hold and go' in (4c). Meanwhile, I also observe that 'V1[ditransitive] + V2[transitive]' constructions are not SVCs, because their arguments cannot be unified.

3.2.Argument structure

From the data shown below, I conclude that grammatical cases are unified into the single predicate which is composed of V1 and V2. And also (7) shows that oblique cases will not be constraints on KSVCs. They are merely subsumed into the unified argument structure.

(7) a. *Mia-ka hak.kyo-ey kel-e ka-ass-ta*.
Mia-NOM school-DIR walk-INF go-PST-DC
'Mia went to school on foot.'
ket(*kel*)- 'walk' (NOM/AGT)
ka- 'go' (NOM/AGT, OBL/DIR)

[5] It is analogous to Hashimoto and Bond (2005:153)'s analysis of V-V Compounds in Japanese.
Another peculiarity involves the fact that the V2 is restricted to a monotrans verb that expresses a spatial motion, while the V1 is transitive and must not be a spatial motion verb.

b. *Mia-ka* *ppang-ul* *hak.kyo-ey* *cip-e* *ka-ass-ta.*
Mia-NOM bread-ACC school-DIR pick up-INF go-PST-DC
'Mia picked up the bread and went to school.'
cip- 'pick up' (NOM/AGT, ACC/THM)
ka- 'go' (NOM/AGT, OBL/DIR)

c. *Mia-ka* *sakwa-lul* *khal-lo* *kkakk-a* *mek-ess-ta.*
Mia-NOM apple-ACC knife-INST pare-INF eat-PST-DC
'Mia pared an apple with a knife and ate it.'
kkakk- 'pare' (NOM/AGT, ACC/THM, OBL/INST)
mek- 'eat' (NOM/AGT, ACC/THM)

d. *Mia-ka* *Cihwan.i-ekey* *chayk-ul* *sa-a* *cu-ess-ta.*
Mia-NOM Cihwan-DAT book-ACC buy-INF give-PST-DC
'Mia bought a book and gave it to Cihwan.'
sa- 'buy' (NOM/AGT, ACC/THM)
cu- 'give' (NOM/AGT, ACC/THM, OBL/DAT)

3.3.Semantic properties

Maunsuwan (2000) introduces FIRST and LAST features into the analysis of Thai SVCs, because a 'manner-of-motion' verb is followed by a 'deictic' verb in Thai.

(8) FIRST and LAST (Maunsuwan 2000:241)
a. manner-of-motion verbs or verbs that entail motion are lexically marked as [FIRST +], meaning that a VP headed by a verb from this class must occur first in the SVC.
b. verbs that take a deictic verb as complement are lexically marked as [LAST +], meaning that a VP headed by a verb from this class must occur last in the sequence of verb complexes.
c. other non-deictic serial verbs are lexically marked as [FIRST boolean, LAST boolean] meaning that they are not constrained in their order of occurrence.

Although Maunsuwan adopts double-headed structure for SVCs, the above solution is similarly available for KSVCs. But, it is so difficult to classify all verbs into subclasses only by intuition. Instead, this paper defines the feature of a verb by inductive methods based on large corpora. Since I extracted verbs' frequency according to their distribution from the corpora previously, it does not fall into hard work.

(9) a. [FIRST +, LAST −]: *cip-* 'pick up', *kkekki-* 'be broken', *khay-* 'dig', *cec-* 'stir', …
b. [FIRST −, LAST +]: *masi-* 'drink', *kku-* 'extinguish', *sey-* 'count', *kkaywu-* 'wake up', …
c. [FIRST boolean, LAST boolean]: <u>*ka-* 'go'</u>, <u>*ket*(*kel*)- 'walk'</u>, <u>*tani-* 'wander'</u>, *wus-* 'laugh', , *mek-* 'eat', *chayngki-* 'take care of, collect', *ccic-* 'tear', *chac-* 'find', *tat-* 'close', …

The restriction on ordering between V1 and V2, mentioned in (5b-c), can be solved with these typed feature structures, which will be presented in (18). There is, however, a weak point in the collection (9). The underlined items in (9) belong to the so-called motion verbs, but (9) cannot give a solution to discriminate between acceptability and unacceptability in (10). Since motion verbs play a significant role in SVCs in any kind of languages, the grammar for SVCs should take motion verbs into consideration.

(10) a. *kel-e ka-ta*, **ka-a ket-ta*
b. *tani-e ka-ta*, **ka-a tani-ta*
c. *kel-e tani-ta*, **tani-e ket-ta*
d. **wus-e ka-ta*, **ka-a wus-ta*

Lee (1977) classifies motion verbs into two subclasses; one denotes a 'manner-of-motion', the other denotes a 'spatial movement.' In (10), *ket*(*kel*)- 'walk' expresses a 'manner-of-motion,' *ka*- 'go' is a typical deictic verb, and *tani*- 'wander' belongs to both the former and the latter. In line with Lee's classification, I build up types for motion verbs as below.

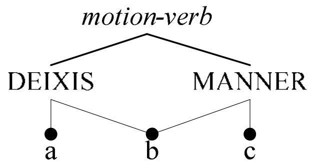

Figure 2: The types of motion verbs

(11) a. [DEIXIS +, MANNER –] : *ka*- 'go'
b. [DEIXIS +, MANNER +] : *tani*- 'wander'
c. [DEIXIS –, MANNER +] : *ket*(*kel*)- 'walk'

(11) offers a solution to the puzzle raised in (10a-c). On the other side, verbs which do not express motion, such as *wus*- 'laugh,' have the typed feature structure like [DEIXIS –, MANNER –]. This structure plays a role to block the ungrammatical construction such as (10d). With these types, I can seek an appropriate treatment for KSVCs which include motion verbs. The related constraints will be shown in (21) and (22).

3.4.COMPs

The constructions with *-e*/*a* are classified into six subclasses with reference to each composition. They are exemplified in (12)[6].

(12) a. intransitive + intransitive : *kel-e ka-ta* 'go on foot'
b. transitive + intransitive : *cip-e ka-ta* 'pick up and go'
c. ditransitive + intransitive : *ponay-e o-ta* 'send to me/us'
d. transitive + transitive : *cip-e mek-ta* 'pick up and eat'
e. intransitive + transitive : *ttwi-e nem-ta* 'jump over'
f. transitive + ditransitive : *sa-a cu-ta* 'buy and give'

The construction with *-ko* has only one type such as 'transitive + intransitive' (e.g. *tul-ko ka-ta* 'hold and go'). In this case, it is clear that the intransitive V2 has a [DEIXIS +] feature.

In the case of the construction with *-eta,* although Sohn (1999) presents only one case whose V2 is *po*- 'look', there are various cases in my data. It is noticeable that the constructions with -*eta* select their verbs in restricted lexicon. In other words, *-eta* constructions have a tendency to become lexicalized.

(13) a. V1 in constructions with *-eta*: *kaci*- 'have', *nay*- 'put out', *nay-li*- 'be set down', *tuli*- 'put in', *pili*- 'borrow', *chi*- 'hit', …
b. V2 in constructions with *-eta*: *peli*- 'discard', *po*- 'see', *po-i*- 'be seen', *ssu*- 'use', *phal* 'sell', …

There are two types in *-eta* constructions. One is 'transitive + transitive' (e.g. *tuli-eta po-ta* 'look inside'), the other is 'intransitive[PASSIVE +] + intransitive[PASSIVE +]' (e.g. *nay-li-eta po-i-ta*[7] 'be looked down').

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[6] (12) is partially adapted from Lee (1994).

[7] In this example, I come to the conclusion that *nay-li*- is transformed into passives after once becoming causatives (i.e. *na*-[root] → *nay*-[causative] → *nay-li*-[passive]).

3.5.Summary

Generalizing facts discussed so far, I sum up constraints on KSVCs as follows.

(14) Constraints on KSVCs

a. If the transitivity of V1 is bigger than that of V2, the V2 is an intransitive verb which has a [DEIXIS +] feature.

b. Grammatical cases are unified into the argument structure of their mother-category, whereas oblique cases are subsumed.

c. V1 has a [FIRST +] feature and V2 has a [LAST +] feature.

d. If a SVC includes motion verbs, V1 has a [MANNER +] and V2 has a [DEIXIS +].

e. In *-ko* constructions, V2 is an intransitive with a [DEIXIS +].

f. In *-eta* constructions, the set of lexicon is rather restricted.

4. Type Hierarchies

Dixon (2006:342), from a typological standpoint, claims 'two basic varieties of SVC can be distinguished, asymmetrical and symmetrical.' Asymmetrical constructions consist of some limited lexicon (e.g. motion verbs) and tend to become grammaticalized, whereas symmetrical constructions where both members come from an open class tend to become lexicalized.

It is said that grammaticalization is the development from lexical expression to functional expression. The other way around, lexicalization refers to 'process whereby concepts are encoded in the words of a language (O'Grady et al. 2005:212).' In this context, it seems that a deictic verbs are under grammaticalization because the original meaning of *ka-* 'go' or *o-* 'come' is diluted in KSVCs. In contrast, *-e/a* constructions, the ordinary form of KSVCs, are inclined to become lexicalized. The obvious evidence is the so-called compound verb.

(15) a. *Mia-ka pam-ul kka-a mek-ess-ta.*
Mia-NOM chestnut-ACC peel-INF eat-PST-DC
'Mia peeled a chestnut and ate it.'

b. *Mia-ka yaksok-ul kka-a mek-ess-ta.*
Mia-NOM appointment-ACC peel-INF eat-PST-DC
'Mia forgot an appointment.' (Oh 1997:26)

(15) shows that the expression such as *kka-a mek-ta* 'peel and eat, forget' is being lexicalized. *mek-e chayngki-ta* 'profiteer' in (5d), likewise, is the result of lexicalization, because it cannot convey senses of *mek-* 'eat' and *chayngki-* 'take care of, collect' wholly. In addition, *-eta* construction, as stated before, is another evidence for lexicalization of symmetrical KSVCs. If we remember members in *-eta* construction are both transitive or both intransitive[PASSIVE +], we can suggest the *-eta* construction shows a typical symmetry. In sum, we can divide KSVCs into two groups in accordance with compositionality.

(16) Compositionality of KSVCs

a. Asymmetrical constructions: TRANSITIVITY(V1) > TRANSITIVITY(V2)

b. Symmetrical constructions: TRANSITIVITY(V1) ≤ TRANSITIVITY(V2)

In this paper, I adapt above compositionality as a prominent branching node for type hierarchies. The reason why I consider compositionality as a major point of hierarchies is that the unification of argument structure mainly depends on compositionality. In asymmetrical constructions, the first complement of the mother-category is co-indexed with the first complement of V1. On the other hand, in symmetrical constructions, the complements of V2 are mainly transmitted to the complements of the mother-category. Another important criterion to decide its types is what COMP is made use of. The major types are sketched out below.

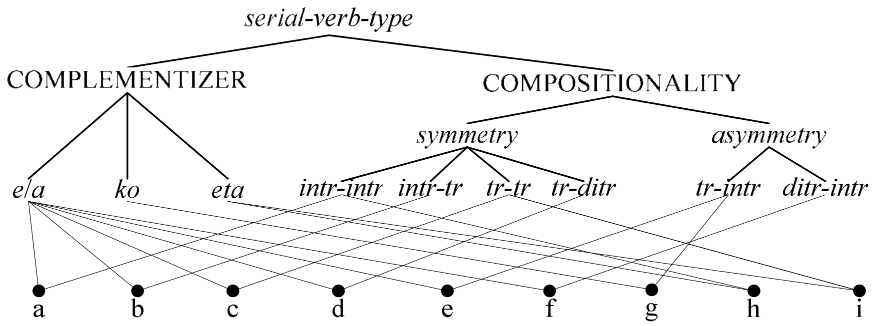

Figure 3: The major types of KSVCs

(17) a. *serial-ea-sym-intr-intr*: *kel-e ka-ta* ‘go on foot’
b. *serial-ea-sym-intr-tr*: *ttwi-e nem-ta* ‘jump over’
c. *serial-ea-sym-tr-tr*: *cip-e mek-ta* ‘pick up and eat’
d. *serial-ea-sym-tr-ditr*: *sa-a cu-ta* ‘buy and give’
e. *serial-ea-asym-tr-intr*: *cip-e ka-ta* ‘hold and go’
f. *serial-ea-asym-ditr-intr*: *ponay-e o-ta* ‘send to me/us’
g. *serial-ko*: *tul-ko ka-ta* ‘hold and go’
h. *serial-eta-intr*: *nay-li-eta po-i-ta* ‘be looked down ’
i. *serial-eta-tr*: *tuly-eta po-ta* ‘look inside’

Korean syntactic structure presented below is adapted from Kim(2004:76). I would like to locate *hd-serial-ex* as a subclass of *lex-ex*, because V1 and V2 combined with each other to build a new verbal expression at the stage of lexical category.

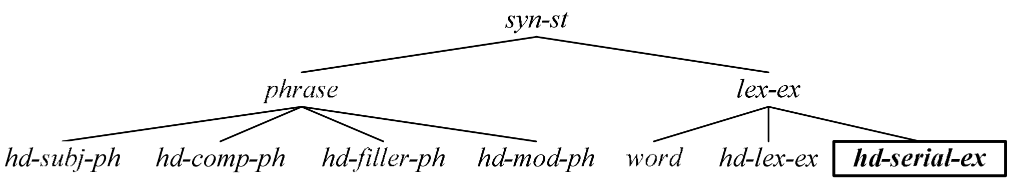

Figure 4: The revised syntactic structure including *hd-serial-ex*

hd-serial-ex shares some properties with *hd-lex-ex* from the points that two verbs combine with each other so as to be a single verb, and the V2 is the head. But, *hd-serial-ex* draws a clear difference with *hd-lex-ex* in respect of argument structure. In *hd-lex-ex* such as the auxiliary construction, V2 takes V1 as its complement (see Kim 2004:123), whereas both V1 and V2 in *hd-serial-ex* do not take each other as complement. The whole type hierarchies that I propose are shown below.

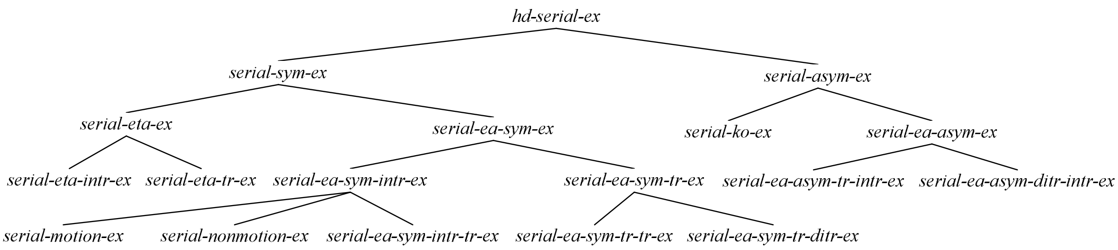

Figure 5: The whole hierarchies for *hd-serial-ex*

Constraints for each type are given as follows. In particular, (18), the top node of KSVCs, indicates that V1 and V2 share the subject, they have a [FIRST +] feature and V2 has a [LAST +] feature, and the head of SVCs is V2.

(18) *hd-serial-ex* ⇒

$$\begin{bmatrix} \text{VAL} \mid \text{SUBJ } \textcircled{1} \\ \text{ARGS} \left\langle \begin{bmatrix} \text{VAL} \mid \text{SUBJ } \textcircled{1} \\ \text{FIRST} + \end{bmatrix}, \mathbf{H} \begin{bmatrix} \text{VAL} \mid \text{SUBJ } \textcircled{1} \\ \text{LAST} + \end{bmatrix} \right\rangle \end{bmatrix}$$

(19) *serial-ea-sym-ex* ⇒

$$\left[\text{ARGS} \left\langle [\text{VFORM } \textit{ea}], [\ ] \right\rangle \right]$$

(20) *serial-ea-sym-intr-ex* ⇒

$$\begin{bmatrix} \text{VAL} \mid \text{COMPS } \textcircled{1} \\ \text{ARGS} \left\langle [\ ], [\text{VAL} \mid \text{COMPS } \textcircled{1}] \right\rangle \end{bmatrix}$$

(21) *serial-motion-ex* ⇒

$$\left[\text{ARGS} \left\langle [\text{MOTION} \mid \text{MANNER} +], \begin{bmatrix} \text{MOTION} \mid \text{DEIXIS} + \\ \text{VAL} \mid \text{COMPS} \left\langle [\text{CASE} \mid \text{SCASE } \textit{scase}] \right\rangle \end{bmatrix} \right\rangle \right]$$

(22) *serial-nonmotion-ex* ⇒

$$\left[\text{ARGS} \left\langle [\text{MOTION} \mid \text{DEIXIS} -], [\text{MOTION} \mid \text{DEIXIS} -] \right\rangle \right]$$

(23) *serial-ea-sym-intr-tr-ex* ⇒

$$\left[\text{ARGS} \left\langle [\text{VAL} \mid \text{COMPS } \langle\ \rangle], [\text{VAL} \mid \text{COMPS} \langle [\text{CASE} \mid \text{GCASE } \textit{acc}], \ldots \rangle] \right\rangle \right]$$

(24) *serial-ea-sym-tr-ex* ⇒

$$\begin{bmatrix} \text{VAL.COMPS} \langle \textcircled{1}, \ldots \rangle \\ \text{ARGS} \left\langle [\text{VAL} \mid \text{COMPS} \langle \textcircled{1}, \ldots \rangle], [\text{VAL} \mid \text{COMPS} \langle \textcircled{1} [\text{CASE} \mid \text{GCASE } \textit{acc}], \ldots \rangle] \right\rangle \end{bmatrix}$$

(25) *serial-ea-sym-tr-tr-ex* ⇒

$$\begin{bmatrix} \text{VAL} \mid \text{COMPS} \langle [\ ], \textcircled{1} \rangle \\ \text{ARGS} \left\langle [\text{VAL} \mid \text{COMPS} \langle [\ ], \textcircled{1} \rangle], [\text{VAL} \mid \text{COMPS} \langle [\ ] \rangle] \right\rangle \end{bmatrix}$$

(26) *serial-ea-sym-tr-ditr-ex* ⇒

$$\begin{bmatrix} \text{VAL} \mid \text{COMPS } \langle [\ ], \textcircled{1}, \textcircled{2} \rangle \\ \text{ARGS} \left\langle [\text{VAL} \mid \text{COMPS} \langle [\ ], \textcircled{2} \rangle], [\text{VAL} \mid \text{COMPS} \langle [\ ], \textcircled{1} \rangle] \right\rangle \end{bmatrix}$$

(27) *serial-eta-ex* ⇒

$$\begin{bmatrix} \text{VAL} \mid \text{COMPS } \textcircled{1} \\ \text{ARGS} \left\langle \begin{bmatrix} \text{VFORM } \textit{eta} \\ \text{VAL} \mid \text{COMPS } \textcircled{1} \end{bmatrix}, [\text{VAL} \mid \text{COMPS } \textcircled{1}] \right\rangle \end{bmatrix}$$

(28) *serial-eta-intr-ex* ⇒

$$\left[\text{ARGS} \left\langle [\text{PASS} +], [\text{PASS} +] \right\rangle \right]$$

(29) *serial-eta-tr-ex* ⇒

$$\left[\text{ARGS} \left\langle [\ ], [\text{VAL} \mid \text{COMPS} \langle [\text{CASE} \mid \text{GCASE } \textit{acc}], \ldots \rangle] \right\rangle \right]$$

(30) *serial-asym-ex* ⇒

$$\begin{bmatrix} \text{VAL} \mid \text{COMPS} \langle \textcircled{1}, \ldots \rangle \\ \text{ARGS} \left\langle [\text{VAL} \mid \text{COMPS} \langle \textcircled{1} [\text{CASE} \mid \text{GCASE } \textit{acc}], \ldots \rangle], [\text{MOTION} \mid \text{DEIXIS} +] \right\rangle \end{bmatrix}$$

(31) *serial-ea-asym-ex* ⇒

$$\left[\text{ARGS} \left\langle [\text{VFORM } \textit{ea}], [\ ] \right\rangle \right]$$

(32) *serial-ea-asym-tr-intr-ex* ⇒

$$\begin{bmatrix} \text{VAL} \mid \text{COMPS} \langle [\ ], \textcircled{1} \rangle \\ \text{ARGS} \left\langle [\text{VAL} \mid \text{COMPS} \langle [\ ] \rangle], [\text{VAL} \mid \text{COMPS } \textcircled{1}] \right\rangle \end{bmatrix}$$

(33) *serial-ea-asym-ditr-intr-ex* ⇒

$$\begin{bmatrix} \text{VAL}\,|\,\text{COMPS}\left\langle [\ ], \textcircled{1}, \textcircled{2} \right\rangle \\ \text{ARGS}\left\langle [\text{VAL}\,|\,\text{COMPS}\left\langle [\ ], \textcircled{1} \right\rangle], [\text{VAL}\,|\,\text{COMPS}\ \textcircled{2}] \right\rangle \end{bmatrix}$$

(34) *serial-ko-ex* ⇒

$$\begin{bmatrix} \text{VAL}\,|\,\text{COMPS}\left\langle [\ ], \textcircled{1} \right\rangle \\ \text{ARGS}\left\langle \begin{bmatrix} \text{VFORM } \textit{ko} \\ \text{VAL}\,|\,\text{COMPS}\left\langle [\ ] \right\rangle \end{bmatrix}, [\text{VAL}\,|\,\text{COMPS}\ \textcircled{1}] \right\rangle \end{bmatrix}$$

Finally, referring to Kim and Yang (2006), I suggest Head-Serial-Lex Rule as (35) for the semantic representation of KSVCs.

(35)

$$\begin{bmatrix} \text{LEX} + \\ \text{C-CONT}\,|\,\text{RELS} \left\langle \begin{bmatrix} \textit{serial-rel} \\ \text{L-IND}\ \textcircled{1} \\ \text{R-IND}\ \textcircled{2} \end{bmatrix} \right\rangle \end{bmatrix} \rightarrow \begin{bmatrix} \textit{v-word} \\ \text{LEX} + \\ \text{INDEX}\ \textcircled{1} \end{bmatrix}, \begin{bmatrix} \textit{v-word} \\ \text{LEX} + \\ \text{INDEX}\ \textcircled{2} \end{bmatrix}$$

5. A sample derivation[8]

This section, instead of conclusion, provides the concrete syntactic structure with a sample sentence given in (7b). For convenience' sake, (7b) is re-written down.

(36) *Mia-ka* *ppang-ul* *hak.kyo-ey* *cip-e* *ka-ass-ta*.
Mia-NOM bread-ACC school-LOC pick up-INF go-PST-DC
'Mia picked up the bread and went to school.'
cip- 'pick up' (NOM/AGT, ACC/THM)
ka- 'go' (NOM/AGT, OBL/DIR)

Since *cip-e ka-ass-ta* in above sentence belongs to *serial-e-asym-tr-intr-ex*, I present the AVM which represents the SVC as (37). The final tree structure is also sketched out below.

(37)

$$\begin{bmatrix} \textit{serial-e-asym-tr-intr-ex} \\ \text{PHON}\left\langle \textit{cip-e ka-ass-ta} \right\rangle \\ \text{HEAD}\ \textcircled{1} \\ \text{VAL}\begin{bmatrix} \text{SUBJ}\left\langle \text{NP}_{[nom]} \right\rangle \\ \text{COMPS}\left\langle \text{NP}_{[acc]}\ ,\ \text{NP}_{[dir]} \right\rangle \end{bmatrix} \\ \text{C-CONT}\,|\,\text{RELS}\left\langle \begin{bmatrix} \textit{serial-rel} \\ \text{L-IND}\ \textcircled{2} \\ \text{R-IND}\ \textcircled{3} \end{bmatrix} \right\rangle \\ \text{ARGS}\left\langle \begin{bmatrix} \text{PHON}\left\langle \textit{cip-e} \right\rangle \\ \text{INDEX}\ \textcircled{2} \end{bmatrix}, \textcircled{1}\begin{bmatrix} \text{PHON}\left\langle \textit{ka-ass-ta} \right\rangle \\ \text{INDEX}\ \textcircled{3} \end{bmatrix} \right\rangle \end{bmatrix}$$

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[8] I have tried to implement the type hierarchies for KSVCs into the *Linguistic Knowledge Building* system in order to check the computational feasibility of my proposals. All sample sentences in this paper have been tested in the *Linguistic Knowledge Building* system**.**

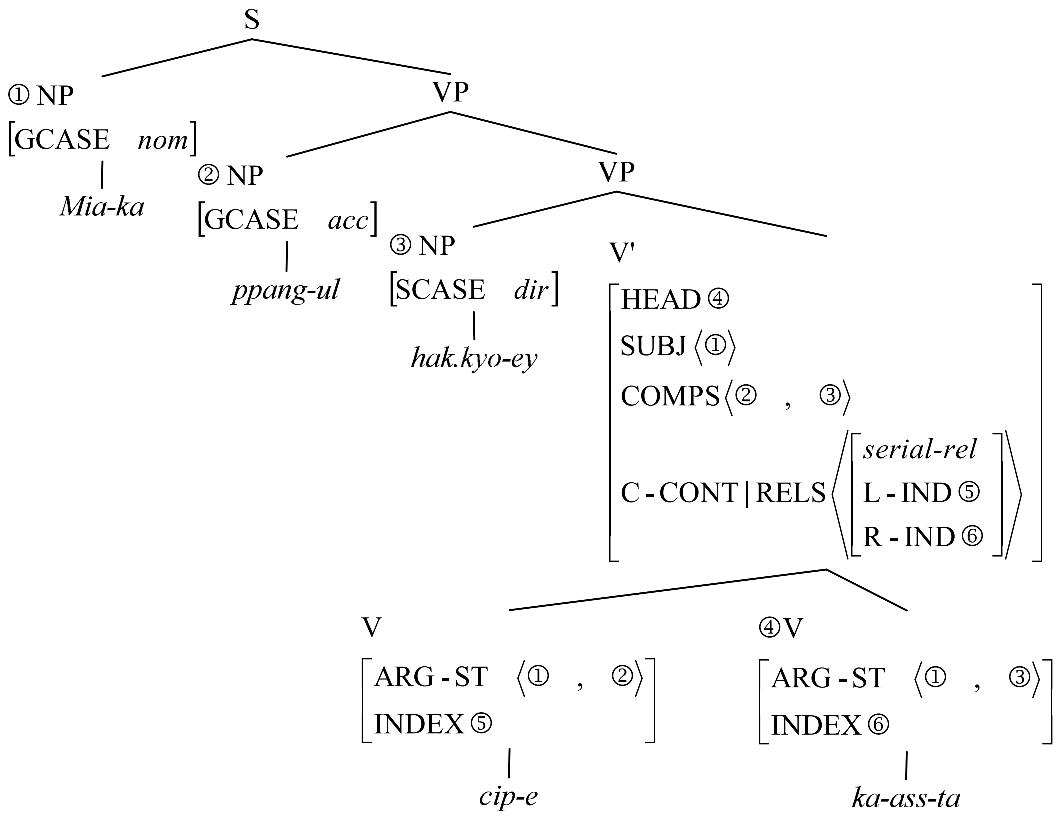

Figure 6: The tree diagram of (36)

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