

On the Syntax and Semantics of the Bound Noun Constructions: With a Computational Implementation*

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Abstract

The so-called Korean BNC (bound noun construction) displays complex syntactic, semantic, and constructional properties. To provide a constraint-based approach to account for these properties, this paper adopts two different syntactic structures for the construction with articulated lexical properties for the BNs and relevant predicates. In order to check the explicitness and feasibility of the analysis, we have computationally implemented this analysis in the LKB (Linguistic Knowledge Building) system, and the result shows us that the analysis is robust enough to offer us desired syntactic structures as well as semantic representations for the construction in question.

Key words: bound noun construction, complex predicate, implementation

1 Introduction

Bound nouns (BN) exhibit various peculiar properties, not found in common nouns in Korean. For example, unlike canonical nouns, bound nouns cannot occur independently: they obligatorily select a complement (determiner or

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sentence). This is rather unusual when considering the language allows most of the arguments to be freely omitted in proper context:¹

- (1) a. *(i) kes
this thing
- b. *(wuli-ka motu nollass-ten) kes
we-NOM all surprise-MOD BN
'the thing that we are all surprised at'

Bound nouns also place restrictions on the types of their complements. There are at least two different types of BNs with respect to their complements: BNs selecting only a dependent clause (Type I) and those selecting either a dependent clause or a determiner phrase (Type II) (cf. Cha 2001):²

- (2) a. Type I: *cheyk* 'pretense', *cwul* 'method', *li* 'reason', *cek* 'experience', *ppen* 'being close to doing something', *ba* 'way', etc.
- b. Type II: *swu* 'possibility', *hwu* 'after', *cen* 'before', etc

For example, unlike Type II BN *hwu*, Type I BN *li* selects only a dependent sentence, as observed in the following contrast:

- (3) a. [John-i cam-ul ca-n]/ku hwu-ka mwusep-ta
John-TOP sleep-ACC sleep-MOD/that after-NOM fearful-DECL
'It is fearful after John was sleeping/after the time'
- b. [John-i cam-ul ca-l]/*ku li-ka eps-ta
John-NOM sleep-ACC sleep-MOD/that possibility-NOM not.exist-DECL
'It is not possible that John is sleeping'

Bound nouns also place tight restrictions on the verb forms of their sentential complement. In the noun complement construction (NCC), the dependent clause places no strict constraints on the head verb's VFORM value:

¹The glosses we use in this paper are as follow: ARG-ST (argument-structure), ACC (accusative), BN (bound noun), COMP (complementizer), COMPS (complements), DECL (declarative), FUT (future), NOM (nominative), MOD (modifier), TOP (topic), POS (parts of speech), PRS (present), PRED (predicate), PST (past), RELS (relations), SUBJ (subject), SEM (semantics), etc.

²In the dependent clause, different from an independent clause, the head verb is inflected with a dependent suffix like *-e* as in *mek-e* 'eat-COMP', disabling it to function as an independent parsing unit. See Kim (2004).

- (4) [John-i cam-ul ca-n/ca-ss-ta-nun] sasil
 John-TOP sleep-ACC sleep-PRES-mod/sleep-PAST-DECL-PNE fact
 ‘the fact that John slept

As in (4), the head verb of the dependent clause, functioning as the complement of the factive noun *sasil* ‘fact’, can be either in a short form *ca-n* or in a full form *ca-ss-ta-nun* with the declarative ending. Meanwhile, in the BN construction, the head verb of the dependent clause cannot be in a full verb form: only a short form with restricted tense is allowed:

- (5) a. John-un cam-ul ca-l/*ca-n-ta-nun/*ca-n
 John-TOP sleep-ACC sleep-FUT.mod/*sleep-PRES-DECL-PNE/*sleep-PRS.mod
 swu-ka eps-ess-ta
 possibility-NOM not.exist-PAST-DECL
 ‘John couldn’t sleep.’
- b. John-un cam-ul ca-nun/*ca-n-ta-nun/*ca-l
 John-TOP sleep-ACC sleep-PRS.mod/*sleep-PRS-DECL-PNE/sleep-FUT.mod
 chey hayess-ta
 pretense did-DECL
 ‘John pretended to sleep.’

In both cases, the full dependent form (with the declarative marking) is not possible. In addition, the BN *swu* requires the head verb of its complement clause be in the future form, whereas *chey* restricts the dependent verb to be marked with the present tense.

Bound nouns are also peculiar in that they impose restrictions on the types of predicates following them. For example, the BN *swu* ‘possibility’ can combine only with the predicate *iss-* ‘exist’ or *eps-* ‘not exist’ whereas the BN *li* with a similar meaning requires only the latter verb *eps-* ‘not.exist’. Also BNs like *tus* ‘likeliness’, *ppen* ‘chance’, and *ccek* ‘pretense’ occur only with *ha-* ‘do’, whereas BNs like *kes* can be followed only by the auxiliary verb *kath-ta* ‘seem’:³

³There are several different usages of the bound noun *kes*:

- (i) a. John-i cam-ul ca-n kes-i pwunmyenghata
 John-NOM sleep-ACC sleep-MOD BN-NOM clear
 ‘It is clear that John slept.’
- b. John-i ilk-un kes-i chaky-i-ta
 John-NOM read-MOD BN-NOM book-COP-DECL
 ‘What John read is a book.’

- (6) a. [John-i o-l li-ka] eps-ta/*iss-ta/*kath-ta
 John-i come-MOD reason-NOM not.exist-DECL/exist-DECL/seem-DECL
 ‘It is unlikely that John will come.’
- b. [John-i o-l tus] ha-ta/*eps-ta/*kath-ta
 John-NOM come-MOD possible do-DECL/not.exist/seem-DECL
 ‘It seems that John will come.’
- c. [John-i o-l kes] kath-ta/*issta
 John-NOM come-MOD possible seem-DECL/exist.
 ‘It seems that John will come.’

Bound nouns have an additional restriction on the occurrence with a case or delimiter (DEL) marker, which may be related to the function of the dependent clause (cf. Cha 2001):

- (7) a. No restrictions: either NOM or ACC can be attached to the BN: *tey* ‘place’, *pa* ‘way’, *ccohk* ‘side’, etc
- b. Only NOM: *li* ‘reason’, *nawi* ‘degree’, *swu* ‘possibility’, etc
- c. Only ACC: *cwul* ‘way’, *chey* ‘pretense’, etc
- d. Only DEL: *tus* ‘seem’, *man* ‘possible’, *sang* ‘seem’, *kes* ‘possible’, etc

The fact that the BNs in (7)b can occur only with NOM and those in (7)c only with ACC can be expected when considering the possible predicate they can be followed. For example, the BN *nawi* requires its following predicate to be an intransitive verb *eps-ta* ‘not.exist’, indicating that the clause headed by this BN functions as a subject. Though all the BNs can occur with a delimiter, those in (7)d allow no case markers at all:

- (8) a. pi-ka o-nun tus-*ul/*i ha-ta
 rain-NOM come-PNE seem-ACC/NOM do-DECL
 ‘It seems to rain.’
- b. John-i o-l *kes-i kath-ta
 John-NOM come-MOD seem-*NOM seem-DECL/exist.
 ‘It seems that John will come.’

The usages of *kes* here are also a bound noun in that it must combine with a dependent clause. The BN *kes* we focus in this paper is the one followed by the auxiliary verb *kath-ta* ‘seem’.

As observed here and in the literature, BNs display complex combinatory possibilities with their complements, case/delimiter markers, and predicates following them. In addition to the constructional properties that each BNC shares, each BN also has its own idiosyncratic properties. This implies that to process these BN constructions with intriguing properties, we need to develop an explicit syntactic and semantic analysis.

2 Syntax and Semantics of the Bound Noun Construction

2.1 Two Different Types

Based on the observations we have seen so far, one could argue that a BN and the predicate following it forms a morphological unit (or undergoes a lexical process). However, this fails empirically in several respects: the BN's occurrence with a case or delimiter marker evidences both its syntactic and phonological independence from the following predicate:

- (9) a. *sensayngnim-i o-si-l* *swu-(ka/cocha/man)* *eps-ta*
 teacher-NOM come-HON-PNE possibility-NOM/even/only not exist
 ‘It is not possible that the teacher comes.’
- b. *sensayngnim-i o-si-l* *kes-(to/man)* *kath-ta*
 teacher-NOM come-HON-PNE possible-also/only seem
 ‘It seems that the teacher also will come.’

If one takes the BN with the following predicate as an inseparable lexical unit (e.g., *swu-iss-ta*), we would ignore the traditional wisdom of wordhood and not account for such productive processes.

One basic syntactic property that BNs and their complements have is that they form a tight syntactic unit with the selected complement clause: no element can intervene between the two:⁴

- (10) a. [*wuli-ka kwanye* *ha-l*] (**cincca*) *pa-ka* *ani-ta*
 we-NOM intervention do-MOD really way-NOM not-DECL
 ‘This is not the case where we can intervene.’

⁴As a reviewer questioned, even though no element can intervene between a prenominal relative clause and its head, it is possible to have a complex head noun:

- (i) [*wuli-ka kwanye* *ha-l*] *cincca eleywun mwuncye*
 we-NOM intervention do-MOD really complicated problem
 ‘the difficult problem that we will intervene’

- b. [wuli-nun ku-ka ka-l] (*cal) cwul-un moll-ass-ta
 we-TOP he-NOM go-MOD way-TOP not.know-PAST-DECL
 ‘We didn’t know that we would leave.’

Further note that there are at least two different types of the BNC (BN construction) with respect to the coherence with the following predicate. In the BNC with *kes*, there is strong syntactic cohesion between the BN and the following predicate, whereas in the BNC with *cwul*, there isn’t such:

- (11) a. pi-ka o-l kes (*cengmal) kah-ta
 rain-NOM come-PNE BN really seem-DECL
 ‘It seems that it will rain.’
- b. wuli-nun ku-ka ka-l cwul-ul/un (cengmal) moll-ass-ta
 we-TOP he-NOM go-MOD way-ACC/TOP really not.know-PAST-DECL
 ‘We really didn’t know that he would leave.’

These two types are also different with respect to the possibility of projecting a full NP. Observe the following coordination data:

- (12) a. *[sensaingnim-i ka-l kes] kuliko
 teacher-NOM go-PNE BN and
 [haksayngtul-i o-l kes]] kath-ta
 student-NOM come-PNE BN exist
 ‘(int.) It appears that the teacher will go and students will come.’
- b. [[sensaingnim-i ka-ko] [hasayngtul-i o-l] kes] kath-ta
 teacher-NOM go-or student come-PNE BN exist

As noted in (12)a, the projection of *kes* does not form a full NP even though its sentential complement can be coordinated as given in (12)b. This implies that the *kes* BN cannot project a full NP even with its sentential complement. This fact can be further observed from the fact that the BN and its sentential complement cannot be used as an NP fragment, either:

- (13) a. *[sensaingnim-i ka-l swu] ‘(lit.) the possibility that the teacher goes’
- b. [sensaingnim-i ka-l hakkyo] ‘the school where the teacher will go’

Unlike this *kes*-type BN, BNs like *check* ‘pretend’ can project a full NP with its sentential complement:

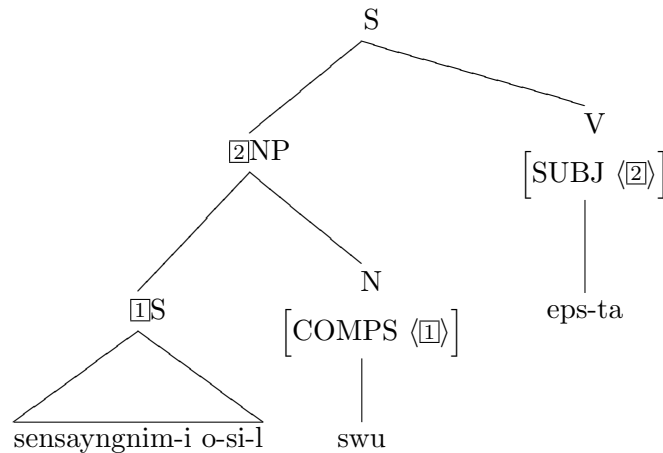
- (14) a. [[aitul-un ca-nun chek], [eleu-un cwuk-un chek]] hayessta
 children-TOP sleep-PNE pretend adult die-PNE pretend did
 ‘Children pretended to be sleeping whereas adults pretended to
 be dead.’
- b. [[aitul-un ka-nun cwul], [elun-un o-nun cwul]] alassta
 children-TOP go-sleep-PNE way adult-TOP come-PNE way know
 ‘(We) thought that children go while adults come.’

As expected, we could use the BN with its sentential complement as an NP fragment:

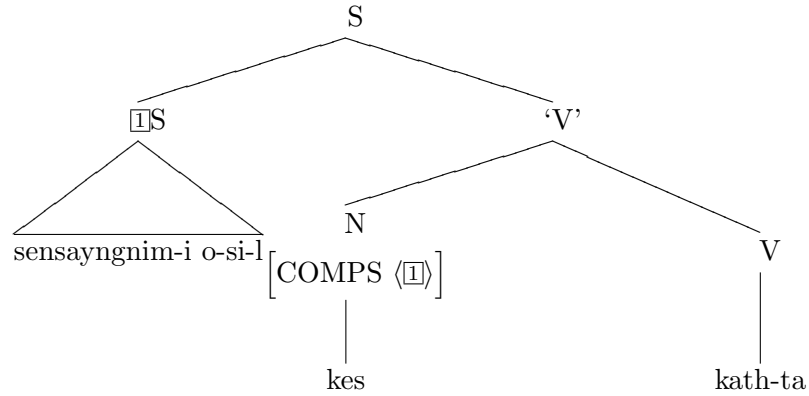
- (15) a. po-ko-to mos po-n chek
 see-after-even not see-MOD pretense
 ‘pretending not to hear even though one saw it’
- b. ku-uy mal-i uymiha-nun pa
 his-GEN saying-NOM mean-MOD way
 ‘the meaning of what he said’

As a simple way of representing the differences between these two different types of BNCs, we can adopt the following two different syntactic structures: (16) for the *swu* type BNC and (17) for the *kes* type BNC. That is, (9)a will have a structure like (16) whereas (9)b will have a structure like (17):

- (16) Head-Complement Structure



(17) Complex Predicate Structure:



The structure in (16) assumes that the matrix predicate *eps-ta* ‘not.exist’ selects one argument (marked by $\boxed{2}$ and realized as a subject) whereas the BN *swu* requires a sentential complement ($\boxed{1}$). The structure shows us that the BN, combined with its sentential complement, projects an independent, full NP. Meanwhile, the structure in (17) assumes that the matrix predicate *kath*-first combines with the BN *kes*, forming a complex-predicate like unit. This resulting expression then combines with the BN’s sentential complement ($\boxed{1}$), forming a complete sentence. In due course, we will see how the grammar set forth here can allow this kind of combinatorial possibilities.

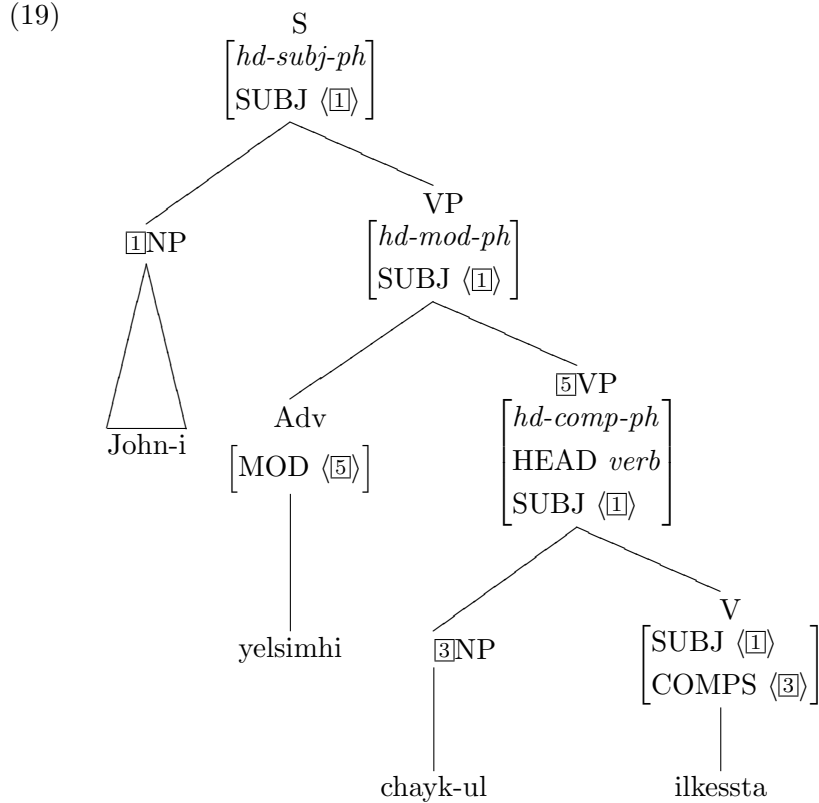
2.2 Head-Complement Type

The structure in (16) is a canonical head-complement phrase licensed by the Head-Complement Rule in (18)b. This rule, along with the other grammar rules given here, licenses well-formed phrasal combinations in the language:

- (18) a. Head-Subject Rule:
 $XP[hd-subj-ph] \rightarrow \boxed{1}, \mathbf{H}[\text{SUBJ } \langle \boxed{1} \rangle]$
- b. Head-Complement Rule:
 $XP[hd-comp-ph] \rightarrow \boxed{1}, \mathbf{H}[\text{COMPS } \langle \dots, \boxed{1}, \dots \rangle]$
- c. Head-Modifier Rule:
 $XP[hd-mod-ph] \rightarrow [\text{MOD } \langle \boxed{1} \rangle], \boxed{1}\mathbf{H}$

The Head-Subject Rule, generating a *hd-subj-ph*, allows a VP to combine with its subject. The Head-Complement Rule ensures a head to combine

with one of its COMPS elements, forming a *hd-comp-ph*. The Head-Modifier Rule allows a head to form a well-formed phrase with an adverbial element that modifies the head, resulting in *hd-mod-ph*.⁵ These rules together can license a structure like the following:



The verb *ilkessta* ‘read’ selects two arguments, which are realized as SUBJ and COMPS, respectively. The verb first combines with its object *chayk-ul* ‘book-ACC’, forming a head-complement phrase. This phrase then is modified by the adverb *yelsimhi* ‘diligently’, forming a head-modifier phrase. This resulting VP will then form a head-subject-phrase with the subject *John-i* ‘John-NOM’.

Going back to the BNC with a BN like *swu* ‘possibility’, we can see that this BN lexically selects a sentential complement whose head verb is marked

⁵Note that the grammar rules here place no restriction on the SUBJ value: this allows the head to combine with the subject before combining with a complement. One clear advantage of this system is to allow sentential internal scrambling with no further operation or mechanism. See Kim (2004) and Kim and Yang (2004) for details.

with a dependent suffix such as *-l*, as represented in the following lexical entry:

$$(20) \left[\begin{array}{l} \textit{bn-nonlex} \\ \text{HEAD} \left[\begin{array}{l} \text{POS } \textit{noun} \\ \text{NFORM } \textit{swu} \end{array} \right] \\ \text{ARG-ST} \left\langle \text{S} \left[\begin{array}{l} \text{MOD } \langle \text{N} \rangle \\ \text{IND } \textit{s0} \end{array} \right] \right\rangle \\ \text{SEM} \left[\begin{array}{l} \text{IND } \textit{i} \\ \text{RELS} \left\langle \left[\begin{array}{l} \text{PRED } \textit{possibility} \\ \text{ARG0 } \textit{s0} \end{array} \right] \right\rangle \end{array} \right] \end{array} \right]$$

As we have noticed here, the BN *swu* (classified as *bound.noun-nonlexical*) has its own NFORM value and selects one sentential argument denoting a situation ‘s0’. This lexical specification on the NFORM value is basically intended to capture that the BN combines only either with a limited set of predicate like *eps-ta* ‘not.exist’ or with *iss-ta* ‘exist’ whose lexical information is given in the following:

$$(21) \left[\begin{array}{l} \textit{int-bn-v} \\ \langle \textit{eps-} \rangle \\ \text{HEAD} \mid \text{POS } \textit{verb} \\ \text{ARG-ST} \left\langle \text{NP} \left[\begin{array}{l} \text{IND } \textit{i} \\ \text{NFORM } \textit{swu} \end{array} \right] \right\rangle \\ \text{SEM} \left[\text{RELS} \left\langle \left[\begin{array}{l} \text{PRED } \textit{not.exist} \\ \text{ARG0 } \textit{i} \end{array} \right] \right\rangle \right] \end{array} \right]$$

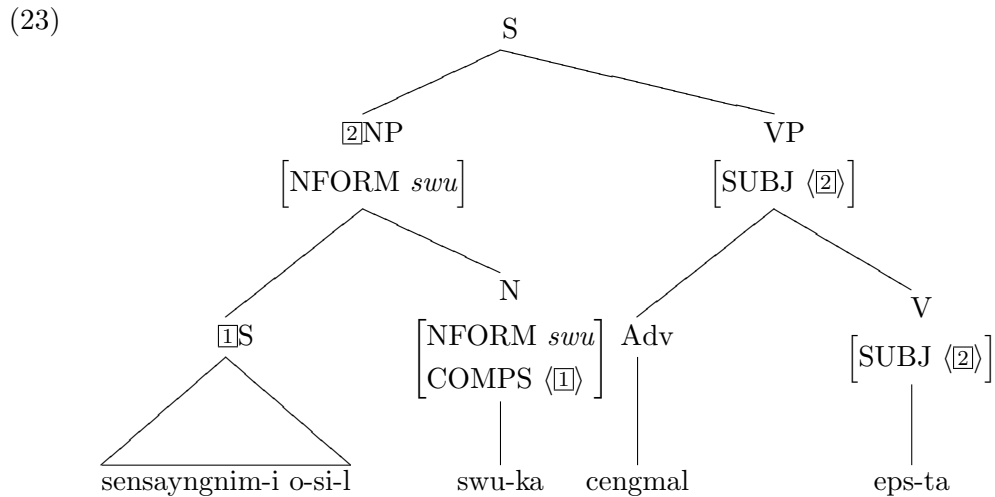
The lexical information indicates that the predicate *eps-ta* (classified as an *intransitive-bound.noun-verb*) selects one argument whose NFORM value is *swu*. This means that the *int-bn-v* predicate *eps-* can combine only with an expression whose head carries this NFORM value, blocking an example like the following:⁶

⁶Meanwhile, the intransitive verb *eps-ta* will have no restriction in the subject as in *haksayngtun-i eps-ta* ‘Students are not there’.

- (22) *[[sensayngnim-i o-si-l] cwul]-i eps-ta
 teacher-NOM come-HON-PNE possibility-NOM not exist

A sentence like this is simply not licensed because the subject of *eps-ta* does not carry the NFORM value *swu*.⁷

Together with the grammar system given here, these lexical entries for the BN *swu* and the predicate *eps-* will project the following structure for a sentence like (9)a:



As represented in the tree structure, the verb *eps-ta* requires one argument realized as the SUBJ in syntax (2). This intransitive verb first combines with the adverb *cengmal* ‘really’, forming a *hd-mod-ph*. Meanwhile, the BN *swu* combines with its sole complement, the dependent clause marked with a prenominal ending. The resulting NP (a *hd-comp-ph*) then will serve as the subject of the verb *eps-ta*. The final sentence thus involves a canonical *head-modifier*, *head-complement*, and *head-subject phrase*, respectively.

2.3 Complex-Predicate Type

Notice that the language, unlike from English, also employs the grammar rule forming a complex predicate including the auxiliary verb construction (AVC). As noted in the literature (cf. Kim (2004)), in the AVC, the main verb and the following auxiliary show a tight syntactic cohesion and form a complex predicate. The complex-predicate properties of the AVC can be

⁷The grammar assumes that all BNs carry their own NFORM value whereas common nouns have no NFORM value.

observed from the strong syntactic cohesion between the main and following auxiliary verb as well as from a monoclausal property in a phenomenon like NPI (Negative Polarity Item):

- (24) a. John-i sakwa-ka/lul mek-ko (*cengmal) siph-ess-ta
 John-NOM apple-NOM/ACC eat-COMP really would.like
 ‘John would really like to eat apples.’
- b. John-i amwukes-to mek-ci anh-ass-ta
 John-NOM anything-also eat-COMP not-PAST-decl
 ‘John didn’t eat anything.’

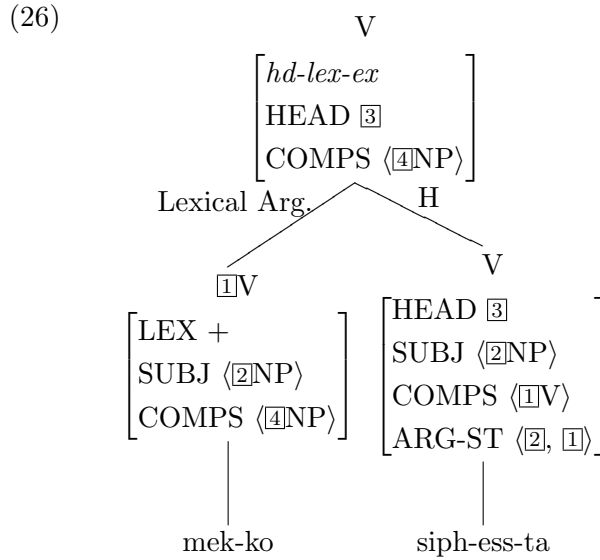
(24)a indicates that no element can intervene between the main and the auxiliary verb. (24)b shows that the NPI *amwukes-to* is licensed by the negative auxiliary verb here, showing that the two are in the same clause.

As argued and shown by Kim (2004), Kim and Yang (2004), and the references cited in thereof, one effective way of capturing such complex predicate-like properties of the AVC is to introduce the following Head-LEX Rule:

- (25) Head-LEX Rule:
- $$\left[\begin{array}{l} hd\text{-}lex\text{-}ex \\ COMPS \boxed{A} \end{array} \right] \rightarrow \boxed{\mathbb{I}} \left[\begin{array}{l} LEX + \\ COMPS \boxed{A} \end{array} \right], H \left[\begin{array}{l} AUX + \\ COMPS \langle \boxed{\mathbb{I}} \rangle \end{array} \right]$$

The rule specifies that the auxiliary verb ([AUX +]) combines not with a phrasal but with a lexical (LEX) complement ($\boxed{\mathbb{I}}$), and that to the resulting combination the COMPS value (\boxed{A}) of this lexical complement is composed.⁸ This system, interacting with appropriate lexical entries for auxiliary verbs, will license a complex-predicate structure like the following in the language:

⁸This kind of argument composition is different from previous analyses, mainly in that the composition happens in syntax rather than in the lexicon.



The auxiliary verb *siph-ess-ta* ‘would-like’ takes two arguments: one realized as subject (②) and the other as a lexical complement (①). When the auxiliary combines with the main verb, the result forms a *hd-lex-ex*. Notice that when this combination happens, the main verb’s COMPS value (④) is inherited to the resulting expression in accordance to the Head-LEX Rule in (25).

We also can observe that the BNC headed by an expression like *kes*, *tus* or *man* also behaves like a complex-predicate construction. First, these BNs also display a tight syntactic unit with the following predicates: no elements can intervene between the two.

- (27) a. *sensayngnim-i o-si-l kes cengmal kathta
 teacher-NOM come-HON-MOD BN really seem
 ‘It seems that the teacher will really come.’
- b. *sensayngnim-i o-si-l tus cengmal hata
 teacher-NOM come-HON-MOD BN really do
 ‘It seems that the teacher will really come.’

These BNs also show the mono clausal property with respect to NPI:

- (28) a. *John-un [amwuto ossta-ko] mit-ci anh-ass-ta
 John-TOP anybody came-COMP] believe-COMP neg-PAST-DECL
 ‘John didn’t believe anybody came’

- b. amwuto o-n kes kath-ci anh-ass-ta
 anybody come-MOD BN seem-COMP NEG-PAST-DECL
 ‘It seemed that no one came.’

The example (28)a indicates that the NPI *amuto* requires its licenser in the same clause. The grammaticality of (28)b indicates that the NPI *amwuto* here and its licenser *anh-ass-ta* are in the same clause, providing evidence to take the expression *kes kath-ci anh-ta* as a complex predicate.

To reflect this observation that the predicate combining with such a BN forms a complex predicate, the grammar set forth here at first specifies that such a BN, just like the other BNs, subcategorizes a dependent sentence as its argument:

$$(29) \left[\begin{array}{l} bn\text{-}lex \\ \langle kes \rangle \\ HEAD \left[\begin{array}{l} POS \textit{noun} \\ NFORM \textit{kes} \end{array} \right] \\ LEX + \\ ARG\text{-}ST \left\langle S \left[\begin{array}{l} MOD \langle N \rangle \\ SEM \textcircled{2} \end{array} \right] \right\rangle \\ SEM \textcircled{2} \end{array} \right]$$

Notice that there is one difference from BNs like *swu*. That is, unlike *swu*-type BNs, this type of BN (classified as *bound.noun-lexical*) is marked with the feature LEX to be allowed to participate in the formation of a *head-lexical*. In addition, its semantics is identified with its complement, reflecting the fact that it behaves like a sentential complementizer, even though it is categorically a noun.

But how about the predicate *kath-ta*? What is its lexical information? Does it require just one argument as the verb *eps-ta* ‘not.exist’ does? What is the subject of this verb? Can it be identical with the subject of the dependent clause? Observe the following contrast between the AVC sentence and the BNC:

- (30) a. sensayng-nim-i o-si-ko siph-(usi)-ta
 teacher-HON-NOM come-HON-COMP would.like-HON-DECL
 ‘The teacher would like to come.’
- b. sensayng-nim-i o-si-l kes kath-(*usi)-ta
 teacher-HON-NOM come-HON-PNE BN seem-HON-DECL
 ‘The teacher would like to come.’

If the subject of *kath-* ‘seem’ in (30)b is *sensayngnim* ‘teacher-HON-NOM’, there is no reason why we cannot have the honorific form *kath-usi-ta* as we do for the *siph-usi-ta* in (30)a. This contrast implies that we cannot identify the subject of the dependent clause to be identical with that of the main verb *kath-ta*, unlike the true auxiliary verb like *siph-ta* ‘would.like’.

As a way of incorporating this fact in the present system, we posit the following lexical entry for *kath-ta*:

$$(31) \left[\begin{array}{l} aux-bn-v \\ \langle kath-\rangle \\ HEAD \left[\begin{array}{l} POS \textit{verb} \\ AUX + \end{array} \right] \\ ARG-ST \left\langle NP[pro], \left[\begin{array}{l} IND \textcircled{3} \\ NFORM \textit{kes} \end{array} \right] \right\rangle \\ SEM \left[RELS \left\langle \left[\begin{array}{l} PRED \textit{seem} \\ ARG0 \textcircled{3} \end{array} \right] \right\rangle \right] \end{array} \right]$$

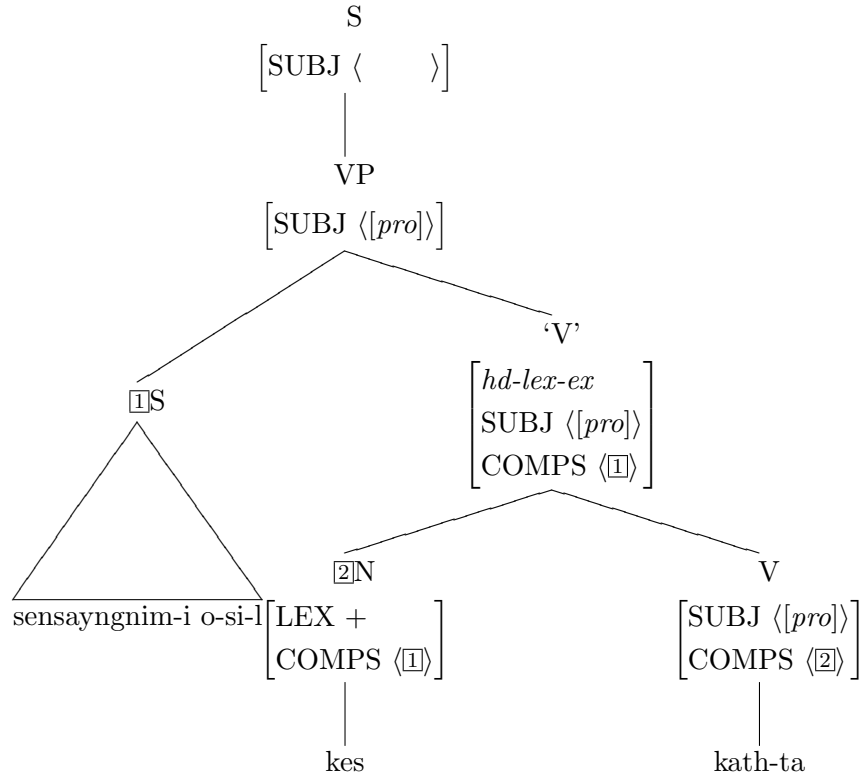
This lexical entry specifies that the auxiliary verb *kath-ta* ‘seem’ (classified as *auxiliary-bound.noun-verb*) selects two arguments: the first one is realized as the *pro* subject which is not realized overtly in syntax whereas the second one is realized as the COMPS whose NFORM value is *kes*.⁹

Given these lexical entries, our grammar will then have a more elaborated structure like the following for a complex-predicate BNC in (9)b:¹⁰

⁹There could be a question of what is the function of this *pro*. We could assume that this is an expletive *pro* element that contributes no meaning to the sentence in question. This then can mean that English has an overt expletive pronoun like *it* or *there* whereas Korean has only a covert expletive pronoun.

¹⁰As an anonymous reviewer points out, one could take the sentential complement of *kes* is raised as the subject of the verb *kath-ta*. However, this would mean that the language allows object-to-subject raising, which we can hardly find in any language.

(32)



The auxiliary-like verb *kath-ta* takes two arguments. The first argument is the *pro* subject whereas the second argument is the lexical BN *kes* realized as a COMPS element. The verb, first combining with this BN complement, forms a complex predicate in accordance with the Head-LEX Rule which in addition allows the resulting complex predicate inherits the BN's COMPS value ($\bar{1}$). This is why the complex predicate can combine with the complement of the BN, the dependent sentence ($\bar{1}$). This final VP still looks for a *pro* subject. Since the language allows its arguments (including subject) to *pro*-drop, this VP then can be projected into a complete parsing unit, S.¹¹

3 An Implementation and Concluding Remarks

The analysis we have presented so far has been incorporated into the typed-feature structure grammar HPSG for Korean (Korean Resource Grammar)

¹¹More specifically, the grammar introduces a Head-Only Rule which pumps up a VP with the unsaturated *pro* subject to an S.

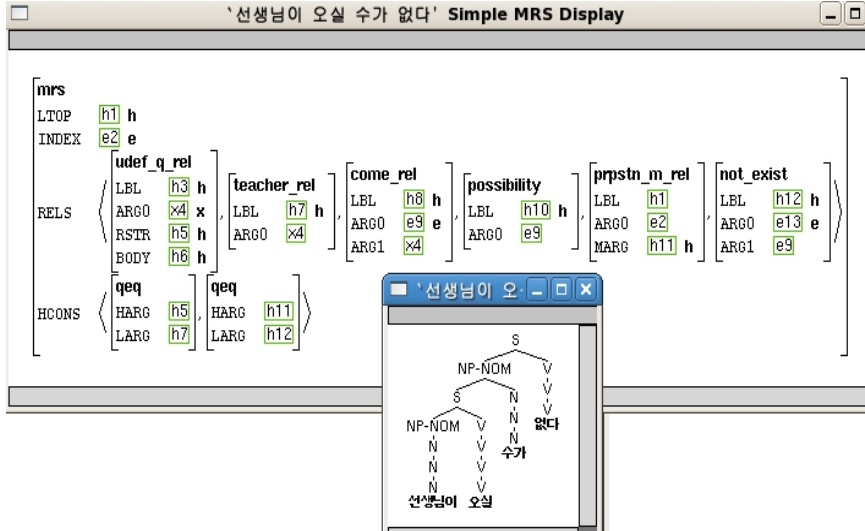


Figure 1: Parsed Tree and MRS for ‘There is no possibility that the teacher will come.’

aiming at building a computationally feasible Korean grammar with a comprehensive coverage.¹² To check the feasibility of our analysis for the BNC, we implemented this grammar in the LKB (Linguistic Knowledge Building) System (cf. Copestake 2002). The LKB system is a grammar and lexicon development environment for use with constraint-based linguistic formalisms such as HPSG.¹³

Figure 1 and Figure 2 are the parsed results for the sentence (9a) and (9b) in our system. Let us consider the small boxes that indicate the syntactic parsing results of the two sentences. The small box in Figure 1 indicates that the BN *swu* combines with its sentential complement, whereas the one in Figure 2 tells us that the BN *kes* forms a complex predicate with the following verb *eps-ta* first. The structure in Figure 2 also shows us that the final VP is pumped up to an S without combining with its subject, as described earlier. These parsing results for the syntactic structures are what the assumed grammar are expecting.

The bigger boxes in Figure 1 and Figure 2 represent the semantics of these two sentences. The semantic representations given here follow Min-

¹²The current Korean Resource Grammar has 394 type definitions, 36 grammar rules, 77 inflectional rules, 1,500 lexical entries, and 2100 test-suite sentences, and aims to expand its coverage on real-life data.

¹³The LKB is freely available with open source (<http://lingo.stanford.edu>).

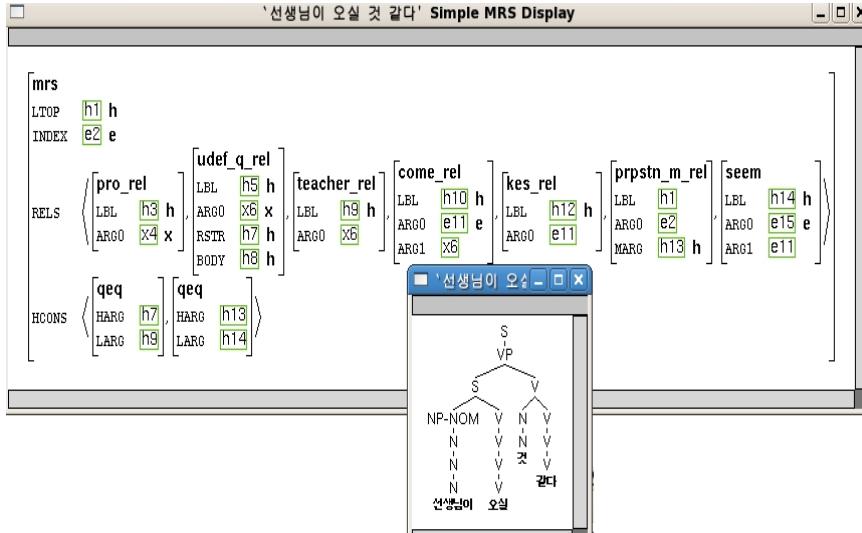


Figure 2: Parsed Tree and MRS for ‘It seems that the teacher will come.’

imal Recursion Semantics (MRS) developed by Copestake et al. (2005). The MRS is a framework for computational semantics designed to enable semantic composition using only the unification of type feature structures (Bender et al. 2002, Flickinger and Bender 2003). We can see here that the MRS that the grammar generates provides us with enriched semantic information as well. The value of LTOP is the local top handle, the handle of the relation with the widest scope within the sentence. The INDEX value here is identified with the ARG0 value of the *prpstn_m_rel* (propositional message). The attribute RELS is basically a bag of elementary predications (EP) each of whose values is a *relation*.¹⁴ Each of the types *relation* has at least three features LBL, PRED (represented here as a type), and ARG0. For example, we can see that in Figure 1, there is an individual (‘x4’) who is ‘teacher’ and whose definiteness (*undef_q_rel*) is undetermined and there is an event (‘e9’) this individual comes. The semantic relation *not_exist_rel* selects the *possibility* of this event (‘e9’) happens. In Fig 2, we can observe that the ARG1 value of *seem* is ‘e11’ which is also the ARG0 value of the BN’s meaning *kes_rel*. This ‘e11’ is in fact the event in which a or the teacher comes.

¹⁴The attribute HCONS is to represent quantificational information.¹⁵ The *undef_q_rel* means an undefined quantificational meaning assigned to the unexpressed determiner. See Bender et al. (2002).

The implementation of the analysis for the BNC in the LKB system thus gives us a right syntactic structure as well as semantic representations. This proves the feasibility of the analysis at least in terms of computational perspective.

4 Conclusion

The Korean BNC (bound noun constructions) display complex syntactic, semantic, and constructional properties. In particular, their combinatorial possibilities with respect to the complement and predicate types call for a much finer-grained syntax. The BNCs can even be classified into two types, depending on the syntactic coherence with the following predicate.

This paper has developed a constraint-based approach that can dissolve such issues. In terms of syntax, we postulated two different syntactic structures: head-complement and complex-predicate structures and then specify articulated lexical properties for the BNs and relevant predicates. This system has been implemented in the LKB system, which gave us robust parsing results for the given sentences.

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