

Interpretive possibilities of role shift in Korean Sign Language*

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Kim, Yeonwoo and JunMo Cho. 2022. Interpretive possibilities in role shift in Korean Sign Language. *Linguistic Research* 39(1): 155-183. This paper investigates properties of role shift in Korean Sign Language (KSL) in contrast to those of “regular” indexical shifts induced by attitude predicates which are also available in the language. It is observed that there are complex interpretive possibilities of indexicals when these two kinds of shifts come together. Those interpretive possibilities include parallel vs. non-parallel shifts as well as all vs. mixed shifts. Parallel shifts are those where a 1st person pronoun in a complement clause shifts its interpretation to the reported author whereas non-parallel shifts are those where the 1st person pronoun surprisingly shifts its interpretation to the reported addressee. The ‘all shift’ interpretation obtains when all indexicals in a given clause shift together while the ‘mixed shift’ interpretation refers to those instances where only a subset of indexicals shift. We propose that KSL has two kinds of shifty operators. One is ‘role shift operator’ which overwrites the context parameter with the locus mapping onto each individual. The other kind is a series of ‘attitude shifty operators’ in line with Deal (2020) which overwrite the context parameter with the intensional index. We demonstrate that the proposed relative hierarchy of these two kinds of shifty operators successfully accounts for the seemingly complex interpretive possibilities observed in KSL indexicals. (Korea University · Handong Global University)

Keywords Korean Sign Language, role shift, indexicals, shifty operators, parallel and non-parallel shifts, all and mixed shifts

1. Introduction

In the following pair of sentences, *I* and *here* are interpreted differently.

- (1) a. I like to stay here.
b. In Seoul John said, “I like to stay here.”

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In (1a), both the pronoun and the locative adverb are interpreted according to the context of the current speech act (I = the current speaker, *here* = the current location). In (1b), however, the same lexical items are interpreted according to the context of the reported speech act (I = John, *here* = Seoul). Lexical items such as I and *here* are known as indexicals, “linguistic elements whose reference is dependent on aspects of the context” (Lillo-Martin 2012).

Korean Sign Language (henceforth KSL) exhibits role shift (RS), a common feature found in many sign languages that allows signers to change their perspective to other participants in a given discourse (Kim et al. 2020; Nam et al. 2011). The RS segments, usually the complement clauses of an attitude verb, are morphologically marked by non-manual signals that typically include body and/or eye gaze shift to indicate two loci of discourse referents. The annotation $__RS_{x \rightarrow y}$ in the following examples refers to the co-articulated non-manual marking over the underlined portion of the sentence¹. $x \rightarrow y$ represents a vector from point x to point y in a given discourse space. It is realized as the signer tilts his/her body close to locus x and faces locus y . This allows the signer to take a new perspective of a discourse referent (assigned with locus x) against another referent (assigned with locus y).

In (2), for instance, $__RS_{x \rightarrow y}$ is co-indexed with IX_i *TEACHER* and IX_j *STUDENT*^{2,3}. This means that during the utterance of the underlined portion, the non-manual marking

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- 1 There are other kinds of non-manuals known in sign languages like ASL that mark various syntactic domains such as WH domain (with furrowed eyebrows) and Negation domain (with headshake). See Neidle et al. (2000) for details.
 - 2 We follow the usual glossing conventions in sign language researches. Manual signs are represented by capitalized words corresponding to the translation of the sign. IX_x refers to a pointing within a signer's discourse space at locus x , and ${}_xV/ERB_y$ indicates verbal inflection for agreement with subject locus x and object locus y . Specific locus morphemes are represented as follows.

s = signer (1st person) position

2 = addressee (2nd person) position (realizable by the direction of the signer's gaze)

i, j etc. = other positions

The locus morphemes are subscripted to a stem without a morpheme delimiter ‘-’ to express that they are connected simultaneously, rather than sequentially, with a stem.

- 3 Most of the data used in this paper were collected in 2020–2021 from nine KSL native signers who acquired the language when they were young, went to deaf schools and are using the language actively. They were asked to give acceptability judgments as well as provide answers to simple wh-questions after each discourse such as “Who is happy? Where does Chelswu want to work? When is he going on a trip?” We thank Mr. Kim Ki-Hoon, a Korean-KSL interpreter, for his generous help in setting up the surveys and gathering the data.

indicates the teacher's perspective facing the student. Under the scope of the RS marking, the interpretation of IX_s (1st person pronoun) shifts from the actual utterance signer to the reported author 'the teacher'. In the same way, (3) shows shifted interpretation of IX_2 (2nd person pronoun) from the actual utterance addressee to the reported addressee 'the student'.

- _____ $RS_{i \rightarrow j}$
- (2) IX_i TEACHER IX_j STUDENT $_i$ TELL $_j$ WHAT IX_s HAPPY
 "Lit. What the teacher $_i$ told the student was I_i am happy."
 "The teacher $_i$ told the student that she $_i$ is happy."
- _____ $RS_{i \rightarrow j}$
- (3) IX_i TEACHER IX_j STUDENT $_i$ TELL $_j$ WHAT IX_2 HAPPY
 "Lit. What the teacher told the student $_j$ was you $_j$ are happy."
 "The teacher told the student $_j$ that he $_j$ is happy."
- (4) IX_i TEACHER IX_j STUDENT $_i$ TELL $_j$ WHAT IX_i HAPPY
 "Lit. What the teacher $_i$ told the student was she $_i$ is happy."

(2) contrasts with (4), a standard indirect report. Note that (4) does not have the RS non-manual marking and the IX in its embedded clause is marked with i , not s . Thus, the interpretation straightforwardly follows from its co-indexation with the matrix subject, IX_i TEACHER⁴. Figure 1 shows person pronouns and RS making in (2-4).

4 A further contrast between a role shift segment and a standard indirect report has been found to exist in the area of *de se* vs. *de re* reading in other sign languages. Since the pronouns within RS segments are evaluated with respect to the context of the reported speech act, it follows that they receive a *de se* reading (Schlenker 2017). For instance, ASL demonstrates the following (example 16 of Schlenker 2017).

Scenario

We showed John lots of videos of people's hands signing – including videos of John signing. When we show him the video of his hands, John doesn't recognize himself, and says: 'He signs well.'

(i) *De Re* reading

IX_i JOHN THINK IX_i SIGN GOOD.

"John thinks that he signs well."

(acceptable under the scenario, i.e., even when John is not aware that he = John)







1 st and 2 nd	3 rd	1 st and 2 nd under RS _{i→j}
 IX _S	 IX _i	 _____ RS _{i→j} ... IX _S ...
 IX ₂	 IX _j	 _____ RS _{i→j} ... IX ₂ ...

Figure 1. Pronouns and RS marking in KSL

A similar contrast is easily found in other sign languages. The following pair of sentences is from Catalan Sign Language (+++ sign refers to repetition)⁵.

- (5) ANNA 3-SAY-1 IX-3 FED-UP LOSE+++
“Anna told me that she was fed up with losing so often.” (Quer 2011)
_____ RS_i
- (6) ANNA_i 3-SAY-2 IX-1_i FED-UP LOSE+++
“Anna told you that she was fed up with losing so often.” (Quer 2011)

(ii) *De Se* reading
_____ RS_i
IX_i JOHN THINK IX_S SIGN GOOD.
“John thinks, “I sign well.””
(unacceptable under the scenario, i.e., if John is not aware that IX_S = John)
(acceptable only when John is aware that IX_S = John)

5 In (5) and (6), the numbers affixed to verbs and *IX* indicate grammatical persons. For instance, 3 and 1 in 3-SAY-1 refer to 3rd person subject and 1st person object agreement while IX-3 refers to 3rd person pronoun. Note also that *i* in the RS non-manual marking does not refer to a specific locus but a referential index that links the first person role in RS fragments to the intended author of the reported utterance.

(7) illustrates that locus s marked in verbal inflection, in this case object agreement, can also shift under an RS scope.

- _____RS_{i→j}
- (7) IX_i CHELSWU WANT WHAT IX_k MINSWU _kHELP_s
 “Lit. What Chelswu_i wants is for Minswu to help me_i.”
 “Chelswu_i wants Minswu to help him_i.”

In this paper, we propose an analysis of KSL role shift. In section 2, we demonstrate the shortcomings of equating KSL role shifts with direct reports. Section 3 summarizes the properties of KSL role shift and contrasts them with those of the “regular” indexical shift in KSL. Section 4 demonstrates how some previous accounts of indexical shift fail to provide a successful explanation for KSL role shift. In section 5, we propose an analysis in line with a Context-Shift Operator approach for KSL. Section 6 concludes the paper.

2. Not a direct report

One might consider role shift a form of a direct report as the literal translations of the aforementioned examples may suggest (Lee et al. 1997 *inter alia*). However, as shown in our previous work (Kim et al. 2020), an RS segment in KSL is syntactically transparent to the rest of the sentence. This sets itself apart from a direct report which is known to be syntactically opaque to the rest of the sentence. (8a) illustrates such opacity. Note that a WH-movement out of a direct report, as opposed to an indirect report in (8b), is prohibited in English.

- (8) a. *Who did Mary say, “I handed the bag to ___”?
 b. Who did Mary say she handed the bag to ___? (Deal 2020)

KSL shows similar behaviors. (9), for instance, shows that movement out of an RS segment is in fact possible, suggesting that RS segments are integrated to the rest of the sentence⁶.

⁶ Other sign languages’ role shift segments have also shown such opacity but not without cross-linguistic variations. Schlenker (2017) reports that while ASL permits WH-extraction out of a role shift segment, LSF

- _____RS_{i→j}
- (9) a. CHELSWU_i [IX_S __ BUY] SAY WHAT COMPUTER
 “Lit. What Chelswu_i said I_i bought was a computer.”
 “It was a computer that Chelswu_i said that he_i bought.”
- _____RS_{i→j}
- b. CHELSWU_i [IX_S __ MEET] SAY WHO MOTHER
 “Lit. Who Chelswu_i said I_i met was mother.”
 “It was mother that Chelswu_i said that he_i met.”
- _____RS_{i→j}
- c. CHELSWU_i [IX_S __ GRADUATE PERF] SAY WHEN LAST.YEAR
 “Lit. When Chelswu_i said I_i graduated was last year.”
 “It was last year that Chelswu_i said he_i graduated.”
- (Kim et al. 2020)

Another challenge to a direct report approach comes from examples like (10) and (11). They demonstrate that an RS segment can be introduced by a predicate of hearing. As a result, the 1st person pronoun in the RS segments ends up referring to the addressee, *Chelswu*. Under a direct report approach, such readings will never be possible.

- _____RS_{i→j}
- (10) IX_i CHELSWU HEAR WHAT IX_S TEST PASS
 “Lit. What Chelswu_i heard was I_i passed the test.”
 “Chelswu_i heard that he_i passed the test.”
- _____RS_{i→j}
- (11) IX_i CHELSWU HEAR WHAT IX_k YENGHUY_kHELP_S
 “Lit. What Chelswu_i heard was that Yenghuy was helping me_i.”
 “Chelswu_i heard that Yenghuy was helping him_i.”

Yet another piece of evidence comes from the ‘mixed shift’ interpretation of indexicals within the RS segment. Within a direct report, all indexicals are known to shift together. In the following English sentence, for instance, we get a reading where both *I* and *today* shift their interpretations from the actual utterance context to the reported

(French Sign Language) does not.

speech act context.

(12) Yesterday John told Bill, “I am going on a trip today.”

On the contrary, it is possible to get a ‘mixed shift’ interpretation in the KSL RS segment. In (13), the interpretation of IX_S must shift to *Chelswu*; it cannot refer to the signer of the actual utterance. On the other hand, the interpretation of the indexical adverb, *TODAY*, can either shift to the time of the reported context (Friday), or stay with the actual utterance time (Saturday).

(13) Context: The day of the utterance is Saturday.

YESTERDAY IX_i CHELSWU IX_j YENGHUY i TELL $_j$ WHAT

_____ $RS_{i \rightarrow j}$

TODAY IX_S TRIP GO

- a. “Yesterday Chelswu $_i$ told Yenghuy that he $_i$ would go on a trip today (=Friday).”
- b. “Yesterday Chelswu $_i$ told Yenghuy that he $_i$ would go on a trip today (=Saturday).”

It is the second reading (13b) where we have a ‘mixed shift’ interpretation as the 1st person pronoun receives a shifted interpretation while the adverb does not. The possibility of the mixed shift reading sets the KSL role shift apart from a regular direct report.

These three phenomena, namely the transparency of an RS segment to the rest of the sentence, the possibility of an RS segment introduced by a predicate of hearing, and the possibility of a mixed shift under its scope, suggest that KSL role shift cannot be equated with direct reports⁷.

In fact, it is fundamentally challenging to see role shifts in sign languages merely as reports of some kind as they are not restricted to quotational environments. A role shift segment can be introduced not only by a non-attitude predicate, but it is also

7 Quer (2011) also claims that there are differences in LSC between direct reports and role shifts. First, they are introduced by different sets of lexical items. Secondly, there is a syntactic difference between direct reports and role shifts. A direct report, but not a role shift segment, can be pre-posed to the beginning of a sentence.

possible to come without any predicate whatsoever. Observe the following examples where the RS segments do not follow a lexical introducer. These instances of so-called non-quotational RS nevertheless display the same properties with respect to pronominal interpretation.

(14) ASL

_____RS_{husband}
 HUSBAND REALLY I NOT MEAN
 “The husband goes, “Really, I didn’t mean it.”” (Padden 1986)

(15) LIS (Italian Sign Language)

_____RS_{GIANNI}
 GIANNI ARRIVE BOOK _iDONATE_{YOU}
 “When Gianni will come, he’ll give you a book as a present.”
 (Zucchi 2004)

(16) KSL

_____RS_{i→j}
 MAN_k MAN_j _kHIT_j WOMAN-IX_i _sSEE₂
 “Lit. Man_k hit man_j; woman_i: I_i saw you_j.”
 “A man_k was hitting another man_j. And a woman_i saw him_j (a woman goes, “I saw you.”).”

As illustrated above, role shift is not limited to reporting a person’s words or thoughts. Rather, role shift has been known to come in two types: quotational and non-quotational. The former has been named primarily as role shift (along with other names such as constructed discourse, role taking, role switching, and reference shift) while the latter as constructed (or reported) action. Schlenker (2017) uses role shift to refer to both types, specifying the former as attitude role shift and the latter action role shift. If these two types are indeed of a single linguistic operation as is the perspective of many scholars, then the fact that a role shift segment does not need to be introduced by a predicate, let alone an attitude predicate, must be taken seriously.

3. Another indexical shift

KSL has another mechanism besides role shift where indexical shifts are possible. Before we introduce that mechanism, summarizing the characteristics of KSL role shift noted earlier would be helpful. First, in KSL RS the shift is determined by the loci indicated in the non-manual RS marking. Second, the context affected by the shift is person. Third, the shift is licensed by none other than the RS marking itself. Fourth, the shift is obligatory.

The first two properties have been noted in examples such as (2) and (3) where first and second person pronouns shift according to the loci indicated in the non-manual RS marking. We also noted that person shift manifests itself not only in pronouns but also in verbal inflection as observed in (7), where we have the first person marked in the object agreement. (17) below illustrates an instance of the first person marked in the subject agreement.

- _____RS_{i→j}
- (17) IX_i CHELSWU WANT WHAT IX_k MINSWU _sHELP_k
 “Chelswu_i wants to help Minswu.”

The third property, namely the shift being licensed by the RS marking itself, was seen earlier in (16) which lacks a predicate preceding the RS segment. (18) below is another example of the same kind. Note again the absence of a predicate preceding the RS segment.

- (18) Context: Mother (IX_i) and Father (IX_j) were talking to each other.
- _____RS_{i→j}
- IX_i MOTHER IX_s IX₂ BECAUSE-OF UNHAPPY
 “Mother_i goes: she_i is unhappy because of him (father).”

The last property of KSL RS, namely the mandatory shift, is illustrated by examples such as (2), (3) and (7) where no other person interpretations are possible. The obligatory person shift is contrasted with the optional shift of adverbial indexical in (13), repeated below as (19). Later, we will argue that the adverbial shift is in fact due to an operation independent from role shift.

(19) (=13) Context: The day of the utterance is Saturday.

YESTERDAY IX_i CHELSWU IX_j YENGHUY _iTELL_j WHAT

_____RS_{i→j}
TODAY IX_s TRIP GO

- a. “Yesterday Chelswu_i told Yenghuy that he_i would go on a trip today (= Friday).”
- b. “Yesterday Chelswu_i told Yenghuy that he_i would go on a trip today (= Saturday).”

As mentioned earlier, role shift is not the only mechanism available for indexical shifts in KSL. Indexical shifts are in fact possible without an RS marking. (20) and (21) do not have the non-manual RS marking. However, it is possible, although not obligatory, for the first and second pronouns shift their meanings as the (a) translations suggest. When they do not shift, the first person pronoun refers to the actual signer and the second person pronoun the actual addressee, as the (b) translations show.

(20) IX_i TEACHER IX_j STUDENT _iTELL_j WHAT IX_s SMART

- a. “The teacher_i told the student that she_i is smart.”
- b. “The teacher told the student that I (= the signer) am smart.”

(21) IX_i TEACHER IX_j STUDENT _iTELL_j WHAT IX₂ SMART

- a. “The teacher told the student_j that he_j is smart.”
- b. “The teacher told the student that you (= the addressee) are smart.”

However, the non-RS induced ‘regular’ indexical shifts display characteristics that are distinct from the observed properties of role shift in KSL. In addition to the optional nature of the shift observed above, the shift is obviously neither licensed nor determined by the non-manual RS marking. Rather, the shift is licensed by an attitude predicate (*TELL* in this case), and the shift is determined by the reported context rendered by the predicate. (22) confirms that the shift must in fact be licensed by an attitude predicate. As it has neither an attitude predicate nor a non-manual RS marking, the adverbial indexical *HERE* does not shift at all.

(22) Context: The location of the utterance is Korea. Yesterday, Chelswu (IX_i)
was in Japan where he got quite upset.

IX_i HERE AIRPORT DOOR PUNCH DOOR BREAK

“He_i punched the airport door here (= Korea, *Japan) and broke it.”

Furthermore, unlike role shift, the affected context of the non-RS shift is not restricted to person. The shift affects all coordinates of context: person, place and time. (23) illustrates the indexical shift of the time adverbial, *TODAY*. Note again the optionality of the shift.

(23) Context: The day of the utterance is Saturday.

YESTERDAY IX_i CHELSWU IX_j YENGHUY ;TELL_j WHAT

TODAY IX_i TRIP GO

- a. “Yesterday Chelswu_i told Yenghuy that he_i would go on a trip today (= Friday).”
- b. “Yesterday Chelswu_i told Yenghuy that he_i would go on a trip today (= Saturday)

4. Review of previous accounts

Traditional sign language researches have characterized role shift as a kind of direct report. As discussed in Section 2, however, we reject the simple quotational (direct report) approach based on the following three reasons⁸. First, RS complements in KSL role shift are transparent to WH-extraction. Second, 1st person pronouns are allowed to refer to the reported addressee rather than the reported author. Third, adverbial indexicals within the RS segment shift optionally, resulting in a mixed shift.

We thus argue that RS in KSL displays a pure case of indexical shift. In this regard, we will provide a brief overview of two formal semantic accounts for the shifted interpretations of embedded indexicals, and will discuss benefits and limitations of these approaches for KSL role shift.

8 Not all sign language exhibits the same behavior in role shift. LSF (French sign language) is known to not allow WH-extraction. It is difficult to find data testing the situation that 1st person pronouns refer to the reported addressee in other sign language studies. Mixed shifts, on the other hand, are a wide-spread feature across sign languages. Note that there are attempts to explain the mixed shift in terms of (mixed) direct quotation (Davidson 2015, Maier 2018).

4.1 The context variable approach

Schlenker (2003) argues that cross-linguistic differences in indexical shifting possibilities are made dependent on whether the denotations of particular indexicals have free context variables or not. For instance, English 1st person pronouns have the context variable of the actual utterance, but shiftable indexicals like Amharic 1st pronouns are lexically underspecified for their context variable, as illustrated in (24). The logical form for the sample interpretation of Amharic indirect reporting (25a) is represented roughly as in (25b). In Schlenker's semantics, attitude verbs quantify over contexts of thought or of speech and bind underspecified context variables in the attitude complements.

- (24) a. English: $\llbracket 1^{\text{st}}.\text{pro} \rrbracket = \text{AGENT}(c^*)$, c^* the context of the actual speech act.
 b. Amharic: $\llbracket 1^{\text{st}}.\text{pro} \rrbracket = \text{AGENT}(c)$, c an underspecified context variable.
- (25) a. Amharic: 'Lit. John_i says that I_i am a hero.'
 b. $\text{SAY}_{(\text{John}, \text{now}, \text{actually})} c_i \text{ be-a-hero } (\text{AGENT}(c_i), \text{TIME}(c_i), \text{WORLD}(c_i))$,
 c_i the context of the reported speech act.

In order to account for RS in Catalan Sign Language, Quer (2011) adopts the context variable approach and suggests a Point of View Operator (PVO_p) as another attitude operator, which quantifies over contexts of role-shifted clauses. The two operators, an attitude verb and PVO_p, semantically compose and determine interpretation of the shiftable indexicals within its embedded RS segment (1st and 2nd person pronouns, time and locative indexicals).

In KSL, however, a comparison between (26) and (27) presents a challenge to such an approach. In (26) the 1st person pronoun IX_s in the RS segment refers to the reported author. In (27), on the other hand, it can refer to either the reported author or the reported addressee. Note that the morphological contrast between (26) and (27) in their RS markings ($i \rightarrow j$ vs $j \rightarrow i$).

- (26) IX_i TEACHER IX_j STUDENT $_i\text{TELL}_j$ WHAT IX_s SMART
 "Lit. What the teacher_i told the student is I_i am smart."
 "The teacher_i told the student that she_i is smart."

- _____RS_{j→i}
- (27) IX_i TEACHER IX_j STUDENT _iTELL_j WHAT IX_S SMART
- a. “Lit. What the teacher told the student_j is I_j am smart.”
 “The teacher told the student_j that he_j is smart.”
- b. “Lit. What the teacher_i told the student is I_i am smart.”
 “The teacher_i told the student that she_i is smart.”

The reading of *IX_S* in (27a) is not parallel with the reported speech act. Namely, it is not interpreted with respect to the reported author *TEACHER*, but to the reported addressee *STUDENT*. Thus, the context variable alone cannot explain this interpretation. Under the extensional semantics of Schlenker, the 1st person indexicals are determined from a coordinate of context like agent(*c*), and attitude verbs quantify the coordinates of context. The alternation between (26) and (27) challenges the indexical denotation and/or the quantification over the context because these two sentences contain the same type of attitude verb and indexical item (*TELL* and *IX_S*).

Even Quer’s PVOp does not explain the ambiguity in (27) because the two interpretations arise from one and the same PVOp. What is actually going on is that the interpretation of the 1st person pronoun *IX_S* in (27a) is determined from the locus *j*, which is linked with both *IX_j* in the matrix clause and the RS marking *j→*. In (27b), on the other hand, the interpretation of *IX_S* is not determined from the morphological RS mechanism. It is interpreted as the reported author which is semantically quantified by the attitude verb *TELL*. Hence, we need to distinguish between the roles of the attitude verb and that of RS marking, taking into account the complex interaction between the two.

Moreover, the context variable analysis is somewhat insufficient in explaining the interpretive optionality of (13) and (28). Reading (a) in both examples shows that the adverbial indexicals *TODAY* and *HERE* are shiftable (hence they have underspecified context variables). The same adverbial indexicals nevertheless fail to shift as shown in reading (b). Since in the context variable approach shiftable indexicals must shift, (28b), where there is no shift, is not accounted for.

- (28) Context: The place of the utterance is Starbucks.

A_WHILE_AGO BURGER EAT WHEN IX_i CHELSWU SAY WHAT

RS_i→_j

IX_S HERE PART_TIME_JOB GET WANT

- a. “When he was eating a burger a while ago, Chelswu_i said that he_i wanted to get a part-time job here (= McDonald’s).”
- b. “When he was eating a burger a while ago, Chelswu_i said that he_i wanted to get a part-time job here (= Starbucks).”

4.2 The context-shifting operator approach

The context-shifting operator approach argues that the shifted readings are determined by shifty operators (Anand 2006; Anand and Nevins 2004; Deal 2020). It is possible to introduce operators that partially change context parameters, so this approach is advantageous to account for the variation of indexical shift within and across the set of languages.

Unlike a context variable analysis, It makes no distinction between shiftable and non-shiftable indexicals. The denotation of 1st person pronouns does not differ between languages like English and languages like Amharic as in (29).

$$(29) \llbracket 1^{\text{st}}.\text{pro} \rrbracket^{c,i} = \text{AUTH}(c)$$

Shifted interpretation of the embedded indexicals is rather determined by the presence/absence of the covert shifty operator. Anand and Nevins (2004) proposes two types of the operators as in (30). Languages such as Zazaki, allowing all types of indexicals to shift, have Op_∇, which overwrites the whole context parameter with intensional index (30a), whereas languages like Slave, where only 1st person pronouns shift have, Op_{AUTH}, which overwrites only the coordinate AUTH of the context parameter (30b).

(30) Context-shifting operators (Anand and Nevins 2004)

- a. Zazaki: $\llbracket \text{Op}_{\nabla} [\alpha] \rrbracket^{c,i} = \llbracket \alpha \rrbracket^{i,i}$
 - b. Slave: $\llbracket \text{Op}_{\text{AUTH}} [\alpha] \rrbracket^{<\text{AUTH}(c), \dots>, i} = \llbracket \alpha \rrbracket^{<\text{AUTH}(i), \dots>, i}$
- (c: context parameter, i: intensional index parameter)⁹

9 The semantic value of an expression is with respect to both a context (situation of utterance) and an

Shifty operators are related to the attitude verbs in selectional relationship. (31a) gives the logical form for the quantification over the intensional index parameter by an attitude verb, and (31b) shows that the operator overwrites the coordinates of the context with the index parameter.

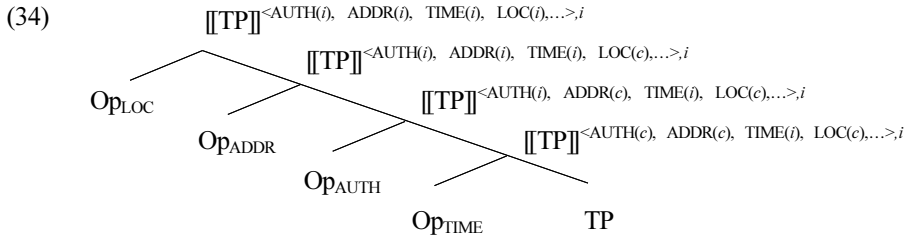
- (31) a. $\llbracket \text{Say Op}_{\forall} [\alpha] \rrbracket^{c,i} = \lambda x_e \forall_j$ compatible with what x says in i , $(\llbracket \text{Op}_{\forall} [\alpha] \rrbracket^{c,j})$
 b. $\llbracket \text{Op}_{\forall} [\text{I am rich}] \rrbracket^{c,j} = \llbracket \text{I am rich} \rrbracket^{i,j} = 1$ iff. $\text{AUTH}(j)$ is rich in j .
 (Anand and Nevins 2004)

Unlike Anand's single operator approach, Deal (2020) proposes a multiple operator system in which Op_{AUTH} , Op_{ADDR} , Op_{LOC} , Op_{TIME} can occur together stacked in a rigid order. The individual operators copy a single coordinate from the index onto the corresponding coordinate of the context as in (32). The sequence of the operators is constrained by the hierarchy of indexical classes (33).

- (32) a. $\llbracket \text{Op}_{\text{ADDR}} [\alpha] \rrbracket^{<\cdots, \text{ADDR}(c), \cdots>, i} = \llbracket \alpha \rrbracket^{<\cdots, \text{ADDR}(i), \cdots>, i}$
 b. $\llbracket \text{Op}_{\text{LOC}} [\alpha] \rrbracket^{<\cdots, \text{LOC}(c), \cdots>, i} = \llbracket \alpha \rrbracket^{<\cdots, \text{LOC}(i), \cdots>, i}$

- (33) Implicational hierarchy of indexical classes¹⁰ (Deal 2020):

Within and across languages, the possibility of indexical shift is determined by the hierarchy **Time** > **1st** > **2nd** > **Loc**. Indexicals of a certain class undergo shift in a particular verbal complement only if indexicals of classes farther to the left undergo shift as well.



intensional index (state of affair expressed by the sentence uttered). For instance, in sentence "Mary said she was happy [uttered by John]", we can distinguish two authors: one is $\text{AUTH}(c)$ (= John) and the other is $\text{AUTH}(i)$ (= Mary).

10 This generalization is based on a set of spoken languages: Nez Perce, Zazaki, Slave, Uyghur, Korean, a dialect of English, etc (Deal 2020).

(34) shows Deal's syntactic implementation of the operator sequence and the derived denotations of intermediate nodes. In this structure, each operator is a functional head and the appearance of one operator predicts the appearance of other operators. If an attitude complement contains Op_{LOC} , it includes Op_{ADDR} , Op_{AUTH} and Op_{TIME} . Similarly, Op_{AUTH} guarantees the appearance Op_{TIME} . Through selectional relationships between attitude verbs and operator phrases, we can explain the variation of indexical shift within and across languages. If an attitude verb allows shift of 1st/2nd person and temporal indexicals within its complement, then the verb selects $Op_{ADDR}P$. If an attitude verb allows only temporal indexical shift within its complement, then the verb selects $Op_{TIME}P$.

Back to KSL. As mentioned above, the shift of adverbial indexicals in KSL is optional. It can be explained by the selectional optionality of attitude verbs. For instance, in (28b), in which the locative adverb *HERE* has unshifty interpretation, the attitude verb *TELL* selects $Op_{ADDR}P$, while in (28a), which shows shifty interpretation, the verb selects $Op_{LOC}P$. The reason why the attitude verb selects $Op_{ADDR}P$ rather than $Op_{AUTH}P$ in (28b) is that, in KSL, the 1st and 2nd person pronouns always shift together as in (35).

- _____ $RS_{i \rightarrow j}$
- (35) IX_i TEACHER IX_j STUDENT ${}_iTELL_j$ WHAT IX_s IX_2 SEE
 “Lit. What the teacher_i told the student_j is I_i saw you_j”
 “The teacher_i told the student_j that she_i saw him_j”

However, the operator sequence (34) cannot be applied to the case like (36) in which person indexicals are shifted obligatory but temporal indexicals are shifted optionally. Since Op_{TIME} is lower than Op_{ADDR} and Op_{AUTH} , the shift of the 1st/2nd person indexicals should predict the shift of the temporal indexicals, but (36b) does not follow the prediction.

- (36) (=13) Context: The day of the utterance is Saturday.
 YESTERDAY IX_i CHELSWU IX_j YENGHUY ${}_iTELL_j$ WHAT
 _____ $RS_{i \rightarrow j}$
 TODAY IX_s TRIP GO
 a. “Yesterday Chelswu_i told Yenghuy that he_i would go on a trip
 today (= Friday).”
 b. “Yesterday Chelswu_i told Yenghuy that he_i would go on a trip

today (= Saturday).”

Deal (2020) considers typological differences in the shifts of adverbial indexicals, distinguishing between Op_{TIME} languages and Op_{ADV} languages. Op_{TIME} languages follow the model (34). On the other hand, in Op_{ADV} languages, locative indexicals and temporal indexicals shift together, and person indexicals have no shifty priority over adverbial indexicals¹¹. KSL, however, does not belong to either of these two types. In KSL role shift, locative indexicals and temporal indexicals shift independently, and person indexicals have the shifty priority over adverbial indexicals. This will be discussed in detail in the following section.

Although the context-shifting operator approach handles the diversity of indexical shift well, it does not account for non-parallel shifty interpretations of RS. As we have seen in (27), in RS 1st person pronouns sometimes refer to a reported addressee. This interpretation cannot be based on intensional index parameters quantified by attitude verbs. Rather, this is interpreted according to locus values assigned to arguments and marked by the non-manual RS signals. We will distinguish the RS-based shift from the attitude-based shift and propose how these two shift systems interact in RS segments.

11 Deal (2020) suggests Korean as a language belonging to Op_{ADV} languages. In Korean, adverbial indexicals must shift together with other adverbial indexicals but person indexicals can shift independent of adverbial indexicals (and *vice versa*) as shown in (i) and (ii) (Park 2014).

(i) Context: John and Mary are having a conversation in Boston on January 3rd.

John: Tom-i ece cenyek Amherst-eyse Sue-ka ece yeki-ey wassta-ko malhayssta.

Tom-Nom yesterday night Amherst-at Sue-Nom yesterday here-at came-C said

‘Lit. Tom said last night in Amherst that Sue came here yesterday.’

a. ‘here’ = Boston, ‘yesterday’ = January 2nd (No Shift)

b. ‘here’ = Amherst, ‘yesterday’ = January 1st (Both Shift)

c. *‘here’ = Boston, ‘yesterday’ = January 1st (Temp. Shift)

d. *‘here’ = Amherst, ‘yesterday’ = January 2nd (Loc. Shift) (Park 2014)

(ii) Context: John and Mary are having a conversation in Seoul.

John: Tom-i Amherst-eyse nay-ka yeki-eyse thayenassta-ko malhayssta.

Tom-Nom Amherst-at I-Nom here-at be.born-C said

‘Lit. Tom said in Amherst that I was born here.’

a. ‘I’ = John, ‘here’ = Seoul (No Shift)

b. ‘I’ = John, ‘here’ = Amherst (Location Shift)

c. ‘I’ = Tom, ‘here’ = Seoul (Person Shift)

d. ‘I’ = Tom, ‘here’ = Amherst (Both Shift) (Park 2014)

5. Proposed Analysis

To account for KSL role shift, we need to consider the following interpretive possibilities of indexical shift:

(37) a. Parallel or non-parallel:

Shifted interpretations of 1st and 2nd person pronouns usually correspond to the reported author and addressee, but sometimes they do not. Their shifted interpretations simply follow the non-manual RS markings of the loci.

b. All or mixed:

While the 1st and 2nd person pronouns shift obligatorily, the adverbial indexicals like *HERE* and *TODAY* shift optionally. Consequentially, all indexicals within an RS scope may acquire shifted interpretations, but in some cases, shifted and non-shifted indexicals co-occur.

5.1 Shifty operators in KSL

In order to account for the interpretive possibilities (37a) and (37b), we propose that KSL has two series of shifty operators: the attitude context-shifting operators: Op_{AUTH} , Op_{ADDR} , Op_{LOC} and Op_{TIME} from Deal (2020), and the role shift operator: $\text{Op}_{\text{RS:X} \rightarrow \text{y}}$. The operators and some indexical denotations in KSL are listed in (38) and (39).

(38) Shifty operators in KSL

a. Attitude context-shifting operators:

$$\begin{aligned} \llbracket \text{Op}_{\text{AUTH}} [\alpha] \rrbracket^{<\text{AUTH}(c), \cdots>, i, g} &= \llbracket [\alpha] \rrbracket^{<\text{AUTH}(i), \cdots>, i, g} \\ \llbracket \text{Op}_{\text{ADDR}} [\alpha] \rrbracket^{<\cdots, \text{ADDR}(c), \cdots>, i, g} &= \llbracket [\alpha] \rrbracket^{<\cdots, \text{ADDR}(i), \cdots>, i, g} \\ \llbracket \text{Op}_{\text{LOC}} [\alpha] \rrbracket^{<\cdots, \text{LOC}(c), \cdots>, i, g} &= \llbracket [\alpha] \rrbracket^{<\cdots, \text{LOC}(i), \cdots>, i, g} \\ \llbracket \text{Op}_{\text{TIME}} [\alpha] \rrbracket^{<\cdots, \text{TIME}(c), \cdots>, i, g} &= \llbracket [\alpha] \rrbracket^{<\cdots, \text{TIME}(i), \cdots>, i, g} \end{aligned}$$

b. Role shift operator:

$$\llbracket \text{Op}_{\text{RS:X} \rightarrow \text{y}} [\alpha] \rrbracket^{<\text{AUTH}(c), \text{ADDR}(c), \cdots>, i, g} = \llbracket [\alpha] \rrbracket^{<g(\text{locus-x}), g(\text{locus-y}), \cdots>, i, g}$$

(c: context parameter, i: intensional index parameter, g: assignment function)

(39) Some indexical denotations in KSL:

$$\llbracket \text{IX}_s \rrbracket^{c, i, g} = \text{AUTH}(c)$$

$$[[IX_2]]^{c,i,g} = ADDR(c)$$

$$[[here]]^{c,i,g} = LOC(c)$$

$$[[now]]^{c,i,g} = TIME(c)$$

The attitude context-shifting operators have scope over an attitude complement and overwrite the corresponding coordinate of the context with that of the intensional index parameter. In contrast, the RS operator, $Op_{RS:x \rightarrow y}$, occupies the segment under role shift non-manual marking $RS_x \rightarrow y$. Namely, the operator overtly represents their scope.

$Op_{RS:x \rightarrow y}$ overwrites the context parameter like the attitude operators. However, it differs from the attitude operators in an aspect that its application is related with the assignment function. For instance, $Op_{RS:i \rightarrow j}$ overwrites the two coordinates of context c $\langle AUTH, ADDR \rangle$ with two applications of assignment function g $\langle g(locus-i), g(locus-j) \rangle$, and at the point when the applications are evaluated, their semantic values are determined:

$$(40) \text{ a. } [[Op_{RS:i \rightarrow j} [a]]]^{<AUTH(c), ADDR(c), \dots, i, g} = [[a]]^{<g(locus-i), g(locus-j), \dots, i, g}$$

$$\text{b. } g': \left[\begin{array}{l} locus-i \rightarrow \text{Chelswu} \\ locus-j \rightarrow \text{Yenghuy} \\ \dots \end{array} \right]$$

We posit that loci in sign languages are variable-like. Indeed, they share some characteristics with variables. When the loci are used anaphorically, signers distinguish referents according to their locus values as in (41). Assuming that both (41b) and (41b') follow the sentence (41a), the two sentences share a locus mapping $\{locus-i, locus-j\}$ onto $\{\text{Chelswu}, \text{Minswu}\}$. The difference in meaning between (41b) and (41b') is due to the difference in the locus value that binds the subject pronoun.

$$(41) \text{ a. } IX_i \text{ CHELSWU } IX_j \text{ MINSWU } i\text{MEET}_j$$

“Chelswu met Minswu.”

$$\text{b. } IX_i \text{ HAPPY}$$

“He($g'(locus-i) = \text{Chelswu}$) was happy.”

$$\text{b'. } IX_j \text{ HAPPY}$$

“He($g'(locus-j) = \text{Minswu}$) was happy.”

$$(g' = g^{[[Chelswu/locus-i][Minswu/locus-j]})$$

(42) (=21)

IX_i TEACHER IX_j STUDENT _iTELL_j WHAT IX₂ SMARTa. “Lit. What the teacher told the student_j is you_j are smart.”✓[... TELL Op_{ADDR} Op_{AUTH} [IX₂ SMART]](IX₂ = tthe addressee of the reported speech act: the student)

b. “Lit. What the teacher told the student is you (= the actual addressee) are smart.”

✓[... TELL [IX₂ SMART]](IX₂ = the addressee of the actual speech act)

The fact that indexical shift is available without role shift non-manual marking is one of the reasons why the attitude operators and the RS operator must be distinguished. As we saw in (20), (21) and (23), in KSL 1st/2nd pronouns and adverbial indexicals optionally shift in non-RS indirect reports; one of the examples is repeated in (42). The 2nd person indexical IX₂ can either shift to the reported addressee ‘the student’ or stay with the addressee of the actual utterance. Given that Op_{RS} morphologically indicates its scope, it is impossible to assume the RS operator in the embedded complement. Rather, the contrast between (42a) and (42b) is determined by the presence/absence of attitude shift operators. According to the generalization of Deal (2020) for the attitude person shifters, we assume that Op_{ADDR} is projected above Op_{AUTH}, and the presence of Op_{ADDR} predicts the presence of Op_{AUTH}.

5.2 Accounting for the parallel or non-parallel shift

We argue that the interpretation of parallel or non-parallel shift in RS is made dependent on the presence/absence of Op_{ADDR} and Op_{AUTH}. Considering that Op_{RS} is present under the RS non-manual marking, the possible operator sequences can be schematized as (43). We propose that when both the attitude person shifters and Op_{RS} appear together, Op_{ADDR} and Op_{AUTH} are syntactically located higher than Op_{RS}. Consequently, although the Op_{RS} sets the two coordinates of the context, <AUTH, ADDR>, the attitude person shifters eventually rewrite the two coordinates. In other words, Op_{ADDR} and Op_{AUTH} shadow Op_{RS} as in (44).

- (43) a. [... TELL [Op_{RS:x→y} TP]]
 b. [... TELL [Op_{ADDR} Op_{AUTH} Op_{RS:x→y} TP]]
- (44) [Op_{ADDR} Op_{AUTH} Op_{RS:x→y} TP]]^{c,i,g}
 = [[Op_{ADDR}]]^{c,i,g}([[Op_{AUTH}]]^{c,i,g}([[Op_{RS:x→y}]]^{c,i,g}([[TP]]^{c,i,g})))
 = [[Op_{ADDR}]]^{c,i,g}([[Op_{AUTH}]]^{c,i,g}([[TP]]^{<g(locus-x),g(locus-y),...>,i,g})))
 = [[Op_{ADDR}]]^{c,i,g}([[TP]]^{<AUTH(i), g(locus-y),...>,i,g}))
 = [[TP]]^{<AUTH(i), ADDR(i),...>,i,g}

Rather than introducing the reported circumstance, the Op_{RS} simply shares locus values with 1st and 2nd pronouns within the RS segments. For that reason, a Op_{RS}-only construction like (43a), may result in non-parallel shift readings if the locus binding of Op_{RS} happens to be not parallel to the reported speech act. On the other hand, in (43b), an ‘Op-shadowing’ construction, the interpretation of person pronouns is finally determined by Op_{ADDR} and Op_{AUTH} rather than Op_{RS}. Thus, it renders parallel readings regardless of the locus binding of Op_{RS}.

(45a) and (46), which have non-parallel shift readings, are examples of Op_{RS}-only constructions. Note that in (46) the Op-shadowing construction simply yields an uninterpretable sentence as the author of the reported speech act is unknown. In contrast, (45b) and (47) are Op-shadowing constructions, as the interpretation of the indexicals is determined regardless of the locus binding of Op_{RS}. Note also that in (47) the Op_{RS}-only construction fails to yield an interpretable result as there is no individual assigned to locus *j*.

- (45) (=27) _____ RS_{j→i}
 IX_i TEACHER IX_j STUDENT TELL_j WHAT IX_S SMART
 a. “Lit. What the teacher_i told the student_j is I_j am smart.”
 ✓[... TELL Op_{RS:j→i} [IX_S SMART]]
 (IX_S = the individual assigned to *locus-j*: ‘the student’)
 b. “Lit. What the teacher_i told the student_j is I_i am smart.”
 ✓[... TELL Op_{ADDR} Op_{AUTH} Op_{RS:j→i} [IX_S SMART]]
 (IX_S = the author of the reported speech act: ‘the teacher’)
- (46) (=10) _____ RS_{i→j}
 IX_i CHELSWU HEAR WHAT IX_S TEST PASS
 “Lit. What Chelswu_i heard was I_i passed the test.”

- ✓[... HEAR Op_{RS:i→j} [IX_S TEST PASS]]
 (IX_S = the individual assigned to *locus-i*: ‘Chelswu’)
 #[... HEAR Op_{ADDR} Op_{AUTH} Op_{RS:i→j} [IX_S TEST PASS]]
 (IX_S = the author of the reported speech act: unknown)
- (47) _____ RS_{i→j}
 HEAR_{CL:PHONE} WHAT IX₂ FRIEND DIE
 “Lit. What (I) heard[on the phone] is your friend died.”
 #[... HEAR Op_{RS:i→j} [IX₂ FRIEND DIE]]
 (IX₂ = the individual assigned to *locus-j*: none)
 ✓[... HEAR Op_{ADDR} Op_{AUTH} Op_{RS:i→j} [IX₂ FRIEND DIE]]
 (IX₂ = the addressee of the reported speech act: the current signer)

According to our proposal, (48), where the interpretation of the IX_S is shifted to ‘the teacher’, is syntactically ambiguous. Its shifted reading may be determined by the locus value of RS marking (*i→j*) or by the reported speech act.

- (48) (=26) _____ RS_{i→j}
 IX_i TEACHER IX_j STUDENT _iTELL_j WHAT IX_S SMART
 “Lit. What the teacher_i told the student was I_i am smart.”
 ✓[... TELL Op_{RS:i→j} [IX_S SMART]]
 (IX_S = the individual assigned to *locus-i*: ‘the teacher’)
 ✓[... TELL Op_{ADDR} Op_{AUTH} Op_{RS:i→j} [IX_S SMART]]
 (IX_S = the author of the reported speech act: ‘the teacher’)

5.3 Accounting for the all or mixed shift

The possibility of all-or-mixed shifts is dependent on the presence/absence of Op_{LOC} and Op_{TIME}. Since the Op_{RS} does not change any coordinates other than coordinates *c* <AUTH, ADDR>, it does not affect the denotations of adverbial indexicals. In contrast, the attitude adverbial operators may change coordinates *c* <TIME, LOC>. Thus, in Op_{RS}-only constructions, adverbial indexicals cannot have shifted interpretations. If we have adverbial shifter(s), locative and/or temporal indexicals are shifted together with person indexicals. (49) shows the comparison of the all-shift reading (49b) and the mixed

one (49a).

(49) (=13) Context: The day of the utterance is Saturday.

YESTERDAY IX_i CHELSWU IX_j YENGHUY _iTELL_j WHAT
 _____RS_{i→j}

TODAY IX_S TRIP GO

“Yesterday Chelswu_i told Yenghuy that I_i would go on a trip
 today (= Saturday/Friday).”

a. ✓[... TELL (Op_{ADDR} Op_{AUTH}) Op_{RS:i→j} [TODAY IX_S TRIP GO]]
 (IX_S = ‘Chelswu’)

(TODAY = the time of the actual utterance: ‘Saturday’)

b. ✓[... TELL Op_{TIME} (Op_{ADDR} Op_{AUTH}) Op_{RS:i→j} [TODAY IX_S TRIP GO]]
 (IX_S = ‘Chelswu’)

(TODAY = the time of the reported speech act: ‘Friday’)

When person indexicals and adverbial indexicals co-occur in a complement marked with a non-parallel RS signals, the possibility of interpretation is diverse. There are two types of variation factors; one depends on whether the shifty interpretation of person indexicals follows RS marking or the reported speech act, and the other depends on whether the adverbial indexicals are shifted or not. sentence Thus, (50) can be interpreted in four ways. Note that (49) and (50) are different from each other only in their RS markings (*i→j* vs *j→i*).

(50) Context: The day of the utterance is Saturday.

YESTERDAY IX_i CHELSWU IX_j YENGHUY _iTELL_j WHAT
 _____RS_{j→i}

TODAY IX_S TRIP GO

“Yesterday Chelswu_i told Yenghuy_j that I_{ij} would go on a trip
 today (= Saturday/Friday).”

a. ✓[... TELL Op_{RS:j→i} [TODAY IX_S TRIP GO]]

(IX_S = the individual assigned to *locus-j*: ‘Yenghuy’)

(TODAY = the time of the actual utterance: ‘Saturday’)

b. ✓[... TELL Op_{TIME} Op_{RS:j→i} [TODAY IX_S TRIP GO]]

(IX_S = the individual assigned to *locus-j*: ‘Yenghuy’)

- (TODAY = the time of the reported speech act: ‘Friday’)
- c. ✓[... TELL Op_{ADDR} Op_{AUTH} Op_{RS:i→j} [TODAY IX_S TRIP GO]]
 (IX_S = the author of the reported speech act: ‘Chelswu’)
 (TODAY = the time of the actual utterance: ‘Saturday’)
- d. ✓[... TELL Op_{TIME} Op_{ADDR} Op_{AUTH} Op_{RS:i→j} [TODAY IX_S TRIP GO]]
 (IX_S = the author of the reported speech act: ‘Chelswu’)
 (TODAY = the time of the reported speech act: ‘Friday’)

In KSL, there is no shifty priority between locative and temporal indexicals. Both classes optionally shift independently. (51), where both appear, shows a four-way ambiguity. 1st person indexical IX_S has shifty reading in all cases, but *TODAY* and *HEAR* show different shift patterns among cases (a-d). Within the multiple operator scenario, the difference between each interpretation can be easily explained by the presence or absence of Op_{TIME} and Op_{LOC}.

One problem is that we cannot determine the sequence of the two operators. For a simple application, we propose Op_{LOC&TIME}, which is present in instances like (51d). Op_{LOC&TIME} overwrites the two coordinates $c \langle \text{TIME}, \text{LOC} \rangle$ of the context with the intensional index as shown in (52). If Op_{TIME}, Op_{LOC} or Op_{LOC&TIME} is present within the attitude complement, it sits higher than person shifters, and the three adverbial operators are under the constraint that they do not appear simultaneously with each other.

- (51) Context: The place of the utterance is Starbucks and the day of the
 utterance is Saturday

YESTERDAY IX_i CHELSWU_i TELL_S WHAT
 _____ RS_{i→j}

IX_S TODAY HERE PART_TIME_JOB APPLY

- a. “Yesterday Chelswu_i told me that I_i applied for a part-time job here (= Starbucks) today (= Saturday).”
 ✓[... TELL (Op_{ADDR} Op_{AUTH}) Op_{RS:i→j} [... TODAY HERE ...]]
- b. “Yesterday Chelswu_i told me that I_i applied for a part-time job here (= McDonald’s) today (= Saturday).”
 ✓[... TELL Op_{LOC} (Op_{ADDR} Op_{AUTH}) Op_{RS:i→j} [...TODAY HERE...]]
- c. “Yesterday Chelswu_i told me that I_i applied for a part-time job here (= Starbucks) today (= Friday).”

- ✓[... TELL Op_{TIME} (Op_{ADDR} Op_{AUTH}) Op_{RS:i→j} [...TODAY HERE...]]
- d. “Yesterday Chelswu_i told me that I_i applied for a part-time job here (= McDonald’s) today (= Friday) .”
- ✓[... TELL Op_{LOC&TIME} (Op_{ADDR} Op_{AUTH}) Op_{RS:i→j} [...TODAY HERE...]]
- (52) $\llbracket \text{Op}_{\text{LOC\&TIME}} [\alpha] \rrbracket^{<\dots, \text{TIME}(c), \text{LOC}(c), \dots>, i, g} = \llbracket \alpha \rrbracket^{<\dots, \text{TIME}(i), \text{LOC}(i), \dots>, i, g}$

5.4 Interaction between role shift and attitude verbs

Based on the non-parallel shifts and the shifts found in non-RS indirect reports, we classified indexical shifts into two kinds: shifts by attitude verbs and shifts by RS markings (i.e., role shift). We introduced the Op_{RS}, distinct from the attitude operators. We have further demonstrated the interpretive possibilities within an operator sequence. It is proposed that the presence/absence of a particular operator is determined by the selectional properties of an attitude verb and shifty operators. The selectional features of verbs and operators in KSL are summarized as in (53).

(53) LEXICAL	COMPLEMENT-OPTION
TELL/HEAR	{ Op _{ADV} P / Op _{ADDR} P / Op _{RS} P / TP }
Op _{ADV}	{ Op _{ADDR} P / Op _{RS} P }
Op _{ADDR}	{ Op _{AUTH} P }
Op _{AUTH}	{ Op _{RS} P / TP }
Op _{RS}	{ TP }
(Op _{ADV} is the supertype of Op _{LOC} , Op _{TIME} and Op _{LOC&TIME})	

These lexical entries reflect the constraints between the shifty operators. First, both the 1st and 2nd person shifters must occur together. Second, the presence of the adverbial shifter predicts the presence of the person shifters including Op_{RS}. Third, the attitude person shifters shadow the RS person shifter when they appear together. The operator sequences that can be generated by the selectional constraints are as in (54).

- (54) The possible operator sequences
- a. In RS attitude complements:
- [Op_{ADV} Op_{ADDR} Op_{AUTH} Op_{RS} TP]

- [Op_{ADV} Op_{RS} TP]
- [Op_{ADDR} Op_{AUTH} Op_{RS} TP]
- [Op_{RS} TP]
- b. In non-RS attitude complements:
 - [Op_{ADV} Op_{ADDR} Op_{AUTH} TP]
 - [Op_{ADDR} Op_{AUTH} TP]
 - [TP] (no shifter)

The interaction between attitude verbs and role shift can be summarized as follows. The RS operator can occur by the selectional relationship with an attitude verb. If it does, the RS non-manual signal is marked in the attitude complement. In accepting this view, the analysis of the so-called non-quotational RS can be problematic because a non-quotational RS has an RS marking but lacks an attitude verb. In addition, this type of role shift allows not only the person pronoun shift but also the adverbial indexical shift.

For the analysis of this type of role shift, we propose a null attitude verb $\emptyset_{\text{ATTITUDE}}$ that quantifies over index parameters as verbs like *TELL* and *HEAR* do. One problem is that the appearance of this null predicate somehow depends on the RS segment. We attribute the dependence to the phonological deficiency of the verb. The dependent relationship between the null attitude verb and the RS operator is described as follows. First, the RS operator can be selected by an attitude verb within the operator sequence. Second, the null attitude verb requires the visible context shifter Op_{RS} for phonological reason. (55) shows the null predicate analysis of the non-quotational role shift.

- (55) Context: The location of the utterance is Korea. Yesterday, Chelswu (*IX*)
was in Japan where he got quite upset.

- RS_{i→j}
- IX_i $\emptyset_{\text{ATTITUDE}}$ HERE AIRPORT DOOR PUNCH DOOR BREAK
 “He_i punched the airport door here (= Korea/Japan) and broke it.”
- a. ✓[... $\emptyset_{\text{ATTITUDE}}$ Op_{RS:i→j} [HERE ...]]
 (HERE = the place of actual utterance: ‘Korea’)
 - b. ✓[... $\emptyset_{\text{ATTITUDE}}$ Op_{LOC} Op_{RS:i→j} [HERE ...]]
 (HERE = the place of the reported act: ‘Japan’)

6. Conclusion

We presented various interpretive possibilities of indexicals in KSL. First, shifted interpretations of 1st person pronouns usually correspond to the reported author, but sometimes the 1st persons refer to the reported addressee, strictly following the locus values of the non-manual marking. Second, 1st and 2nd person pronouns shift obligatorily, while adverbial indexicals shift optionally. Consequentially, when person and adverbial indexicals come together, two cases are possible: one where all indexicals shift, and the other where person indexicals shift but adverbial indexicals do not.

To account for such interpretive possibilities, in line with the multiple shifty operator approach, we adopted a series of attitude shifty operators, which overwrite the context parameter with the intensional index. We also proposed the role shift operator, Op_{RS}, which overwrites the context parameter with the locus mapping onto each individual. Furthermore, we proposed an operator stacking system by combining Op_{RS} with the attitude shifty operators. This system generates a limited number of operator sequences and complement sizes, successfully accounting for the complex interpretive possibilities of indexical shifts observed in KSL.

There are two ways in which this research bears on the recent operator-based analyses of indexical shift across languages. First, our findings refute the claims that the role shift operator is a mere visual counterpart of the attitude context shifter of spoken languages. Rather, our findings demonstrate that both types of operators are needed for sign languages. Second, our analysis demonstrates the cross-linguistic validity of the multiple operator analysis. Different sizes of attitude complements generated in KSL crucially provide the various interpretive possibilities of indexical shift in the language. That is exactly how the multiple operator approach accounts for the variation of indexical shifts across spoken languages. Although the role shift operator we proposed has modality-specific characteristics, it does not differ from the other shifty operators in that it constitutes an operator sequence within an attitude complement.

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