# ASL IX to locus as a modifier[*]

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1.   Introduction

The indexical point (IX) in sign languages like American Sign Language (ASL) can be used to point to the signer herself, the addressee, or to other referents in the context, and refer to them like indexical pronouns *I*, *she*, or *it*. If an entity is not present in the context, an abstract location in the signing space can be established and associated with that entity, and IX to that location (locus) refers to that entity (Lillo-Martin and Klima 1990, Liddell 2003, Sandler and Lillo-Martin 2006, Neidle et al. 2000, a.o.). IX can also be produced in the neutral space in front of the signer, pointing forward without a specific target (cf. MacLaughlin 1997, Neidle et al. 2000, Koulidobrova and Lillo-Martin 2016, Schlenker et al. 2013). Throughout this paper, I label the pointing to a specific, abstract locus as IX_{LOC}, and the pointing in the neutral space as IX_{NEUT}. The indexical pointing to first, second, and third-person entities present in the immediate context will be labeled as IX_1, IX_2, and IX_3, respectively. IX_{LOC}, IX_{NEUT}, and IX_1 are depicted in (1) below.
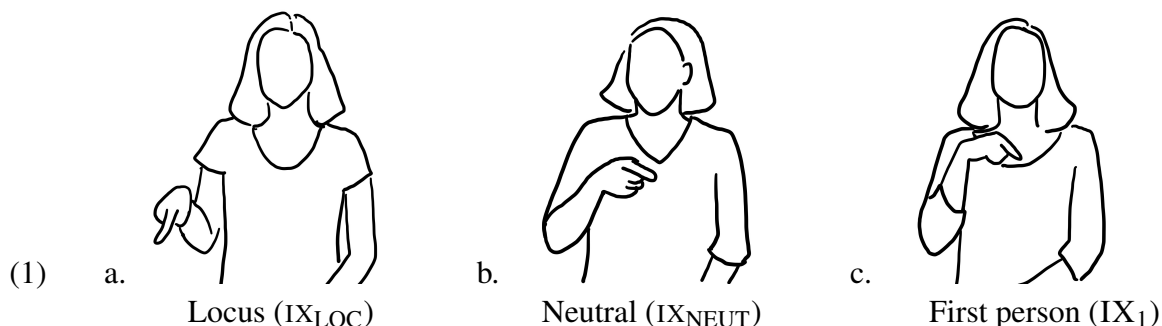
(1)   a.   b.   c.
       Locus (IX_{LOC})   Neutral (IX_{NEUT})   First person (IX_1)

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Reference to entities present in the context will be called 'exophoric' while reference to familiar entities in the discourse will be called 'anaphoric'. To distinguish reference to actual entities from reference to abstract loci, I will use letters 'A, B, ...' to represent abstract locations, and '3A, 3B, ...' for exophoric reference to third-person entities, as shown below. In an exophoric use as in (2), a signer can point directly to herself (IX_1) and to two individuals at their respective locations (IX_{3A} and IX_{3B}). In an anaphoric use as in (3), the signer first establishes two loci: A for the teacher and B for the student, as represented by underlined text. Then, IX to A and B (bolded) can be used to refer to the teacher and the student, respectively.

(2)   YESTERDAY IX_1 SEE $\textbf{IX}_{\textbf{3A}}$ $\textbf{IX}_{\textbf{3B}}$.
       'Yesterday I saw **[the person located at A]** and **[the person located at B]**.'

(3)   YESTERDAY IX_1 SEE TEACHER IX_A STUDENT IX_B. $\textbf{IX}_{\textbf{A}}$ WOMAN $\textbf{IX}_{\textbf{B}}$ MAN.
       'Yesterday I saw a teacher and a student.
       The teacher was a woman and **the student** was a man.'

IX as a whole class has generally be analyzed as some type of a pronoun (cf. Sandler and Lillo-Martin 2006). IX_{LOC} stands out from indexical uses (IX_1 and IX_2) and IX_{NEUT} because there is an infinite number of abstract locations that can be pointed to, raising a question of whether sign languages have an infinite number of pronouns available unlike spoken languages that have a limited set. Instead of arguing that sign languages have an infinite number of pronouns, Lillo-Martin and Klima (1990) argue that loci are overt instantiations of indices that IX, the pronoun, can be assigned to. This analysis resolves the problem of infinite pronouns, but still has to assume that sign languages differ from spoken languages in overtly marking the anaphoric indices.

This paper presents some empirical and theoretical limitations that arise from the general assumption that sign languages make anaphoric indices overt. After reviewing these limitations, I propose an alternative solution to the infinite pronoun problem that does not require the sign-specific stipulation of overt indices. I argue that IX_{LOC} is not a pronoun, or any anaphoric expression in general. Instead, I argue that IX_{LOC} should be analyzed as a modifier like an adjective or a relative clause that contributes a locational restriction. Moreover, I argue that IX_{LOC} is identical in form and meaning to the co-speech pointing gesture that is used in spoken languages.

Anaphoric expressions like definite descriptions can carry additional restrictions like adjectives or relative clauses to distinguish the intended referent from the context. The main implication of analyzing IX_{LOC} as a modifier is that IX_{LOC} is now one of the many possible restrictions that an anaphoric expression may carry, rather than an overt referent tracking mechanism unique to sign languages. I show that this analysis allows for a unified theory of pointing in both spoken and sign languages that better accounts for the distributional and interpretive properties of pointing without stipulations specific to the signed modality.

2.   Setting the stage

2.1   Previous analyses of IX

Formal studies have often focused on the specific use of the IX handshape and movement separately from the abstract location. IX, with or without loci, has been analyzed as a definite determiner (Neidle et al. 2000, MacLaughlin 1997, Irani 2016), an adverbial (Neidle et al. 2000), a pronoun (Lillo-Martin and Klima 1990, Sandler and Lillo-Martin 2006, Schlenker et al. 2013), and as a demonstrative (Koulidobrova and Lillo-Martin 2016).

While the debate on the nature of IX continues to present day, it is important to note that the labels 'pronoun', 'definite', and 'demonstrative' may not be so crucial when it comes to the underlying semantic meaning, and sometimes even misleading. Across languages, anaphoric expressions have been shown to form a spectrum based on their morphosyntactic and semantic complexity that correlates reversely with how salient the intended referent is (cf. Ariel 2000, Gundel et al. 1993). It has also been shown that where an anaphoric expression falls in such a spectrum depends not on the specific morphosyntactic property but on the inventory of anaphoric expressions available in that language (Ahn 2019). Thus, a pronoun of one language might not behave similarly to a pronoun of another language. For example, an overt pronoun of Spanish blocks bound-variable readings and often carries contrastive focus due to its competition with a null pronoun (cf. Montalbetti 1984, Mayol 2010). An overt pronoun in English, however, is not marked in that way because they do not compete with covert pronouns.

Given this background, what can we know about IX in sign languages? There is evidence in the literature that suggests that IX is a relatively marked anaphoric expression in sign languages. Referent tracking studies show that IX is restricted in distribution relative to other anaphoric expressions available in the language. Like any other language, ASL makes use of many kinds of anaphoric expressions other than IX$_{\text{LOC}}$, such as null anaphors (Koulidobrova 2012, Bahan et al. 2000, Lillo-Martin 1986), bare nouns, and IX$_{\text{NEUT}}$ (Neidle et al. 2000). Out of these possible expressions, Czubek (2017) and Frederiksen and Mayberry 2016 show that IX barely occurs (2% of the total number of anaphoric expressions; Czubek 2017) in naturally produced discourse when signers are asked to tell a story based on picture panels.

IX has also been shown to be restricted in where it is licensed. Irani (2016) and Koulidobrova and Lillo-Martin (2016) show that IX cannot occur where unmarked definites occur in other languages as in (4), or where unmarked pronouns occur as in (5).

(4)   FRANCE (#IX) CAPITAL WHAT
       'What is the capital of France?'   [Koulidobrova and Lillo-Martin 2016; (22)]

(5)   a.   a-MOTHER$_i$ PERSUADE b-MARY$_j$ MAKE SANDWICH$_k$. neu-IX$_{j,k,?i}$ GOOD.
             'My mother persuaded my sister to make a sandwich. {She/it} is good.'

b.   SANDWICH$_k$ a-MOTHER$_i$ PERSUADE b-MARY$_j$ MAKE. neu-IX$_{i,j,?k}$ GOOD.
       'Mother is persuading Mary to make a sandwich. {Mother/Mary} is good.
       (neu-IX: IX$_{\text{NEUT}}$)   [Koulidobrova and Lillo-Martin 2016; (35)]

Based on these observations, Irani (2016) argues that IX is a marked, familiarity-denoting definite (cf. Schwarz 2009) while Koulidobrova and Lillo-Martin (2016) argue that IX should be analyzed as a demonstrative. Moving away from the morphosyntactic labels, we can generalize that IX falls near the marked end of the anaphoric spectrum in ASL.

2.2   Previous analyses of loci

We now turn to analyses of loci in the formal literature. Loci have been analyzed in semantic works as a referent tracking mechanism, such as indices that variables carry (Lillo-Martin and Klima 1990, Steinbach and Onea 2015, Schlenker et al. 2013). [1]

In formal representations of languages, indices are one possible mechanism used to keep track of referents. In models that make use of indices, whenever there is a new referent introduced in the discourse, it is assumed that the referent is assigned a unique index. Anaphoric expressions with a specific index then is assumed to refer to that antecedent through coindexation. The pioneering idea of Lillo-Martin and Klima (1990) is that loci are the signed correlates of these indices that pronouns carry and share with their antecedents. Studies that follow generally assume that loci mediate the relation between a pronominal element and its antecedent (cf. Schlenker et al. 2013) and investigate how sign languages can help tease apart different proposals on the formal link between the anaphoric pronoun and the antecedent (Schlenker 2011). Thus, under these accounts, the overt locus A in (6a) formally links the doctor and IX, just as the unpronounced coindexation of 7 formally links the doctor and the pronoun *she* in (6b).

(6)   a.   YESTERDAY I SEE DOCTOR IX$_A$. IX$_A$ SMART.
             'I saw a doctor$_i$ yesterday. She$_i$ was smart.'   [ASL]

       b.   I saw a doctor$_7$ yesterday. She$_7$ was smart.   [English]

2.3   A puzzle

Analyzing loci as the formal link in anaphoric relations, however, leads us to a puzzle when we consider our generalization from the previous section that IX is restricted and marked in ASL. Loci are only marked with IX, and so the infrequent use of IX entails that loci are used only in a small subset of anaphoric expressions in ASL. If loci are overt instantiations of indices, and indices are the mechanism behind referent tracking, why do indices only appear with IX? In the semantic frameworks that make use of indices, every discourse

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[1]Loci have also been analyzed as grammatical features that pronouns carry to check the uninterpretable features on verbs (cf. Neidle et al. 2000, Kuhn 2015). However, because the feature-based analysis is motivated by syntactic agreement and is assumed not to carry semantic meanings like other meaningful features such as *phi*-features, I do not discuss this analysis further and focus on the index-based analyses.

referent is assigned an index. If loci are the overt instantiations of indices as previously claimed, we would expect loci to appear with other kinds of anaphoric expressions in ASL as well. Null anaphors, bare nouns, and IX$_{\text{NEUT}}$ are anaphoric expressions but do not make use of overt loci.[2]

2.4   Pragmatically-constrained indices

In discussing this issue, it is important to note that the claim of the index-based approach is more complicated than what was sketched out in Section 2.2. Specifically, their argument is not that loci are the sole mediators between anaphoric expressions and their antecedents.

Lillo-Martin and Klima (1990) argue that referential indices are overtly manifestated in ASL, but further note that this discourse representation must be at a pragmatic level. So, in this analysis the index system used in sign languages is not the same as the semantic index system used in spoken languages. Steinbach and Onea (2015) also propose a pragmatic analysis of pointing in sign languages for discourse referent tracking. In their analysis, unlike Lillo-Martin and Klima 1990 who place the full locus representation in the pragmatic level, Steinbach and Onea maintain that loci are formal links represented at the semantic level just like it is assumed in spoken langauges. However, they make a distinction between overtly marked loci and covert, logical loci. Their argument is that semantically, every discourse referent is marked with a locus, regardless of whether it is overt or not. Depending on pragmatic constraints, a signer may decide to overtly mark that locus using the pointing device. Schlenker et al. (2013) differ from Lillo-Martin and Klima 1990 and Steinbach and Onea 2015 in assuming that both the overt loci and regular indices are assigned at the semantic level. They assume that 'assignment functions assign values to loci as well as to standard (unpronounced) indices' (p.105) in sign languages.

Allowing both overt and covert indices in sign languages resolves the issue of optional locus marking, with the pragmatic constraints added in Lillo-Martin and Klima 1990 and Steinbach and Onea 2015 further deriving the restricted distribution of overt loci. However, it still leaves the question open as to why sign languages might differ from spoken languages in this way. Specifically, it is unclear why only sign languages have the option of overtly marking the underlying indexing mechanism. In semantic frameworks that assume anaphoric indices, the indices never get overtly marked. Instead, it is the anaphoric expression carrying the index – such as a pronoun or a demonstrative – that gets marked with more content. If covert index system is still needed to account for the anaphoric uses of bare nouns and null anaphors, it is unclear why the overt forms of loci should also be analyzed as indices, especially in a form that does not resemble something we find in other languages. It is possible that sign languages are unique in this respect, but a more conservative analysis may be possible if we could find a phenomenon in spoken languages that resembles the use of overt loci in sign languages in a more parallel way.

In this paper, I argue that there is indeed a phenomenon in spoken languages that correlates fully to the use of overt loci in sign languages, namely the co-speech pointing gesture

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[2]Bare nouns can be signed in the relevant loci if loci were established for them previously, but they can be used without loci and still function as antecedents and anaphoric expressions as shown in (8a).

used with demonstratives. In the remainder of this paper, I motivate and propose a unified analysis of IX$_{\text{LOC}}$ and the co-speech pointing gesture in spoken languages.

3.   Proposal

I argue that IX$_{\text{LOC}}$ should be analyzed as a modifier. IX to a locus A (IX$_A$) is analyzed as an *et*-type function that takes an individual *x* and returns true iff *x* is located at A. This modifier serves as a restrictor to an anaphoric expression, making it a marked anaphoric expression just like demonstratives in spoken languages.

The main inspiration comes from Koulidobrova and Lillo-Martin 2016 who argue that IX is a demonstrative. Recall that Koulidobrova and Lillo-Martin make this argument based on the markedness of IX$_{\text{NEUT}}$ that resembles markedness of demonstratives in other spoken languages. However, because markedness is a relative concept, we need a closer investigation on what IX$_{\text{NEUT}}$ is marked against. In order to investigate the relative markedness and distribution of different anaphoric expressions in ASL, Ahn, Kocab, and Davidson (2019) present a felicity judgment task given to three native ASL signers and show that while IX$_{\text{LOC}}$ is marked similar to demonstratives, IX$_{\text{NEUT}}$ is less marked than IX$_{\text{LOC}}$ and allows reference to the most salient entity. For example, in a context with just one salient referent as in (7), all three signers preferred the use of the null argument ($\varnothing$) or IX$_{\text{NEUT}}$. In contexts with two potential referents for the anaphoric expression in the second sentence, signers preferred either the bare noun BOY (8a) or creating loci for the referents (8b) and found $\varnothing$ or IX$_{\text{NEUT}}$ in (8a) degraded.

(7)   BOY ENTER CLUB. $\{\varnothing, \textbf{IX}_{\textbf{NEUT}}\}$ DANCE.
       'A boy$_i$ entered a club. **He**$_i$ danced.'

(8)   a.   BOY ENTER CLUB. SEE GIRL READ. $\{\textbf{?}\varnothing, \textbf{?IX}_{\textbf{NEUT}}, \textbf{BOY}\}$ DANCE.
       b.   BOY IX$_A$ ENTER CLUB. SEE GIRL IX$_B$ READ. IX$_A$ DANCE.
             'A boy$_i$ entered a club. He$_i$ saw a girl read. **The boy**$_i$ danced.'

3.1   IX$_{\textbf{LOC}}$ as a demonstrative?

We have established so far that IX$_{\text{LOC}}$ resembles a marked anaphoric expression like a demonstrative of other languages. In order to analyze IX$_{\text{LOC}}$ like a demonstrative, we first need to know how demonstratives are analyzed in spoken languages. I provide an overview of the analysis of demonstratives proposed in Ahn 2019 before applying it to IX$_{\text{LOC}}$.
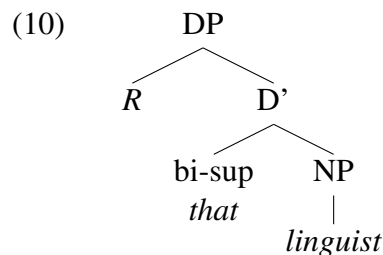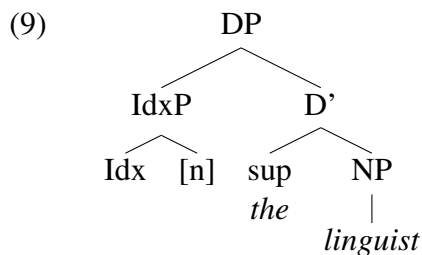
3.1.1   Demonstratives in spoken languages

Demonstratives in the literature have been investigated with focus on how they extend the meaning of definites. For example, demonstratives have been argued to extend the meaning of definite articles by additionally presupposing a demonstration (Roberts 2002), by requiring a different kind of a domain in which uniqueness is evaluated (Wolter 2006), or by carrying an additional slot for a property than a definite (Elbourne 2008, King 2008,

Nowak 2014). In evaluating how demonstratives combine with co-speech gestures, Ebert and Ebert (2014) argue that demonstratives shift the non-at-issue status of gestures to at-issue content.

Ahn (2019) proposes a different way that the definite description extends the meaning of other anaphroic expressions. In this analysis, all anaphoric expressions including the null and overt pronoun and the definite share the same underlying semantic structure that consists of a) a set of restrictions such as the *phi*-feature or the NP property, b) a maximality operator that takes those restrictions and returns the maximum entity that meets the properties,[3] and c) an anaphoric index that checks that the returned entity is identical to the intended antecedent.

Demonstratives extend this underlying structure by replacing the anaphoric index with a different property she calls *R*, and lexicalizing a binary supremum operator that allows *R* to combine with the rest of the DP structure. The proposed structure for a definite description is shown in (9), and the extension for the demonstrative with the binary maximality operator and the *R* property is shown in (10), with their denotations in (11) and (12).

(9)
```
              DP
           /      \
        IdxP       D'
        /  \      /   \
     Idx  [n]   sup    NP
                the     |
                     linguist
```

(10)
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              DP
           /      \
          R        D'
                  /   \
              bi-sup   NP
               that     |
                     linguist
```

(11) $[\![[\text{the linguist}]_7]\!] = [[\![\text{Idx}]\!](7)](\text{sup } (\lambda x. \text{linguist}(x)))$

　　a. $[\![\text{sup}]\!] = \lambda P\ \iota x{:}\forall y\ [P(y) \leftrightarrow y \sqsubseteq x]$

　　b. $[\![\text{Idx}]\!] = \lambda n \lambda x_e{:}\ x=g(n).x$

　　c. returns the maximal entity that is a linguist in the given context

　　d. presupposes: $[\![D']\!] = g(7)$

(12) $[\![\text{that linguist}]\!] = \text{bi-sup } (\lambda x. \text{linguist}(x))(\lambda x. R(x))$

　　a. $[\![\text{bi-sup}]\!] = \lambda P\ \lambda R\ \iota x{:}\forall y\ [P(y) \wedge R(y) \leftrightarrow y \sqsubseteq x]$

　　b. returns the maximal entity that is a linguist *and R*

　　c. does *not* presuppose that $[\![D']\!]$ is familiar

The replacement of the anaphoric index by *R* is motivated by the observation that only demonstratives, and not other anaphoric expressions, can refer to entities that are not familiar in the discourse. In other words, only demonstratives can refer to new referents.[4] For example, demonstrative descriptions can be accompanied with a pointing gesture ($\rightarrow$) and

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[3]The nature of the maximality operator is not critical to the current work. In Ahn 2019, a supremum operator is used, but a more typical *iota* could be used without affecting the meaning.

[4]Pronouns like *she* can also refer to new entities. Ahn assumes that these exophoric, animate pronouns *she* and *he* are pronominal demonstratives, similar to demonstrative pronouns in German, and contrasts them from *it*, which already has a demonstrative counterpart *that* and thus is restricted to anaphoric reference only.

introduce a new entity as in (13a). Demonstratives can also appear with relative clauses and introduce a new set of referents that are defined by the content of the relative clause, as in (13b), returning the maximal set of entities who read.

(13)   a.   Look that that$_{\rightarrow A}$ star!
       b.   Those who read never fail.

The exophoric pointing $\rightarrow$ is given a simple denotation as in (14), where it takes a locational variable a and an individual x and returns true iff x is at a. Here, the property of 'being at a' is taken to be fully spatial. Thus, *that$_{\rightarrow A}$ star* in (13a) returns the maximal star that is in physically located at A.

(14) $[\![\rightarrow]\!] = \lambda a.\ \lambda x.\ x$ is (located) at a

Lastly, Ahn (2019) argues that when neither pointing nor a relative clause is available to fill the R slot, speakers accommodate by resorting to the most salient, familiar entity. This analysis correctly predicts anaphoric demonstratives to be degraded. When used anaphorically, demonstratives end up being denotationally equivalent to simpler anaphoric expressions like a definite, which would be ruled out by general economy principles.

3.1.2   IX$_{\text{LOC}}$ as an exophoric demonstrative

We could analyze IX$_{\text{LOC}}$ as an exophoric demonstrative like *that$_{\rightarrow A}$*, which would return the maximal entity that is at (the abstract location) A.

(15) $[\![\text{IX}_A]\!] = \sup [\lambda x.\ \text{entity}(x) \wedge [\![\rightarrow]\!](A)(x)]$

There is a problem, however. One property that distinguishes IX$_{\text{LOC}}$ from other forms of IX like IX$_{\text{NEUT}}$ or (marked) anaphoric expressions of other languages is that it first has to be associated with a referent. For IX$_{\text{LOC}}$ to be used anaphorically, it must be used in the previous occurrence of the antecedent as in (16a). It is not felicitous to use IX$_{\text{LOC}}$ anaphorically without first using it with the intended referent as in (16b).[5]

(16)   a.   <u>JANE IX$_A$</u> SIT-IN CLASS. **IX$_A$** DANCE.

       b.   JANE SIT-IN CLASS. *IX$_A$ DANCE.
            (intended): 'Jane sat in class. She danced.'

Note that in the anaphoric use of IX$_{\text{LOC}}$, it has to refer to a familiar entity that has been associated to some abstract locus. In the introductory use, however, this location has not been established. If IX$_{\text{LOC}}$ as a whole is analyzed as in (15), the introductory use of IX$_{\text{LOC}}$ would have to be analyzed as something separate from the anaphoric IX$_{\text{LOC}}$. Instead of

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[5]It may be possible to use a IX$_{\text{LOC}}$ without previously having associated the locus with a referent, but I assume that some kind of accommodation takes place in such cases.

going that route, I alternatively propose that IX$_{LOC}$ be analyzed as a modifier in both the anaphoric and the introductory use.

3.2   IX$_{LOC}$ as a modifier

The proposal is as follows: Instead of analyzing IX$_A$ as denoting the full denotation in (15), I argue that IX$_A$ is only contributing the locational restriction as in (17). The meaning is identical to the co-speech pointing gesture as in (14).

(17) $[\![$IX$_A]\!] = [\![\rightarrow]\!]$(A) $= \lambda$x. x is (located) at A

Thus, IX$_{LOC}$ occupies the *R* slot, just like the co-speech pointing gesture occupies the *R* slot of the demonstrative structure. The structure and the meaning of the anaphoric use simply fall out, if we assume that the D head is phonologically null for ASL unlike the English demonstrative *that*. IX$_{LOC}$ can be followed by a noun, meaning that the NP has an option to be produced overtly.

   Thus in (16a), while only the modifier IX$_A$ is visible, it is underlyingly a full anaphoric expression that takes IX$_A$ as the *R* restriction. The meaning of the second sentence in (16a) is that the maximal entity at A danced, as shown in (18).

(18) $[\![$IX$_A$ DANCE$]\!] = [\![$DANCE$]\!]$(bi-sup $(\lambda$x. entity(x))(λx. $[\![\rightarrow]\!]$(A)(x)))

We now move on to the introductory use, where IX$_{LOC}$ appears with a referent for the first time. IX$_{LOC}$ remains as a modifier that adds a locational restriction. The only difference is that it now combines with the proper name *Jane* in a non-restrictive, supplementary way. While it is generally assumed that restrictive and non-restrictive modifiers have different underlying structures and meanings for the two kinds of modifiers (cf. Del Gobbo 2007), it is not the case that they are always overtly distinguished. For example, Japanese does not overtly distinguish restrictive and non-restrictive relative clauses (Kuno 1973). Moreover, Esipova (2019) argues that all adnominal content, either in the spoken domain or in the signed domain like co-nominal gestures, have the same kinds of composition mechanisms available, to be restrictive or supplementary. Based on these studies, I argue that IX$_{LOC}$ is a modifier for which both restrictive and non-restrictive composition are available and that there is no overt marking that distinguishes the two.

   Thus, in (19), which is repeated from (16a), $[\![$JANE IX$_A]\!]$ has the same denotation as a name, but supplementary information that she is 'located at A' is added to the discourse.

(19)   JANE IX$_A$ SIT-IN CLASS. **IX$_A$ DANCE.**
   a.   'Jane (who is at A) sat in class. **The entity at A** danced.'

Supplements can add new information, so it is possible that the addressee accommodates this new information as it unfolds. The exact nature of this new information (i.e. what does it mean for Jane to be 'at A'?) is discussed in the next section.

3.3 A pragmatic extension of an exophoric reference

The 'located at A' denotation applies directly to exophoric uses of IX, where actual referents present in the context are pointed to. In an exophoric use, the referent is identified by the location in which she is physically located. In an anaphoric use with loci, the referent is identified by the location to which the signer assigned her. There is a nontrivial difference between these two uses, given that in the former context, the referent is physically occupying that position while in the latter, the location is merely an abstract label or a place-holder for that referent.

What would it mean for a referent to be at some abstract location A? Given the spatial cue that the signer is pointing to a location in which there is no referent, the addressee might take this to be a labeling mechanism rather than an actual exophoric reference. I propose that the anaphoric use of IX with loci is a pragmatic extension of the regular, exophoric reference.

This kind of pragmatic extension is also detected with co-speech pointing gestures in spoken languages. For example, in (20), the speaker can point to her right for the first referent *Jin*, and to her left for the second referent *Jimin* in the first mention of their names, and use pointing in subsequent discourse to refer to them. Even though the referents are not actually present in the respective locations, anaphoric reference is possible.

(20) $Jin_{\rightarrow A}$ called $Jimin_{\rightarrow B}$, but $he_{\rightarrow B}$ was also calling $him_{\rightarrow A}$.

The pronoun *he* with pointing to A or B in the second half of the sentence can be analyzed as an exophoric pronominal demonstrative that combines with the locative information restrictively (cf. Ahn 2019). What we see here is a phenomenon in spoken languages that resembles the locus use in sign languages: two abstract locations are created for entities, and then pointed to for subsequent anaphoric reference. The speaker does not intend to mean that Jin actually is located at A, but instead is using the location A as some marker of the referent.

Another evidence for this pragmatic extension comes from the use of symbolic locations in sign languages. Sandler and Lillo-Martin (2006) note that it is possible for signers to point to 'an actual previous or potential location that a referent might occupy' (p.25). For example, one could point to an empty desk and refer to the owner of that desk, or point to a telephone and refer to someone who just called. Here, even though the exophoric pointing is directed to a specific object like a desk or a telephone, the referent of the anaphoric expression is not the object itself but some maximal entity that has to do with the object. Spoken languages allow that, too, as in (21).

(21) $He_{\rightarrow DESK}$ is late again.
       (suggesting that the owner of that desk is late again.)

Given that the meaning of a noun *N* can readily be extended to mean 'having to do with N' when used as a modifier, a similar analysis can be applied here, where $he_{\rightarrow DESK}$ refers to 'the maximal male entity that has something to do with the desk the speaker pointed to.'

What we have seen in this section is that in both spoken and sign languages, pointing to an abstract or a symbolic location can be used to keep track of referents. The idea is that these pointing gestures are contributing some type of a restriction that describes the intended referents and helps in distinguishing them from competing antecedents.

3.4 A link to deverbal anaphors

Analyzing IX$_{\text{LOC}}$ as a modifier allows for an interesting connection to another type of anaphoric expresion found in sign languages. Senghas (1995) observe that the signers of Nicaraguan Sign Language (NSL) produce what she calls a deverbal anaphor, 'a reduced, truncated form of a recently-signed verb... to refer back to the referent in the narrative that last served as the most salient argument of that verb' (p.139).[6] An example of a deverbal anaphor from her work is shown in (22), where COLLECT in the last line refers to 'the one who collected' (glossed as 'the collector' in Senghas 1995).

(22)   MAN FALL-DOWN-[iterative].
        'The man falls down head-over-heels.'

        FEATHER-PL FLOAT-DOWN, MAN COLLECT-PL.
        'Feathers float down and the man collects them.'

        BIRD LAUGH.
        'The bird laughs.'

        [COLLECT]$_{\text{N}}$ LOOK UP.
        '**The collector** looks up.'   [Senghas 1995; ex. (16)]

Kocab et al. (2016) show that these anaphors show prosodic reduction, which may suggest their status as a relative clause. The rough meaning of the deverbal anaphor in (22) could be 'the maximal entity that did the collecting'. The man was described in the previous discourse with the property of collecting, and that same property is being used to point out the intended referent. If we analyze this as an anaphoric expression that has a null head and a restrictive relative clause, we can come up with an analysis of deverbal anaphors that is fully parallel to what has been proposed for IX$_{\text{LOC}}$ in this paper.

4.   Conclusion

In this paper, I have argued for a modifier analysis of IX$_{\text{LOC}}$ in ASL. After discussing the limitations of analyzing loci as semantic or pragmatic indices that mediate between anaphoric expressions and their antecedents, I propose an alternative analysis of IX$_{\text{LOC}}$ where it is equated to the co-speech pointing gesture used with demonstratives in spoken

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[6]A study on anaphoric expressions in different generations of NSL learners in Coppola et al. 2013 show that deverbal anaphors only appeared with Cohort 3, the latest learners of NSL.

languages. I argue that both kinds of pointing should be analyzed as a modifier that takes an individual x and returns true iff x aligns with the pointed direction and location.

The main implication of this paper is that IX_{LOC} should be analyzed as a simple modifier, rather than a special indexing mechanism available in sign languages. Analyzed this way, IX_{LOC} is basically one of many possible restrictions that an anaphoric expression can carry. Exophorically, this locative restriction contributes a literal information of the referent's whereabouts. Anaphorically, its literal meaning is pragmatically extended so that it serves as an additional restriction that helps tease apart the potential antecedents ('the one here' vs. 'the one there'). I conclude by discussing the main advantages of this proposal.

Empirically, the markedness properties of IX_{LOC} discussed in works like Koulidobrova and Lillo-Martin 2016 and Ahn, Kocab, and Davidson 2019 are derivable. IX_{LOC} in this analysis is a marked anaphoric expression that carries more restrictions. The markedness of an expression that carries more restrictions can be captured by independently motivated economy-based principles such as *Minimize Restrictors!* (Schlenker 2005) and Redundancy (Meyer 2014).

Theoretically, the introductory use and the anaphoric use of IX_{LOC} are unified, without having to analyze the two uses as accidental homophones. More broadly, a sign-language-specific stipulation is not necessary in this account. Because IX_{LOC} is not analyzed as an overt indexing mechanism, the underlying referent tracking mechanism can stay consistent for both sign and spoken languages. Furthermore, this analysis shows that sign and spoken languages have many previously-unobserved similarities as to how marked anaphoric expressions behave. Marked anaphoric expressions in both modalities carry more restrictions, and are restricted in distribution because they are redundant in contexts where the referent is sufficiently salient. When the intended referent is less salient, anaphoric expressions with more restrictions are used. These restrictions could be a location indicated by exophoric pointing, a label-like abstract location like IX_{LOC}, or other verbal content like relative clauses and deverbal anaphors.

The difference in modality of spoken and sign languages provides an important avenue for semantic research. Whether/how the logical core of the two systems differ is hotly debated (cf. Schlenker 2018 and responses). Loci in sign language have often been discussed as an aspect where such difference exists. The current study shows that when we analyze IX_{LOC} as a modifier, loci do not look very different from what we find in spoken languages, suggesting that this is one aspect of the language that actually benefits from considering sign language as language plus gesture (Goldin-Meadow and Brentari 2017) and from making the most conservative assumption that sign languages do not make meaning more visible than other spoken languages (Davidson 2018).

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