Locus Agreement in American Sign Language

KEARSY CORMIER, STEPHEN WECHSLER, AND RICHARD P. MEIER
University of Texas at Austin

1. Introduction
For the past several years, syntacticians have used HPSG to analyze many of the world’s spoken languages. Recent analyses of signed languages have been based largely on Government and Binding theory (Aarons, Bahan, Kegl & Neidle 1992, Bahan 1996, Lillo-Martin 1986, Lillo-Martin 1991); no work has been done on a signed language within a constraint-based grammar. Like many spoken languages, signed languages typically have rich morphological agreement systems. In this paper we use HPSG to shed new light on the agreement properties of one particular signed language, American Sign Language (ASL). This study is that it appears to lend support to the theory of index agreement due to Pollard and Sag (1994).

ASL is a natural language used by most deaf people in the United States and Canada. For deaf children of deaf parents, ASL is acquired just as naturally as any spoken language (Newport & Meier 1985, Meier 1991). For deaf children of hearing parents, ASL is acquired through contact with other children at residential schools for the deaf. ASL shares characteristics with many spoken languages. It is a topic-oriented language much like Chinese (cf. Lillo-Martin 1991) and has a classifier system comparable to
Locus Agreement in American Sign Language

Navajo's (Klima & Bellugi 1979). ASL is typically SVO, but due to its agreement inflection, many other word orders are possible (Fischer 1975).

2. Description of ASL

2.1 Lexical items
Loosely speaking, a manual sign (i.e., a lexical item) in ASL consists of a particular handshape, a location, a movement, and a palm orientation. Some signs maintain the same general handshape and location throughout the articulation of the sign. Other signs involve changes in handshape and/or movement and/or location. For example, the verb LIKE starts with a 5 handshape (all 5 fingers extended and spread) at or contacting the center of the chest, and closes to an 8 handshape (contact between middle finger and thumb, with other fingers extended) in the neutral space in front of the chest. (Neutral space consists of the area in front of the signer's torso, within approximately a forearm's length from the body.) This distinct change of location from the signer's chest to neutral space in front of the signer is an example of path movement, a feature of many ASL signs including LIKE. Path movement will be relevant to our description of agreement morphology below.

2.2 Nouns
Before looking at the verbal system of ASL, it is important to understand how nominals are signed in space. An NP can consist of a noun by itself (e.g., BOY)\(^1\), or a pronominal pointing sign as shown in Figure 1.\(^2\)

Figure 1

---

\(^1\)As is conventional in ASL literature, English glosses appear in small caps.

\(^2\)\(\text{APT}\) is a pointing sign, with x being the location toward which the point is directed. In the illustrations containing more than one lexical sign, the dotted lines indicate the sign that is articulated first, followed by the sign shown in solid lines.
When a pointing sign occurs in a construction with a noun, it functions as a determiner instead of a pronoun (Bahan 1996). The determiner can occur immediately before the noun, immediately after it (see Figure 2), or perhaps even concurrently with the noun if that noun is one-handed.\(^3\)

\[\text{Figure 2}\]

\[\text{BOY} \ \text{¡PT} \]
\[\text{boy} \ \text{there} \]
\[\text{“the boy”}\]

\(^3\)Other researchers have claimed that pointing signs occurring before the noun function as determiners, while pointing signs occurring after the noun function adverbially (Bahan et al. 1995, Bahan 1996, MacLaughlin 1997). However, I will assume for the purposes of this paper that both prenominal and postnominal pointing signs can function as determiners.
The pointing sign ($_{PT}$), whether functioning as a pronoun or determiner, acts as a discourse marker. By using a pointing sign, a signer can associate a noun or a pronoun with a distinct location in space. Any subsequent signs that point to a location established in this manner are interpreted as being coreferential. If the referent is physically present, the signer points to its location. If the referent is not present, the signer may arbitrarily choose a location in neutral space for it. These locations remain throughout the discourse until actively changed (Lillo-Martin 1986).

**2.3 Verb Agreement**

Some verbs in ASL, called agreement verbs, make use of the association between NPs and distinct locations (Padden 1983). Since ASL lacks case marking and word order is fairly free, the agreement morphology on the verb is often what identifies the subject and object. These verbs generally distinguish subject and object locations in one of two ways: i) through palm orientation or ii) through path movement between locations. STARE-AT is a verb that shows agreement through changes in palm orientation. In this sign, the palm is oriented toward the location associated with the object NP and the back of the hand is oriented toward the location associated with the subject NP. Subject and object can also be distinguished by differences in the location of the verb. Verbs such as HELP have path movement that begins with the location associated with the subject NP and ends with the location associated with the object NP, as in Figure 4 where the subject and object NPs refer to signer and addressee, respectively. The $S$ and $A$ subscripts on HELP indicate that the verb is marked for subject agreement with the signer and object agreement with the addressee.

---

4 Other researchers have claimed that there are other factors that determine where a locus is set up in signing space (e.g., discourse factors, semantic affinity with another referent, conventional location, etc.). Thus, the set up is rarely arbitrary (Engberg-Pedersen 1993).
Agreement verbs fall into two subclasses, referred to as single-agreement and double-agreement verbs (Meier 1982, Padden 1983). Single-agreement verbs agree only with the object, while double-agreement verbs can agree with both the subject and object. For example, HELP is a double-agreement verb and agrees with its subject and object, as in Figure 4.

---

5Double-agreement verbs agree with the notional indirect object if there is one (e.g., GIVE). If there is no indirect object, the verb agrees with the direct object (e.g., HELP).
Locus Agreement in American Sign Language

Figure 4

¡PT ¡HELPj
she she-help-him
“She helps him.”

SEE is a single-agreement verb; it agrees only with its object. (The lack of an initial subscript on SEE in Figure 5 indicates that this verb is not marked for subject agreement.) Single-agreement verbs tend to be body-anchored. That is, their articulation begins on the signer’s body. It is not possible for the initial location of such a verb to match the location of the subject (i.e., *¡SEEj). However, some single agreement verbs are not body-anchored (e.g., TEACH, for some signers). This suggests that the verb classes (see 10 below) are not completely predictable on the basis of phonological form.

Figure 5

¡PT SEEj
she see-him
“She sees him.”
These two subclasses both allow subject pro-drop. In both Figures 6a and 6b, for example, the verb HELP begins at the location of the subject and ends with the location of the object. The overt subject pronoun in Figure 6b is optional.

Subject pro-drop for single-agreement verbs patterns closely with pro-drop in Chinese. That is, because both ASL and Chinese are topic-prominent languages (versus subject-prominent languages like English), overt subjects are not required if the topic (usually the subject) is clear from context (Lillo-Martin 1991).

Both single-agreement verbs and double-agreement verbs allow object pro-drop. Thus, examples (7a - d) are grammatical.

(7)  
(a) \text{iPT iHELP} 
(b) \text{iPT iHELP} \text{jPT} 
(c) \text{iPT SEEj} 
(d) \text{iPT SEEj} \text{jPT}

The contexts in which overt object pronouns may be favored over non-overt object pronouns (and vice-versa) is not clear; we leave this issue for further research.

So far only third-person translations for the \text{i} and \text{j} indices have been used. Signer/addressee agreement works exactly the same way as third
person agreement shown above.\footnote{Since the status of person in ASL is a matter of some controversy (Meier 1990, Lillo-Martin & Klima 1990), "first person" and "second person" will not be used when referring to the speaker and addressee loci. "Third person" here simply means a location not associated with the speaker or addressee.}

The only difference is that for every signer, there is a particular location associated with the signer him/herself, and likewise for every addressee there is a particular location that is associated with the addressee, as illustrated in Figure 8 and in (9).\footnote{Some verbs (e.g., TELL, FINGERSPELL-TO, & TEACH for some signers) lack a first-person object form. For such verbs speaker agreement would need to be precluded.}

**Figure 8**

\[
\begin{align*}
\text{\textsuperscript{3}PT} & \quad \text{\textsuperscript{3}HELP}_A \\
\text{I} & \quad \text{I-help-you} \\
\end{align*}
\]

"I help you."

\[
\begin{align*}
\text{\textsuperscript{1}PT} & \quad \text{\textsuperscript{1}HELP}_S. \\
\text{You} & \quad \text{you-help-me} \\
\text{"You help me."} \\
\end{align*}
\]

Agreement verbs make up one of three major classes of verbs in ASL: plain verbs, spatial verbs, and agreement verbs (Padden 1983).

(10) Types of ASL Verbs

I. plain
II. spatial
III. agreement
   a. single (e.g., SEE)
b. double (e.g., HELP)

Plain verbs show no agreement with the subject or the object; these verbs require overt subject and object arguments. An example of a plain verb is LIKE, as described above in 2.1. Spatial verbs are verbs of motion and show agreement with locations associated with the initial and final positions of motion, not with the subject or object. Spatial verbs are a complex issue and beyond the scope of this paper.

In summary, agreement verbs in ASL involve either i) a distinct palm orientation in which the palm faces away from one location and toward another location, or ii) path movement from one location to another. For double-agreement verbs, these locations must be the subject location and the object location, respectively.\(^8\) For single-agreement verbs, the final location must be associated with the object.

3. HPSG Analysis of ASL Agreement

Agreement in HPSG depends on structure-sharing of the index value of one expression with the index value of another expression. For most spoken languages, these index values must include some combination of the categories person, number and gender. But as we have seen in the above description, ASL agreement depends heavily on location, or locus. Therefore I propose the following sort declaration for index:\(^9\)

\[\text{(11) index: } [\text{LOCUS locus}]\]

\[\text{Partition of locus: } S, A, \text{other}\]

\[\text{Partition of other: } i, j, k, \ldots\]

Following Meier (1990), S and A will be used to refer to locations associated with the signer and addressee, respectively. S(signer) is the location directly in front of the signer's chest. A(addressee) is the location within the signer's own sign space but toward and associated with the addressee. The index values \(i, j, k, \ldots\) et c. represent distinct locations in neutral space.

3.1 Verbal Lexical Entries

The lexical entry for an agreement verb stem specifies only the ARG-S list (not the SUBJ and COMPS list) and coindexes the NPs with their appropriate semantic roles in CONTENT. Thus the lexical entry represents the verb stem, unmarked for any agreement morphology. Each lexical entry

---

\(^8\)The reverse is true of a subclass of double agreement verbs called backwards verbs (Meir, in press). For these verbs, the initial location must be associated with the object and the final location with the subject. Examples include TAKE and BORROW.

\(^9\)ASL also has number agreement, which may also be explained to a certain extent in terms of locus agreement. However, this issue needs to be further analyzed.
simply gives the valence features of the verb and cross-references those valence features with the semantic roles that the verb takes. The lexical entries also assign verbs to their appropriate agreement types, so that SEE is of the sort *single-agr-vstem*, and HELP is of the sort *double-agr-vstem*.

(12) Lexical entry for SEE:
\[\text{single-agr-vstem}\]
\[
\text{PHON} \langle \text{SEE} \rangle
\]
\[
\text{SYNSEM} | \text{LOC}
\]
\[
\text{CONTENT} \langle \text{SEE} \rangle \]
\[
\text{ARG-S} \langle \text{NP}_{[1]}, \text{NP}_{[2]} \rangle
\]

(13) Lexical entry for HELP:
\[\text{double-agr-vstem}\]
\[
\text{PHON} \langle \text{HELP} \rangle
\]
\[
\text{SYNSEM} | \text{LOC}
\]
\[
\text{CONTENT} \langle \text{HELP} \rangle \]
\[
\text{ARG-S} \langle \text{NP}_{[1]}, \text{NP}_{[2]} \rangle
\]

3.2 Verbal Sort Declarations
To account for the pro-drop patterns mentioned above in 2.3, each type of verb has a sort declaration that specifies valence features of all possible surface forms. Below are the sort declarations for single-agreement and double-agreement verbs.
(14) Sort declaration for single-agr-verb (e.g., SEE):

\[
\text{single-agr-verb : }
\begin{align*}
\text{PHON } & F_{\text{single}}([3], y) \\
\text{SYNSEM } & [4] \parallel \text{CAT } [\text{VAL } [\text{SUBJ } ([1]NP)] \\
& \text{COMPS } ([2]NP)] \\
& \text{ARG-S } \{[1]NP, [2]NP_{\text{LOCUS } y}\} \\
\text{STEM } & \text{single-agr-vstem} \\
\text{PHON } & [3] \\
\text{SYNSEM } & [4]
\end{align*}
\]

where \( F_{\text{single}}(\alpha, \beta) = \alpha \beta \)

(15) Sort declaration for double-agr-verb (e.g., HELP):

\[
\text{double-agr-verb : }
\begin{align*}
\text{PHON } & F_{\text{double}}(x,[3], y) \\
\text{SYNSEM } & [4] \parallel \text{CAT } [\text{VAL } [\text{SUBJ } ([1]NP)] \\
& \text{COMPS } ([2]NP)] \\
& \text{ARG-S } \{[1]NP_{\text{LOCUS } x}, [2]NP_{\text{LOCUS } y}\} \\
\text{STEM } & \text{double-agr-vstem} \\
\text{PHON } & [3] \\
\text{SYNSEM } & [4]
\end{align*}
\]

where \( F_{\text{double}}(\alpha, \beta, \gamma) = \alpha \beta \gamma \)

These sort declarations expand the lexical entries for the verbs.\(^{10}\) For both single and double-agreement verbs, the SUBJ list member as well as the first member of the COMPS list are optional. Unexpressed ARG-S list

\(^{10}\) Other factors such as eye gaze, shift in body position, and other non-manual signals also play a part in ASL verb agreement (cf. Aarons et al. 1992). However, given the high degree of subtlety and variation associated with these non-manual signals, only manual information is included in the verbal sort declarations in this paper.
items (those which are not structure-shared with valence list items) are interpreted as pronouns.

The functions $F_{single}$ and $F_{double}$ specify the morphological operations whereby loci associated with ARG-S list items are affixed to the verb. The $x$ and $y$ tags represent items of sort $locus$, hence range over the full set of loci, $\{S, A, i, j, k...\}$. Thus, these sort declarations account for agreement with any locus. No separate specifications are needed for speaker and addressee agreement.

3.4 Origins of Locus Values

As mentioned above, NPs can be set up in space whether or not the referent is present. If the referent is present, the locus of the pronoun or determiner must correspond to the actual location of the referent. We can set up a separate restriction on the anchoring of indices to handle this; however, we will not examine this issue here.

If the referent is not present, then loci are set up arbitrarily. In this case, the index values originate within the CONTENT of the pointing sign $iPT$ (whether it functions as a pronoun or a determiner), not within the CONTENT of the noun; cf. (16) and (17).

(16) Lexical entry for pronoun/determiner $iPT$:

\[
\begin{align*}
\text{PHON} & \{iPT\} \\
\text{SYNSEM} & \text{LOC} \\
\text{CAT} & \text{VAL} \\
\text{VAL} & \text{COMPS} \left\{ \text{NP}[,3\text{npro}] \right\} \\
\text{SPR} & \text{SUBJ} \left\{ 0 \right\} \\
\text{CONTENT} & \text{INDEX} \left\{ 2 \text{LOCUS } i \right\} \\
\text{RESTR} & \text{INST} \left\{ 2 \right\}
\end{align*}
\]

(17) Lexical entry for the noun BOY:

\[
\begin{align*}
\text{PHON} & \{BOY\} \\
\text{SYNSEM} & \text{CONTENT} \left\{ \text{nom-obj} \right\} \\
\text{RELN} & \text{boy}
\end{align*}
\]

(18) Sort declaration for $npro$:

\[
\begin{align*}
\text{PHON} & \{npro\} \\
\text{SYNSEM} & \text{CONTENT} \left\{ \text{nom-obj} \right\} \\
\text{RELN} & \text{boy}
\end{align*}
\]

\[^{11}\text{See Footnote 4.}\]
npna \[\begin{array}{l}
\text{RELN rel} \\
\text{INST index}
\end{array}\]

(19) Sort declaration for ppro:

\[
\begin{array}{l}
\text{ppra} \quad \begin{array}{l}
\text{INDEX index} \\
\text{RESTR set(psoa)}
\end{array}
\end{array}
\]

The index, and hence the locus feature, lexically originates in the pronoun, while the common noun supplies only the relation (here, the boy relation). This means that an NP consisting of a noun without a determiner either lacks a locus value altogether or receives its locus in some manner other than through the determiner.\(^\text{12}\) In example (20b), we have assumed that no mechanism (pointing or otherwise) has assigned a locus value to the noun BOY.

To summarize, if \(\mathfrak{iPT}\) subcategorizes for a nonpronoun complement, then it is a determiner. If, on the other hand, \(\mathfrak{iPT}\) does not subcategorize for a complement, then it functions as a pronoun. Therefore the lexical entries in (16) and (17) allow for three main types of NPs, shown in (20).

(20) Possible NPs in ASL

<table>
<thead>
<tr>
<th>a. Noun + Determiner</th>
<th>b. Noun only</th>
<th>c. Pronoun only</th>
</tr>
</thead>
<tbody>
<tr>
<td>(i\text{NP})</td>
<td>(\text{NP})</td>
<td>(i\text{NP})</td>
</tr>
<tr>
<td>(\text{wo})</td>
<td>(\text{(H)})</td>
<td>(\text{1})</td>
</tr>
<tr>
<td>(\text{(C)})</td>
<td></td>
<td>(\text{1})</td>
</tr>
<tr>
<td>(\text{NP:npn})</td>
<td>(\text{N:ppr})</td>
<td>(\text{NP:npn})</td>
</tr>
<tr>
<td>(\text{1})</td>
<td>(\text{1})</td>
<td>(\text{1})</td>
</tr>
<tr>
<td>(\text{1})</td>
<td>(\text{1})</td>
<td>(\text{1})</td>
</tr>
<tr>
<td>(\text{BOY})</td>
<td>(i\text{PT})</td>
<td>(\text{BOY})</td>
</tr>
<tr>
<td>(\text{1})</td>
<td>(\text{1})</td>
<td>(\text{1})</td>
</tr>
</tbody>
</table>

4. Conclusions

The analysis presented here accounts for the basic agreement properties of ASL verbs. The verbal sort declarations account for the pro-drop properties

\(^{12}\) Other methods of assigning a noun a locus value, apart from the use of a determiner, include body shift (i.e., shifting the body toward a locus), eye gaze (i.e., gazing at a certain location in space), and articulating the noun at a certain location in neutral space (this is particularly true of fingerspelled names and is not possible with body-anchored nouns).
described above by allowing for different combinations of overt and non-overt pronominal arguments. The agreement functions specify the index value of certain members of the ARG-S list, regardless of the overt/non-overt nature of the arguments. These functions ensure that the locus values of the verb are token identical to the locus values of the verb's arguments.

This analysis lends support to Pollard & Sag's (1994) account of index agreement, according to which agreement features attach to the index or discourse marker. The ASL locus functions exactly as a discourse marker (see Lillo-Martin & Klima 1990), even though locus is not normally considered a phi-feature like the other agreement features of person, number and gender. The fact that locus participates in verb agreement provides interesting evidence for index agreement.

Also, the fact that locus functions as a phi-feature in ASL but not in any spoken language suggests that phi-features as we know them are not universal. In order to encompass both signed and spoken languages, the inventory of phi-features would therefore need to be expanded to include these spatial loci.

Although ASL does share many characteristics with spoken languages, there are many differences as well. One difference is the number of possible values for agreement features in spoken languages versus locus in ASL. Person, number, and gender each consist of a finite set of values. ASL can have an infinite number of possible locus values (Lillo-Martin 1991, Meier 1990). The number of loci that a signer might actually use is limited by perceptual and memory-related constraints, but theoretically an infinite number of loci is possible.

Turning to another point of comparison with spoken languages, ASL agreement appears to violate Greenberg's (1966) markedness universal, according to which subject agreement is less marked than object agreement (see also Everett 1996). While ASL has both subject and object agreement (and thus accords with Greenberg's claim that languages with object agreement also have subject agreement), ASL object agreement is less marked in the sense that some verbs have only object agreement but none have only subject agreement. This unexpected and quite interesting difference between ASL and spoken languages still awaits an explanation.

The question of whether this and other peculiarities of ASL can be attributable to modality (signed versus spoken) will be answered by comparing agreement systems in other signed languages. We leave this matter for future research (see Engberg-Pedersen (1993) and Supalla (in prep) on agreement verbs in non-ASL signed languages such as Danish Sign Language).
5. Appendix: Notation
The subscripts $S$, $A$, $i$, $j$, $k$, etc. represent distinct locations in space — see (11). Verbs are translated in present tense for clarity. ASL does mark aspect and can mark tense, but often tense is not marked if it is understood in context. Also, different genders are used here to distinguish between different locations, although ASL does not grammatically distinguish gender.

VERB $x$VERB$_y$ A verb unmarked for agreement; verb stem
VERB$_y$ A verb marked for subject and object agreement.
VERB$_y$ A verb marked for only object agreement.

6. Acknowledgments
This research is supported in part by a grant (R01 DC01691-05) from the National Institute on Deafness and Other Communication Disorders, National Institutes of Health, to RPM. All original illustrations by Tony McGregor (copyright RPM).

Thanks to Gene Mirus for his native signer intuitions and to Perry Connolly, the model for the illustrations.

We thank Karen Emmorey, Carol Neidle, and Ben Bahan for their comments on an earlier draft of this paper.

7. References


Locus Agreement in American Sign Language


