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Secondary Signing Location in American Sign Language¹

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1 Introduction

Location is one of the primitives of sign structure. In this paper I show that, contrary to previous proposals, signing location in American Sign Language (ASL) is divided into only two sublocations, *center* and *non-center*.² I also show that the two-dimensional concept of signing location needs to be extended to a three-dimensional representation of *local signing space*.

1.1 Movement as Change

Besides *location*, the primitives of signs are widely held to be: *handshape*, *orientation*, and *movement* (Stokoe (1960), Battison (1978)). In this paper, following Hayes (1989) and Stack (1988), I assume that movement is not a primitive construct of the sign. For the purposes of this presentation I accept without argument the notion that movement is derived from the other three parameters. For example, in (1a), UNDERSTAND is articulated with a change in handshape, in (1b), BORED, is articulated with a change in orientation, and in (1c), LIE, is articulated with a change in location. Notice that each of those changes produce what can be interpreted as movement. In this paper, I will be concerned primarily with changes in location.³

(1) "Movement" is Change



a. UNDERSTAND
Change in Handshape
(Δ HS)



b. BORED
Change in Orientation
(Δ OR)

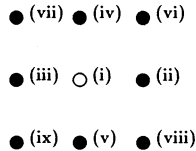


c. LIE
Change in Location
(Δ LOC)

1.2 Previous Proposals

Although it is agreed that location is a primitive, a review of the proposals for phonological representations of sign language shows that there is no agreement about a single set of signing locations (Liddell and Johnson (1989), Sandler (1989), Brentari (1990)). There is even less agreement on a set of features that define the signing sublocations, i.e., the subdivisions of each location. For example, Liddell and Johnson (1989) propose a system that specifies nine sublocations, shown in (2): (i) center, (ii) and (iii) to either side of center, (iv) above center, (v) below center, (vi) and (vii) above and to the sides of center, and (viii) and (ix) below and to the sides of center.

(2) Signing Sublocations



Considering only the signing area on the face, simple math shows that, since Liddell and Johnson proposed nine locations for the face, up to eighty-one sublocations can be specified for the face. This large number reflects their desire to provide a transcription system as well as a phonology for signs.

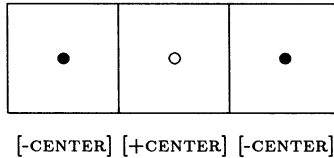
In a more abstract representation of location, Sandler (1989) proposes two place features, but each feature has three values, so this also generates nine sublocations. However, in contrast to Liddell and Johnson, Sandler regards the face as a single location. The result is nine sublocations on the face.

In (3), I summarize these two proposals to illustrate that previous proposals for sublocations have been on the one hand very rich and on the other hand, perhaps too sparse. The third column represents my proposal. I believe there's more than one, but fewer than nine primary locations on the face, but will say no more about that here, as I've indicated by the question marks.

(3)	L & J (1989)	Sandler (1989)	New Proposal
Locations on the Face	9	1	??
Sublocations	9	9	2
	—	—	—
Sublocations on the Face	81	9	1 < ?? < 18

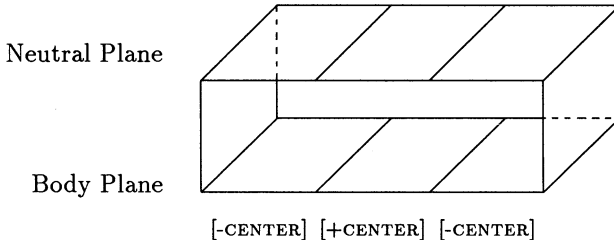
Rather, in this paper, I propose that there are only two sublocations, as illustrated in (4). I claim that the two sublocations are *center* and *non-center*, where *center* is the middle of the location, marked here by an open circle, and *non-center* is the remainder of the location. I show that the two disjoint areas marked here by closed circles can be treated as a unit.

(4) Secondary Signing Locations



In addition to constraining the number of sublocations, I propose to extend the traditionally two-dimensional notion of signing location, to *local signing space*, a three-dimensional construct. I define *local signing space* as an area defined by two planes, the *body plane* and the *neutral plane*. The *body plane* is a planar representation of the two-dimensional signing location on the body. The *neutral plane* is a projection of the body plane onto the neutral space directly in front of the body location. The result is two parallel planes that define a local area of signing space, depicted in (5).

(5) Local Signing Space



The goal of this paper is to establish the following as part of a theory of visual phonology: (i) there are only two signing sublocations, and (ii) a three-dimensional representation of signing space is to be preferred over the two-dimensional concept of signing location. Finally, further support for this proposal is provided by showing that a prediction about sign metathesis follows straightforwardly from this analysis.

2 The Data

The key data are shown in (6).⁴ Each is articulated at the chin. LIE, in (6a), differs from the other signs because it is articulated in continuous contact with the chin. The other three signs form a minimally distinctive group. Each has the same handshape and orientation, but makes contact with a different part of the chin. BITCH, in (6b), contacts the center of the chin and BREAKFAST, in (6c), contacts the side. BACHELOR, in (6d), is articulated with two discrete contacts, one on either side of the chin.⁵

(6)



a. LIE



b. BITCH



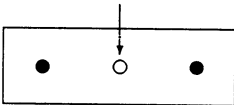
c. BREAKFAST



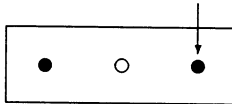
d. BACHELOR

LIE demonstrates that the chin serves as a single signing location. BITCH, BREAKFAST, and BACHELOR illustrate that some signs are articulated at only part of the chin. In (7), I present an abstraction of the movements for (6b), (6c), and (6d). The circles represent the contact points for the signs. Their independence from each other emphasizes that these are points of discrete contact and that no signs are articulated between them. The arrows represent the movement of the hand. For BITCH and BREAKFAST, the arrows show movement towards the chin; for BACHELOR, the arrow represents the change in location from one side of the chin to the other. This set of movements is exhaustive. In other words, no other combinations of changes in location occur. There are also no signs which contact more than two parts of the chin.

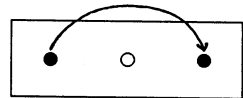
(7) Points of Discrete Contact



a. BITCH



b. BREAKFAST



c. BACHELOR

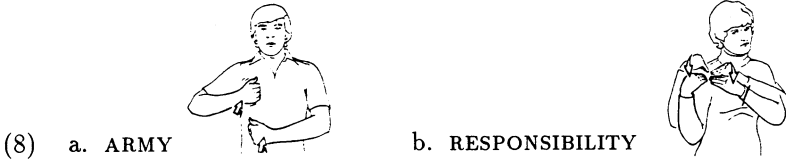
Thus, it appears that three sublocations are adequate to account for the distribution of the data. However, as indicated by the closed circles marking both sides, further investigation reveals that the sides behave as a unit.

3 Sides and Center

A striking property of signs articulated on the sides is the apparent insignificance of the right/left distinction, i.e., the side on which the sign is articulated doesn't seem to matter. This happens whether the sign contacts one side of the location, as in **BREAKFAST**, or two sides of the location, as in **BACHELOR**.

3.1 One Side of Contact

Examples of signs articulated at only one side of a location are shown in (8). **ARMY**, in (8a), is articulated on the side of the chest. **RESPONSIBILITY**, in (8b), is articulated on one shoulder. But for both of these signs the side of the location is not distinctive; **ARMY** can be articulated on the right or on the left. Likewise, **RESPONSIBILITY** can be articulated on either shoulder.



One could do the same for **BREAKFAST** and articulate it on the left side of the chin with the right hand. However, the addressee will think it odd if the signer is right-handed. If the signer is left-handed or the right hand is otherwise occupied, articulating **BREAKFAST** on the left side of the chin would be quite natural. The point is: articulating signs on the “other” side of what might be considered “natural” does not produce a unique sign. Hence, for signs that contact only one side of a location, the side of articulation is non-distinctive.

3.2 Two Sides of Contact

Significantly, it is also the case that signs that contact both sides of the location are insensitive to the right/left distinction. For signs like **BACHELOR** the order of articulation is ambiguous. The sign can be articulated with the hand in contact first with the right side of the chin and then the left, or vice versa. Johnson (1986) called this phenomenon sign metathesis. He noted that in signs that metathesize (e.g., **PARENTS**, **FLOWER**, **RESTAURANT**) the order of contact is non-distinctive and conditioned by the preceding sign.

For example, the sign for DEAF can be articulated with the index finger first touching the upper cheek and then touching the lower cheek, or vice versa. The order is determined by the preceding sign, as illustrated in (9). In the phrase MOTHER DEAF, in (9a), MOTHER is articulated at the chin, hence the first contact of DEAF is at the lower cheek, the part of the cheek closest to the chin. In contrast, as shown in (9b), DEAF is articulated from the top to the bottom of the cheek. In this case, the preceding sign, FATHER, is articulated at the forehead which conditions DEAF to begin at the top of the cheek.



(9) a. MOTHER-DEAF

b. FATHER-DEAF

Note that the cheek, where DEAF is articulated, has a vertical orientation. This differs from the horizontal orientation of the chin location. Yet, the cheek can be subdivided in the same way as the chin, into three sublocations: center, top, and bottom. This emphasizes that not only the sides, i.e., right and left, of a location are non-distinct, top and bottom are also non-distinct.

3.3 Center

In contrast to the sides, the symmetry of the center sublocation inherently blocks variation of the type noted for the sides. By definition, no variation occurs at the center.

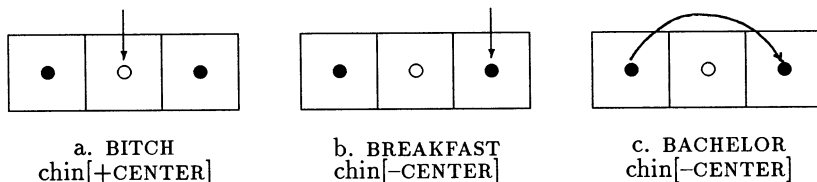
3.4 Center and Non-Center

Thus, signs articulated at the center of a location differ significantly from those articulated at the sides. Signs articulated at the side of a location, whether they contact only one side, or both, are non-distinctive with regard to side. This leads to the conclusion that the two sides be considered a single, though disjoint, unit separate from the center. In addition, observe that there is no crossing over from one sublocation to the other during a monomorphemic sign. No lexical sign is articulated with a combination of center and sides, nor are there signs articulated by contacting more than two sublocations. This emphasizes the uniqueness of the two sublocations.

As noted above, however, the subdivisions of location must apply to both horizontally and vertically oriented locations. Hence, I propose that the appropriate distinction for the sublocations is *center* and *non-center*.

In (10) I adopt the binary feature, [+/-CENTER]. [+CENTER] represents the center sublocation, as in (10a), and [-CENTER] marks the disjoint non-center sublocation, in (10b) and (10c).

(10) A (Preliminary) Representation



But this feature alone is insufficient to differentiate BREAKFAST and BACHELOR; both are specified for the non-center sublocation.

4 The Third Dimension

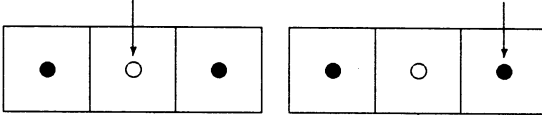
To separate the representation for BREAKFAST from the representation for BACHELOR, note that a salient difference between them is that BREAKFAST is articulated by contacting only one side of the sublocation. BACHELOR, in contrast, is articulated by contacting both sides of the sublocation. So one possibility is to differentiate them on the basis of sublocation usage, i.e., mark BREAKFAST as using only one half of the sublocation and BACHELOR as using two halves, or the whole, of the sublocation. However, there are more substantial differences between them.

4.1 One Area of Contact, or Two

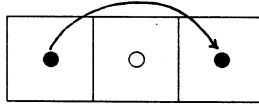
In (11), for ease of discussion, signs that are articulated at only one part of a location, either the center or a single side, are grouped together and called type A signs. Signs articulated on both sides of a location are called type B signs.

(11) Type A:

- (i) Can have change in handshape or change in orientation.
- (ii) Single or multiple contacts.
- (iii) Can be reduplicated.

Type B:

- (i) No change in handshape or change in orientation.
- (ii) Single contact only.
- (iii) Cannot be reduplicated.



The first difference between the two sets of signs is that the repertoire of movement for type A signs is richer than that for type B signs. The set of type A signs includes signs articulated with changes in handshape and changes in orientation, but Type B signs do not. For example, WHO and RED are both type A signs and both are articulated with a change in handshape. SOUR and DELICIOUS are also type A signs and both are articulated with a change in orientation. In contrast, the only type of movement that occurs for type B signs is change in location.

A second difference between type A and type B signs is that some type A signs have lexically significant multiple contacts, but type B signs do not. For example, the only difference between the type A noun/verb pair, EAT and FOOD, is that the noun is articulated with two contacts at the chin and the verb with only one (Supalla and Newport (1978)). In type B signs, only a single contact is made with each side of the non-center sublocation. There are no signs in which multiple contacts are made on one side of the location or in which multiple contacts are made on both sides of the location.

Finally, type A signs can be reduplicated but type B signs cannot. For example, some signers reduplicate the sign BITCH to produce an adjective meaning *bitchy*, but signs like BACHELOR never reduplicate.

In sum, signs like BREAKFAST and BACHELOR have more fundamental differences than using only one half or two halves of the sublocation — differences that warrant the addition of a new dimension to signing location.

4.2 Signing Planes

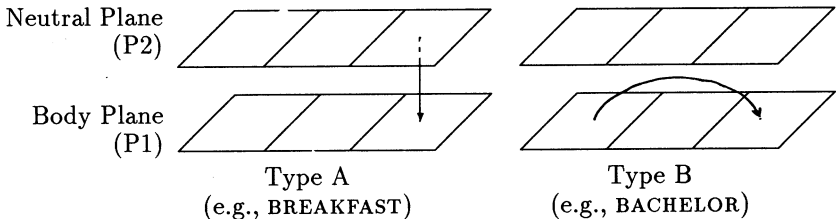
Previous analyses treat signing locations on the body as two-dimensional areas, typically characterizing them as an area on the body defined by a physical feature, e.g., the chin. I have been more specific, depicting signing location as a rectangle, thus implying that the location has length and width. However, signs really occupy three-dimensional space.

As has been noted for type A signs like *BREAKFAST* and *BITCH*, the change in location is not limited to the area directly on the chin. Rather, there is movement from the area near the chin to a point on the chin. This is true of other body locations, too. Changes in location occur between specific locations on the body and less tangible, but related, locations in the space near the body, e.g., *LIKE* begins with the hand in contact with the center of the chest and ends with it in the area directly in front of the chest.

In contrast, there are no lexical signs which change location from a random location in space to a specific location on the body. Lexical change in location is constrained to a “local” space in the proximity of the signing location on the body. I propose to formalize this concept of “local” space by incorporating height into the standard two-dimensional notion of *signing location*. The result is *local signing space*.⁶

In (12) I represent local signing space as two parallel planes. The plane labeled P1 represents the width and length of the location on the body and is the *body plane*. The plane, P2, represents the projection of the location on the body into local neutral space and is called the *neutral plane*.

(12) Local Signing Space



This concept of signing space reveals that the crucial difference between type A and type B signs is the type of change in location they undergo. The change in location for type A signs is from one plane to the other, whereas for type B signs the change of location is restricted to the body plane.

4.3 Representation

The three-dimensional representation of sublocations provides a distinctive representation for the data in (6), as shown in (13). The notation for change in location is Δ LOC. The secondary signing locations are marked with the binary feature, [+/-CENTER], and the signing planes are represented as subscripts of the primary location. If only one plane is listed, the change in location is restricted to a single plane. If two planes are listed, the change in location is between the two planes in the order that they are listed.

- (13) a. LIE
 [Δ LOC: chin_{P1}]
- b. BITCH
 [Δ LOC: chin_{P2,P1}[+CENTER]]
- c. BREAKFAST
 [Δ LOC: chin_{P2,P1}[-CENTER]]
- d. BACHELOR
 [Δ LOC: chin_{P1}[-CENTER]]

In (13a), the change of location for LIE is articulated across the whole chin. In (13b), the change in location for BITCH is from the center of the neutral plane, P2, to the center of the body plane, P1. The contrast between BREAKFAST, in (13c), and BACHELOR, in (13d), is now obvious. Although both are articulated at the non-center sublocation, the change in location for BREAKFAST is from the neutral plane, P2, to the body plane, P1. In contrast, the change in location for BACHELOR is restricted to P1 and is, thus, articulated at the two disjoint non-center sublocations in the body plane.

4.4 A Prediction: Sign Metathesis

Returning now to the discussion about sign metathesis, the utility of this analysis is obvious. Liddell and Johnson (1989) noted that a variety of signs metathesize, but were inconclusive about the phonological constraints on metathesis. In a framework that includes the concept of local signing space, the conditioning for metathesis is straightforward:

- (14) The set of signs that metathesize are specified for:

Δ LOC: location_{P1}[-CENTER]

In other words, only signs articulated by contacting both sides of a location are candidates for metathesis.⁷

5 Conclusion

In sum, using a set of minimally distinctive signs I first showed that there are only three candidates for signing sublocations. I then showed that the sides are non-distinctive and concluded that there are only two sublocations, *center* and *non-center*. Further inspection revealed the need to modify two-dimensional signing location to three-dimensional *local signing space*. Doing so not only provides a way to differentiate between signs like BREAKFAST and BACHELOR, it also leads to a prediction about sign metathesis.⁸

This paper is part of my work on *visual phonology*, a phonology sensitive to the spatial and visual characteristics of signs. The distinction between center and non-center sublocations has implications for a principled definition of symmetry in signs, and the introduction of signing planes is a step towards developing a spatial representation of signs. In this part of the analysis I have shown that only a minimal number of sublocations are necessary and that they play a role in the formulation of phonological constraints on signs, a result not unfamiliar in spoken language phonology — evidence that a comprehensive theory of visual phonology will lead to the discovery of the mode independent phonological universals of language.

Endnotes:

¹I am indebted to Sandra Klopping for reviewing the data, and to Jennifer Fitzpatrick Cole, K.P. Mohanan, Bill Poser, and James Scobbie for helpful discussions and comments. Naturally, I alone am responsible for mistakes.

²ASL is the natural language of the Deaf in most of northern America.

³Pictures in (1), (6a), (8), and (9) are reprinted with permission from T.J. Publishers. DEAF, in (9), is from Liddell and Johnson (1989).

⁴(6b) and (6d) are from Sternberg (1987), (6c) is a modified version of (6d).

⁵The signs in (6b) - (6d) have other forms: (i) for BITCH, a 90 degree twist of the wrist substitutes for the change of location; (ii) BREAKFAST has two other forms, (a) EAT + MORNING, and (b) the same handshape, but with fingers parallel to the ground, palm facing towards the body and making small rotations near the chin; (iii) BACHELOR can be articulated with a downward brushing contact at each side of the chin.

⁶Liddell and Johnson (1989) and others differentiate spatial locations from body locations. I claim that local signing space applies to all locations.

⁷Not all signs phonologically conditioned for metathesis metathesize, probably due to semantic constraints, e.g., the metathesized form of IMPROVE, at *forearm*_{P1}[-CENTER], means DEGENERATE. YESTERDAY, at *cheek*_{P1}[-CENTER], is constrained by the imaginary timeline perpendicular to the body.

⁸Another consequence of this analysis is that straight and arced movement, previously analyzed as features, are phonetic properties of the system.

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