Theory-Description-Theory: A round trip in French sign language phonology

Carlo Geraci (CNRS, IJN) & Justine Mertz (Unive. Paris-Diderot)

Goals. We use French sign language (LSF) data to evaluate descriptive and explanatory adequacy of current models of Sign Language (SL) phonology. Specifically, we show that LSF poses several problems for current theories of orientation both in terms of feature inventory and in terms of general accounts of orientation as a relative relation between the hand and the plane of articulation.

Background. SLs are natural languages that are perceived visually (vs. acoustically) and produced gesturally (vs. vocally). The perception-production systems of SL give rise to one macroscopic modality effect, namely the simultaneous production of a significant amount of contrastive phonemic (and morphemic) material (Vermeerbergen et al. 2007). Phonological contrast is accounted in SL phonology via feature geometry (Brentari 1998, Sandler and Lillo-Martin 2006, van der Kooij 2002). These models introduce three major classes of phonemes of primitives (*handshape*, *place of articulation* and *movement*), and derive a forth, *orientation*, as the result of the interaction between handshape and place of articulation. In other words, hand-*orientation* is not computed in absolute terms with respect to the signer's body serving as a landmark, but it is defined in relative terms. *Absolute orientation* is typically left as a phonetic implementation or as a lexical specification in iconically motivated signs (van der Kooij 2002).

Problematic Data. A source of problematic data has to do with the inventory of features that is crosslinguistically attested and necessary to derive *relative orientation*. A second source are those signs that do not meet descriptive adequacy at the *phonological* level, if *relative orientation* only is considered.
The first case is illustrated by the minimal pair EGG / SHIT in LSF, fig. (1a) and (1b). The two signs are identical except for *relative orientation*. Specifically, the radial part of the non-dominant hand is involved for EGG, while the web between the two selected fingers is involved in SHIT. The current set of features for orientation cannot capture this contrast. Orientation for EGG is derived with a $[+radial]$ feature on both hands. Orientation for SHIT has the same feature for the dominant hand, $[+radial]$, but no specification can capture the relevant part of the non-dominant hand. Indeed, Brentari (1998) explicitly exclude $[\pm web(ing)]$ from the set of active features. According to her, apparent contrasts for ASL can be derived as cases of $[+radial]$. The other models implicitly assume Brentari's proposal.

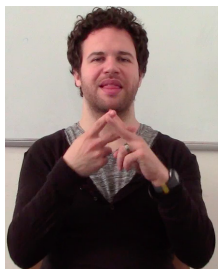(1)   a. EGG: final frame   c. ALL: initial frame   e. STRING BEAN: initial frame

       b. SHIT: final frame   d. ALL: final frame   f. STRING BEAN: final frame

The second case is provided signs like ALL and STRING BEAN, fig. (1c)-(1d) and fig. (1e)-(1f). Both

signs involve orientation change and are problematic for different reasons. *Relative orientation* for ALL is captured by specifying $[+tip]$ & $[+palm]$. However, this specification does not capture the fact that *relative orientation* is kept constant throughout articulation while the sign involve orientation change. Current models would predict surface forms that are near minimal pairs FLIP-PAGE and LATE (not illustrated here).

Both relative and absolute *orientations* are problematic for STRING BEAN. One could try to derive *relative orientation* of the initial frame (fig. 1e) with $[+tip]$ & $[+fingerfront]$. However, this would leave unaccounted *relative orientation* of the final frame (fig. 1f), which cannot be reasonably derived via redundancy. *Absolute orientation* is also problematic, as the orientation change leaves the main features unaffected ($[+tip]$ always faces $[+fingerfront]$). Other problems that are raised by signs like STRING BEAN will be illustrated during the presentation.

Analysis. Fixing the first problematic case does not introduce major consequences for current frameworks. These are normally modeled after one particular sign language (ASL, NGT, Israeli SL) and tacitly extended to others. It is expected that the feature inventory may not capture typological variation. The EGG / SHIT contrast in LSF simply shows the need to add a feature to the inventory of possible contrastive features in sign language. Descriptive adequacy is met by introducing a $[\pm web]$ orientation feature in the pool (see Liddell & Johnston 1989), while explanatory adequacy is met by allowing individual languages to select that feature as phonologically contrastive. Alternative solutions, like positing a $[\pm webing]$ movement feature (cf. Stokoe 1960) will be discarded during the presentation.

The second case is more problematic: the effects of orientation change cannot be captured by *relative orientation*. These are far from being just phonetic adjustments, and iconic motivations cannot be argued for. Indeed, ALL is not an iconic sign, while STRING BEAN has an iconic handshape which is not affected by orientation change. In order to account for this second set of data, we propose to introduce in the feature geometry system a second (recursive) layer for orientation specification. This would be a "secondary" plane of articulation. For sake of illustration, we take it to be the signer's body in the case of ALL and STRING BEAN. The configuration $[+tip]$ / $[+torso]$ would capture the final frame in ALL (fig. 1d), while $[+tip]$ / $[+palm]$ captures *relative orientation*. Similarly, $[+palm]$ / $[+torso]$ would capture *absolute orientation*, while $[+tip]$ / $[+fingerfront]$ captures *relative orientation*. In both cases, the initial status of absolute orientation can be redundantly recovered by movement features.

At the global level, our account introduces a major innovation in sign representation as it call for *absolute orientation*. However, it does so by minimally modifying current frameworks. Indeed, the requirement to obtain absolute orientation is to have a "secondary" plane of articulation. Notice that by specifying only one pair of features for absolute orientation leaves ample margins for phonetic adjustment, so that the flexibility required by the cases discussed in van der Kooij (2002) are still accounted for.

Conclusions. Theoretical models are extremely important to capture linguistic generalizations. However, blind extension from a language to another may lead to empirical inaccuracies. We showed that the inventory of active features is not fixed in SL. Exotic features (e.g., $[\pm web]$) may be active in creating minimal pairs in some SLs but not in others.

Reasons of elegance and economy have led researchers to eliminate *absolute orientation* from SL description. Data from LSF showed that this move is premature and that both *absolute* and *relative orientations* are needed to meet descriptive and explanatory adequacy.

References

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