Contact: A Phonological or a Phonetic Feature of Signs?

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0. Abstract

In early, simultaneous analyses of signs, $\alpha_{contact}$ is a multivalent feature pertaining to the movement parameter (cf. Friedman 1976). In models that make use of sequential units (Liddell and Johnson 1989, Sandler 1989, Perlmutter 1989, van der Hulst 1993) the valence of $[contact]$ can be reduced to one. In comparing two types of sequential models I will show that one of them - the No-Movement model - is more adequate in accounting for the contact types proposed in Friedman (1976). By examining the consequences of the representation of the contact types in the No-Movement model of van der Hulst (1993) and further developments thereof (Crasborn 1995, 1996; van der Hulst 1995, 1996; van der Kooij 1994, 1996; van der Kooij and Crasborn 1996). I will show that contact is a redundant property, predictable from the place specification of the sign. Being phonologically redundant, variation and non-distinctiveness of contact is correctly predicted.

1. Introduction

In all sign languages studied so far, signs exist that contact the body, the head or the hand, and signs that don’t. Another fact that has been noticed (cf. Stokoe 1978, Greftegreff 1992) is that contact is not a stable property of signs. Signs that make contact in their citation forms can easily lose this physical contact in current signing or in certain contexts (e.g. signing in formal contexts, discussed in Stokoe 1978 p. 55).

From the very early analyses on (Stokoe 1960), contact has been acknowledged as one of the minor formational aspects of the sign form. Major components of signs are place, movement, hand configuration (handshape and orientation\(^1\)) and non-manual information. All lexical signs consist of a hand configuration moving to or at a specific place. Not all lexical signs have a non-manual component. Other aspects that are potentially meaning distinctive are hand arrangement (one or two manual articulators and the relation between them) and contact. In Nederlandse Gebarentaal

\(^1\) Orientation of the hand is not among the sign aspects that Stokoe (1960) proposed. Battison et al. (1975) were the first to demonstrate that some signs are distinguished only on the basis of their orientation.
(NGT- Sign language of the Netherlands) however, no minimal pair has been attested on the basis of presence or absence of contact only.

Since early linguistic research in sign languages has aimed at phonetic description and the development of notation systems more than at phonological contrast, a large set of phonetic/phonological features exists in the literature on sign form. One of the goals of my research is to investigate the phonological relevance of these features by determining their distinctiveness on the one hand, and by looking into the implications of structural models for the interpretation of features on the other hand.

In this paper I will investigate the nature of contact. Throughout the paper I will use 'contact' in its phonetic meaning, i.e. the manual articulator physically touches the place of articulation, unless stated otherwise. The following questions will be addressed:

1. How has contact been represented in phonological models?
2. Is contact a unary or a multivalent feature?
3. What are the implications of the representations proposed in different sign models?
4. How can we best account for the phonetic variability of contact?
5. How can we account for the non-distinctive character of contact?

In section 2 the different contact types proposed by Friedman are discussed and illustrated. In section 3 I will introduce two types of phonological sign models. In section 4 and 5 these models are compared in their account of contact. In section 6 I will argue that in the model that best represents contact - the No-Movement model - the feature [contact] is in fact redundant and can be predicted on the basis of the place specification. Examples are taken from NGT and American Sign Language (ASL).

2. Contact as multivalent feature in simultaneous analyses of signs

In early analyses of signs (Stokoe 1960, Friedman 1976), representations of signs are SPE-like bundles of simultaneous features. In Stokoe’s model (1960), contact is a property of movement - the touching action of the articulator - and its notation is a diacritic mark, 'x'.

Friedman (1976) distinguishes six values of the feature contact based on the moment in the sign that contact with the place is established. Non-contact is one of the values but I will not include this value in the overview. Mandel (1981) adds 'grazing' - contact halfway the path movement - to the typology of Friedman. In (1) the values are given, followed by an example from ASL and an example from NGT. The ASL examples are illustrated in the appendix.
(1)

Value:  

<table>
<thead>
<tr>
<th>Contact Type</th>
<th>ASL Example</th>
<th>NGT Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. [contact:continuous]</td>
<td>FEMALE</td>
<td>MOEDER</td>
</tr>
<tr>
<td>contact during path movement</td>
<td></td>
<td>'mother'</td>
</tr>
<tr>
<td>b. [contact:holding]</td>
<td>LATER</td>
<td>WISKUNDE</td>
</tr>
<tr>
<td>contact during local movement</td>
<td></td>
<td>'mathematics'</td>
</tr>
<tr>
<td>c. [contact:end]</td>
<td>ACCURATE</td>
<td>PRIJS</td>
</tr>
<tr>
<td>contact at the end of the movement</td>
<td></td>
<td>'prize'</td>
</tr>
<tr>
<td>d. [contact:begin]</td>
<td>NOT</td>
<td>ZOON</td>
</tr>
<tr>
<td>contact at the begin of the movement</td>
<td></td>
<td>'son'</td>
</tr>
<tr>
<td>e. [contact:double]</td>
<td>LATIN</td>
<td>SERIEUS</td>
</tr>
<tr>
<td>contact at the begin and at the end of the path</td>
<td></td>
<td>'serious'</td>
</tr>
<tr>
<td>f. [contact:grazing]</td>
<td>CANNOT</td>
<td>BEKWAAM</td>
</tr>
<tr>
<td>contact halfway the movement</td>
<td></td>
<td>'skilled'</td>
</tr>
</tbody>
</table>

In Friedman's analysis contact is a multivalued feature. In the next section I will show that by analyzing these contact types in subsequent sign models, a reduction of the valence of [contact] - from multivalent to unary - is possible. I will compare two types of sequential models in their account of contact, so-called LML-models and No-Movement models.

3. Contact as a unary feature in sequential segmental models

As a result of the acknowledgement of the importance of sequentiality in models of sign representation, several models (Liddell and Johnson 1989, Sandler 1989, Perlmutter 1989) were proposed that make use of two segment types (cf. C and V segments, Clements and Keyser 1983): static and dynamic segments. L(ocation) represents the static segment and M(ovement) represents the dynamic segment. Perlmutter (1987), among others, explicitly compares L and M to C (consonants) and V (vowels). The unit that is constituted by a sequence of L's and M's is compared to the spoken language syllable (Sandler 1989, Perlmutter 1989). One LML sequence is considered to be the prototypical sign syllable. Movement in these models is thus represented as a primitive unit, i.e. as a segment. Although the models differ in the temporal interpretation of the static segments, I will refer to them as LML-models.

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2 NGT-examples are taken from the corpus of signs in citation form stored in the SignPhon database. At this moment SignPhon contains signs from the Rotterdam and Voorburg/Den Haag/Zoetermeer region.
In 2a. the model of Liddell and Johnson (1989) is partially and schematically represented. Unordered feature bundles are linked to the L and M slots. The bundles linked to the L slot contain, among other things, information about the handshape and the orientation of the hand. These bundles spread to the M-slot to indicate that a transition takes place from one state of the articulator to the other.

Sandler (1989) introduced a feature geometric structure. Handshape and orientation constitute a featureclass: Hand configuration. Like Place, Hand configuration is autosegmentally linked to all skeletal slots.

In sign phonology literature a well-known generalization on the surface form of signs is that all (manual) signs have movement. In LML models this generalization has no straightforward representation since only path movements - transitions from one place to the other - require the presence of an M-segment. Movements caused by a transition in hand configuration do not license an M-segment. Sign syllables can consist of different combinations of L's and M's. Among these combinations are LML, ML, L.

Apart from the fact that no straightforward representation of movement can be given, LML-models contain in addition redundancy with respect to the representation of movement. It has been argued (cf. Hayes 1993) that the movement follows if two different static values are given. This idea is taken up in several models that I label No-Movement models (Stack 1988, Uyechi 1995, van der Hulst 1993). In these models movement is not a primitive, but is the result of a change in handshape, orientation or location. I will limit myself here to the model of van der Hulst (1993) that is given in (3)
(3) No-Movement model

Place, hand configuration and manner appear in head-dependent relation. Place is the head of the structure, indicating that place is a stable, non-spreading and prominent aspect of signs. Hand-configuration is a dependent, indicating that it can spread independently from place. In the Manner node information is given about the way the articulator relates to the place. The content of the manner node is not worked out in van der Hulst 1993, but contact is suggested as one of the manner features.

Movement is represented as a branching structure in the place, handshape or orientation node. Only one type of skeletal position figures in this model. The feature values that are specified on the branching end nodes (a-f) have to be associated to the skeletal positions to get their linear order. In order to assure that all signs have movement the following constraint is proposed (van der Kooij 1994):

(4) Sign Minimality Constraint:

A sign contains minimally two skeletal positions

While the [LML] combination of units in LML models is more comparable to a spoken language syllable, the unit expressed by the model in (3) is comparable to both a (complex) segment, regarding the featural content, and to a minimal prosodic unit - a foot - regarding the skeletal requirement.

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3 Contrary to Sandler (1993) no durational information is expressed by the x-slots. Temporal information - duration - is assumed to be partially determined by the prosodic structure (cf. Wilbur 1993). See also Poizner et al. (1983)
4. The representation of contact in LML-models

We will now turn back to the representation of contact in both of these sequential models. In LML models, Friedman’s typology of contact signs can be represented with a unary feature - [contact] - associated to different segments, as is shown in (5).

\[(5) \text{ contact in LML-model} \]

\[
\begin{array}{|c|c|c|}
\hline
\text{L} & \text{M} & \text{L} \\
\hline
\text{continuous:} & x & x & x \\
\text{hold:} & x & - & - \\
\text{begin:} & x & o & o \\
\text{end:} & - & o & x \\
\text{double:} & x & o & x \\
\text{grazing:} & o & x & o \\
\hline
\end{array}
\]

\[x = \text{[contact]} \quad - = \text{no segment specified.} \quad o = \text{no [contact]}\]

It has been mentioned before that LML is not the only syllable type allowed in LML models. If we restrict ourselves to the syllable inventory that is agreed upon in all three LML models, we can distinguish three types of syllables: LML, ML and L. Based on the possible presence or absence of the feature [contact], the following representations are predicted.

\[(6) \text{ overgeneration in LML-models} \]

\[
\begin{array}{|c|c|c|}
\hline
\text{LML} & \text{ML} & \text{L} \\
\hline
\checkmark & x x x (continuous) & * x x & \checkmark \quad x (holding) \\
* & o x x & \checkmark o x (end) & ? o (no contact) \\
* & o o x & * x o & \\
* & x o o & \checkmark o o (no contact) \\
\checkmark & x o o (begin) \\
\checkmark & x o x (double) \\
\checkmark & o x o (grazing) \\
?^4 & o o o (no contact) \\
\hline
\end{array}
\]

The LML models are shown to overgenerate since only half of the logical possibilities are actually used (marked with a \(\checkmark\)). For instance signs with contact on the first

\[^4 \text{It is not clear if an LML or an L-syllable without contact could be given an interpretation in one of the LML-models.}\]
location, during the movement, but not on the final location \((L_CM_{c,L})\) and signs with contact only during the movement and on the final location \((LM_{c,L_{c}})\) are predicted. Neither of these sign types have been shown to exist. If we would take into account the syllable types that are not shared by all three models, even more non-attested syllable types could be generated.

5. The representation of contact in a No-Movement model

In this section I will show that the model of van der Hulst (1993) and further developments thereof (Crasborn 1995, 1996; van der Hulst 1995, 1996; van der Kooij 1994, 1996; van der Kooij and Crasborn 1996) can give a better, less overgenerating account of Friedman's contact types than the LML-models.

In (7a-d) a schematic representation of the contact types is given. Contact is a manner feature and is represented in the specifier position in the feature tree.

(7) contact in No-Movement model:

a. holding

b. continuous, begin and grazing
In the presentation of *holding* contact (7a), movement originates in the articulator node. Contact is established with the place of articulation and held during the change in orientation (as in ASL LATER and NGT WISKUNDE ‘mathematics’) or handshape (as in ASL UNDERSTAND and NGT RIJK ‘rich’).

The representations of continuous contact, begin contact and grazing contact are the same. The moment that contact with the place of articulation is established, is determined by the content of the place node. The ASL *continuous* contact sign FEMALE has the (putative) setting values [cheek high]\(^6\) aligned to the first slot and [cheek low] aligned to the second slot. The ASL *begin* contact sign NOT can be represented with the (putative) values [chin] and [front]. The reason why we have to specify the second setting [front] here, is that begin contact signs can have distinctive directions (van der Kooij 1996). Direction of movement is not a feature class in this model and can only be deduced from the specified setting values. *Grazing* contact in the ASL sign CANNOT would be represented by the value Weak Hand under

\[\text{P = place of articulation}\]
\[\text{[F] = Place feature}\]
\[\text{[a], [b] = setting features}\]
\[\text{[h],[i] = hand configuration features}\]

5 The articulator node dominates handshape and orientation features. The branching node in (7a) indicates that either the handshape node or the orientation node branches.

6 Another option for the setting values of this sign would be [ear] to [mouth] since these would be values that would be needed in the phonological inventory of place values anyway. We leave the issue of distinctive place specifications for further research.
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Place (major place) and [high] to [low] under the setting node. The implementation of these values would be, that the weak hand is touched during the transition in neutral space from [high] to [low]. Summarizing, the interpretation of the unary feature [contact] specified in the Manner node in continuous, begin and grazing contact signs is dependent on the specifications in the Place node.

In (7c) the representation of an end contact is given. The bipositional skeleton, required by the Sign Minimality Constraint in (4), assures that the sign contains movement. The setting value specified is associated to the second skeletal position and the first position gets its phonetic interpretation either by spreading the setting value of the previous sign, or - when the sign is in isolation or stressed - by default (cf. van der Kooij 1996).

Uyechi (1995) analyzed double contact signs as repeated end contact signs at two sides of the Local Signing Space. I adopt this analysis of double contact signs in the model in (3). The double contact signs are represented as end contact signs with a doubled skeletal unit. The first slot of the second unit gets the default interpretation (S2') and the result is a smooth arc-movement from the first to the second setting (cf. Uyechi 1995). This is illustrated in (8)

(8)

In this analysis the difference between continuous and double contact signs is not made ‘melodically’ - using a distinctive feature - but prosodically. For instance the double contact ASL sign DEAF has the same setting values as the continuous contact sign FEMALE (illustrated in the appendix) and is distinguished by the prosodic information that is arguably present in the lexical representations of these signs. Interestingly I did find alternations between the potentially distinctive continuous and double skeletons. Although no systematic research has been done on the conditions in which these alternations do and can occur, I attested (within the same signer and the same setting) some instances of double contact signs (e.g. DOOF ‘deaf’ and

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7 At the moment we have no evidence yet as to why the setting specification should be associated to the second X-slot. There might - however - be prosodic reasons for this. Poizner et al.(1983) in their article on neuromotor constraints in ASL mention that Kelso, Holt and Flatt (1980) have presented data indicating that the human motor system is organized to achieve the final position of a movement.

8 The default interpretation of a setting value in the context of a skeletal unit (indicated by square brackets) is a function of the value specified in this unit (S' - setting prime) and is interpreted as “a few inches away from S”.

9 The index finger briefly touches the cheek near the ear, then near the mouth.
DIRECTEUR\(^{10}\) ‘director’) articulated as continuous contact signs. A representation of this alternation is illustrated in (9a). I also attested one instance of a continuous contact sign (LAAT\(^{11}\)) articulated as a double contact sign and illustrated in (9b).

\[
(9) \begin{align*}
\text{a} & \quad \text{Double} \rightarrow \text{Continuous:} \\
& \quad \begin{array}{c|c|c|c|c}
\quad \text{a} & \quad \text{b} & \quad \text{a} & \quad \text{b} \\
\hline
\quad & \quad & \quad & \\
\hline
\quad [X \ X] & \quad [X \ X] & \quad [X \ X]
\end{array}
\end{align*}
\]

\[
\begin{align*}
\text{b} & \quad \text{Continuous} \rightarrow \text{Double:} \\
& \quad \begin{array}{c|c|c|c|c}
\quad \text{a} & \quad \text{b} & \quad \text{a} & \quad \text{b} \\
\hline
\quad & \quad & \quad & \\
\hline
\quad [X \ X] & \quad [X \ X] & \quad [X \ X]
\end{array}
\end{align*}
\]

In the phonetic implementation of the signs the same segmental content is associated to different prosodic structures. Since these different structures are potentially distinctive, the variation in phonetic realisation is neutralizing. These observations await further systematic research.

6. Is contact a phonological or a phonetic property of signs?

In this section the question of the status of the property contact is addressed. I will argue that contact is a phonetic property of signs, and that it can be predicted from the place specification. Wilbur (1987) also relates the type of place specification to contact. She uses [contact] to distinguish signs in neutral space from signs made on the body (p. 46). Here I will show that in the context of the model in (3) the relation is rather the other way around: if a specific location value is given, contact can be seen as the consequence.

In the introduction it was already mentioned that signs involving contact in their citation form or in careful speech, sometimes do not actually show the hand touching the place of articulation in running speech or in formal contexts (cf. Stokoe 1978). This variation is accounted for if we make the following move.

In the representation of contact types in the model of van der Hulst (1993) it was noted that the interpretation of the representation depended on the specified setting values. Taking this observation into account, we can ask how the representation with

\(^{10}\) The A(dot)-hand first touches the contralateral side of the upper chest, then the ipsilateral side of the upper chest. Note that if this sign is articulated as a continuous contact sign, it is homophonous with the sign EARLY ‘vroeg’.

\(^{11}\) The hand with four selected fingers goes from the contralateral side of the upper chest to the ipsilateral side.
the same setting values, but no contact specified, should be interpreted. The model allows for such representations to be distinct. Since signs with and without actual touching of a location are found not to be distinct (cf. Greftegreff 1992), we have to conclude that ‘contact’ cannot be a phonological feature assuming the model in (3). Touching of the place (phonetic contact) is the consequence of the presence of a specific place value in the representation. Given a place value on the head, body, arm or weak hand (body locations), on a virtual plane (see next paragraph), or a place value determined by syntactic or pragmatic context (e.g. loci that are linked to specific referents by means of inflection or localization13), contact is predicted. Systematic research as to which setting values result in actual phonetic contact and which contextual factors play a role is still to be executed.14 The urge to avoid pain seems to be one of these factors, as for instance the setting [eyes] is always articulated without actual touching. What is important in this article is that touching vs. non-touching is predicted to be non-distinctive.

In studies on sign acquisition (Bonvillian and Siedlecki 1996) it has been argued that place is the most prominent aspect of the sign, as it is first acquired correctly by young children.15 It seems that touching action (phonetic contact) is the optimal realization of the identification of a location. A less optimal way of identifying a location would be pointing action. I assume that in non-concrete locations (non-physical locations) or in physical locations (e.g. the eyes) where touching action is inconvenient, pointing action is used to identify the location.

Finally, the analysis of contact as a phonetic rather than a phonological feature, allows for a straightforward comparison of the following pairs of signs. The pairs of signs are identical in the formational aspects handshape, movement shape and relative orientation;16 they only differ in location. All first signs occur on the head or on the body and all second signs occur in so called neutral space- the space in front of the signer. Signs marked *‘* are illustrated in the appendix.

(10)

<table>
<thead>
<tr>
<th>Action</th>
<th>Physical Location</th>
<th>Neutral Space</th>
</tr>
</thead>
<tbody>
<tr>
<td>a circling while touching</td>
<td>VERVELEN*</td>
<td>KAMER*</td>
</tr>
<tr>
<td>b approaching and touching</td>
<td>POSTBODE*</td>
<td>STAD*</td>
</tr>
</tbody>
</table>

12 Thanks to Onno Crasborn for bringing this problem to my attention.
13 See also the section on the redundancy of H segments in Wilbur (1993).
14 Thanks to an anonymous reviewer for bringing the lack of mentioning the need for systematic research to my attention.
15 It has also been observed in acquisition studies (cf. Bonvillian and Siedlecki 1996) that the movement that is by far first acquired accurately by young deaf children, is contacting action. The authors suggest that this could be due to the tactile information that the child gets from touching action.
16 Relative orientation is the orientation of a part of the hand with respect to the specified location (cf. Crasborn & van der Kooij- this volume).
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If we assume that the (psychologically real) virtual horizontal plane can host specific settings on a par with body locations (cf. Poizner et al. 1983), the signs in neutral space in the pairs in (10) will receive the same representation as the signs with physical locations

7. Summary

In this article I proposed a reduction in the array of formational properties that figure in the literature, by making use of a restrictive phonological model - the No-Movement model by van der Hulst (1993 and subsequent developments). It was shown that by representing the different types of contact signs (cf. Friedman 1976) in this model, [contact] is analyzed as a redundant feature, predictable from the place specification. By considering contact to no longer be a phonological feature, we correctly predict the variation found in the phonetic realization of contact signs, as well as the fact that we do not find distinctive pairs based on contact only.

References

Crasborn, O. and E. van der Kooij (this volume) ‘Relative Orientation in Sign Language Phonology.’

17 In TOT (10c) we assume the virtual time line in front of the signer (cf. Schermer et al.1991) to be the place of articulation.
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Appendix

ASL signs: FEMALE, LATER, ACCURATE, NOT, LATIN, CANNOT.
copied from Sternberg (1994)
NGT signs: KAMER, POST(BODE), STAD (used in Groningen only).
copied from Basis gebarenschat (1989)
VADER (used in Groningen only).
copied from Handen uit de mouwen (1988)
VERVELEND, EIGEN.
copied from Gevoelgebaren (1993)