SIGN LANGUAGE PHONOLOGY AND THE KHK SYSTEM

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Abstract: *The aim of this paper is to provide a general view of Sign Language Phonology and of the system I am developing for describing the contact signing area. All that will be done in order to prove the Universality of Sign language parameter Location. I will take into account the research works developed by Rodríguez (1992), Muñoz (1999), and Herrero (2003) in Spanish Sign language, and the research done by Brentari (1998) in American Sign Language.*
First I will provide some general clues about Sign Language Phonology, especially on the parameters that shape a sign—Hand Shape, Movement, Location, Orientation and Facial Expression among others—. Then, I will focus my presentation on Location, because it can be taken as a mental parameter that is concretized in the different locations in the contact signing space used by deaf and deaf-blind signers. In the presentation, I will show the system I am developing for classifying those locations, for what I will divide the articulators that take part in signing into 11 absolute regions, and each of them into 9 relative regions. I will also show the features needed for doing so by using a binary system. The theoretical framework that I am assuming is the Generative model.

Keywords: sign lenguage phonology.

Resumen: *El objetivo de este trabajo es proporcionar una idea general en torno a la Fonología de la Lengua de Signos y en torno al sistema que estoy desarrollando para describir el espacio de contacto en que se realizan los signos. Todo ello se realizará para demostrar la Universalidad del parámetro punto de articulación de la lengua de signos. Para ello tendré en cuenta las investigaciones realizadas por Rodríguez (1992), Muñoz (1999) y Herrero (2003) en lo referente a la Lengua de Signos Española, y la investigación llevada a cabo por Brentari (1998) sobre la Lengua de Signos Americana.*
En primer lugar, haré una introducción sobre la Fonología de la Lengua de Signos, especialmente sobre los parámetros formativos de los signos—Configuración de la mano, Movimiento, Toponemas, Orientación, y expresión Facial, entre otros—. A continuación, me centraré en los toponemas o lugar de articulación de los signos, porque éste puede ser tomado como un parámetro mentalcuya realización se hace concreta en los diferentes lugares de articulación en el area de signado de contacto utilizado por los sordos y los sordo-ciegos. En la presentación, mostraré el sistema que estoy desarrollando para clasificar esos puntos o lugares de contacto, para lo cual dividiré los articuladores que participan en la realización de un signo en 11 Regiones Absolutas y cada una de ellas la subdividiré en 9 Regiones Relativas. También mostraré, del mismo modo que vienen haciéndolo otros lingüistas que siguen el modelo Generativista, los rasgos distintivos necesarios para llevar a cabo la clasificación.

Palabras clave: fonología, lengua de signos.

1.General introduction

According to Chomsky (1986) we are all born with an innate *knowledge* of language and all of us can exteriorise it. So, if we have no disfunction in our brain, it seems to be dessigned to be exteriorised orally the phonemes we receive from the input. But if there is a disfunction in our brain, then our brain seeks for other ways for exteriorising language, that is, through the hands in the case of the deaf and deaf-blind, through Sign Language.But what do we know

about language in general? We will do a general introduction to Sign Language and its Phonology[2].

2. General introduction on Sign Language Phonology

We know that Sign Language is the visual language used by the deaf and deaf-blind all over the world. It is not international, even though there is an international sign language used in internatinal congresses, but it is a covention. Each country has its own Sign Language. Even in some countries that share the same oral language, their deaf and deaf-blind inhabitants use different Sign Languages. England, and the USA, for instance, share oral English, but each has its own Sign Language, BSL in England, ASL in the USA. In Spain there is one Sign Language, Lengua de Signos Española or LSE. All Sign Languages have dialectal differences, in general in vocabulary. That happens with LSE for example when someone from Madrid and someone from the Basque Country produce the sign for ZAPATO.

(1) *a. ZAPATO in Madrid*
    b. ZAPATO in the Basque Country

The deaf and deaf-blind signers from Madrid and from the Basque Country will produce the sign used by their community. The ones from Madrid will touch the nouse with the index and the middle together as if like putting the glasses in their right place. The ones from the Basque Country would make the sign as if they would hold a shoe with both hands and as if they would put it on and they would do it in front of the chest. So, we have two signs for expressing one referent. However, we will not analyze dialectal differences here, but the Parameters that form a sign, and more specifically one, Location. If we observe the differences in the production of the two signs given for ZAPATO in Madrid and in the Basque Country, we see that the first one is one-handed and the second one is two-handed. So, in Sign Language an important thing to take into account is if a sign is one-handed or two-handed. If it is two-handed, we have to consider if the *movement* the hands do is symetric or not and if the *hand shape* is the same or not.

(2) *a. One-handed signs: SAL, COMER, VER,*
              (Salt, eat, see)
    b. Two-handed signs: LOGROÑO, MIÉRCOLES, FIESTA, ARAÑA, VIERNES, VIAJAR.
              (Logroño, Wednesday, party, spider, Friday, to travel)

3. Parameters that form a sign

Up to 1960 the language used by the deaf and deaf-blind was not considered a language in the chomskian way, but it was taken as the way deaf and deaf-blind use to communicate among themselves, and it was also taken as mimics. But what happened in 1960 for this change to take place was an important point in time for the deaf and deaf-blind communities, because of Stokoe´s proposal. Stokoe (1960) proposed that what was considered deaf people´s way of communicating, what we know nowadays as Sign Language, is a real language because it has and it needs to have three basic parameters for producing a sign: Hand Shape, Location and Movement. These parameters or cheremes[3] are basic for doing a sign, otherwised we will get something else but a sign.

(3) *LENGUA DE SIGNOS*
    (Sign language)

So, as I have just said, Stokoe (1960) proposed three Parameters for forming a sign: Hand Shape, Location and Movement. Twenty years later, Liddlell and Johnson (1982) proposed that there were two more Parameters that form a sign, that is, Hand Shape, Location, Movement, Orientation and Facial Expression .

(4) *ABRIR vs. CERRAR, MOSTRAR-TU vs. MOSTRAR-YO, GUAPO vs. GUAPÍSIMO.*
   (to open vs. to close; to show you vs. to show me; handsome vs. very handsome)

Ten years later, Rodríguez (1992) proposed there were six parameters, that is, Hand Shape, Location, Movement, Orientation, Facial Expression and Movement´s Direction.

(5) *DESPUÉS vs. ANTES, DAR-TU vs. DAR-YO, SUAVE vs. DESAPARECER.*
   (after vs before; to give you vs. to give me; soft vs. disappear)

In less than ten years another important research work was published in Spain, the one by Muñoz (1999) ¿Cómo se articula la lengua de signos?, where she proposed seven Parameters for forming a sign, that is, Hand Shape, Location, Movement, Orientation, Non manual Components, layers of sign articulation and contact point or dominant hand´s part that touches the body.

(6) a. *TU HOY AQUÍ CENAR?*
      ¿Hoy por la noche cenarás aquí?
      Would you have dinner here tonight?

   b. *HOY AQUÍ CENAR QUIÉN?*
      ¿Quién cena hoy aquí?
      Who will stay here for dinner tonight?

   c. *TRAVEL vs. TRAVEL FAR AWAY*
      (to travel vs. to travel so far away)

So, since Stokoe´s proposal, many research works have been done on Sign Language. But instead of analysing all the possible Parameters, I will focus my attention on one of them, on Location, and I will try to prove the Universality of Sign Language through this parameter.

4.The system

Sign Language Cherology and Location can be analyzed in many different ways. Rodríguez (1992) and Muñoz (1999) use the same system for classifying locations or Toponemes, as they call them, in Spanish Sign Language. They use a number based system, in which each location has a number. They organize the numbers for the locations according to their usage. For instante, a point in the face will have a lower number than one in the stomach, since the first one is more used than the second one. I propose to dessign a map or Cartography of all the possible locations in the contact signing space in our body, which from now on we will call KHK, and which is in process. But, how are locations differenciated among themselves in the KHK? I propose to do it in two types of regions. On the one hand, the contact signing area can be divided in 11 Absolute Regions, and on the other hand, I propose to subdivide the Absolute Regions into Relative Regions, which are classified in a nine cell scheme. For doing this classification, I am developing a system according to two axis, Place of Articulation and Height. Since the map is flat, in a way, we do not need any other axis. I am developing it following the Generative Program, for which I use a binary feature system quite similar to the one used for describing oral languages. We will analyze contact features[4] and we will do it in terms of Place of Articulation and in terms of Height We will consider Place of Articulation features [±dominant hand], [±subordinate hand], [±front], [±back], [±in] and [±out] and we will consider Height features [±high], [±low], [±top] and [±under].

As it can be seen, the same features that are used by other linguistis that follow the Generative model for describing oral languages will be used in this description, but we will include, [±top], [±under], [±dominant hand], [±subordinate hand], [±in] and [±out], because the description requires it. We will explain the KHK system and the basic scheme we will use for dividing and subdividing the Absolute Regions and the Relative ones. So, I propose eleven Absolute Regions, three in the face, Fcf for the forehead area, Fcn for the nose area and Fcc for

the chin area; one in the head, Hd; two in the arm, Rmf for the forearm and Rm for the arm; two in the hand, Hndp for the handpalm and Hndf for the fingers; one in the neck, Nck; one in the chest, Chst; and one in the stomach, Stch. We will classify the the neck, the chest and the stomach, through a nine Relative Region scheme. The three Absolute Regions in the face will also be divided by using this scheme, but since there are more locations than in the other Absolute Regions, but the hand and the arm Absolute Regions will be classified by using schemes based on the following one but a little bit different.

1	3	2		2	3	1
7	9	8		8	9	7
4	6	5		5	6	4

(7) *Scheme for a left-handed and scheme for a right-handed*

Each of the schemes that will represent the Absolute Regions will have nine cells and they will be subdivided in groups of three Relative Regions. Horizontally, and taking into account a right handed person´s perspective, we will go from right to left. The relative regions will be classified taking into account Place of Articulation and Height, and each of them will have a particular number. In what concerns Place of Articulation and using a binary system, starting from the top right hand side of the scheme, the first number or Relative Region will be 1 [+ dominant hand], number 2 or the second relative region on the top left hand side of the scheme will be [+subordinate hand], and the third point, the Relative Region between 1 and 2 on the top will be number 3 or [[- dominant hand][- subordinate hand]]. That is why numbers appear in that order in the table.

If we go down in the scheme horizontally, we find numbers 7, 8 and 9. The smallest one will be [+ dominant hand], that is, number 7 will be in the midline on the right, number 8 will be [+subordinate hand], it will be the one in the midline on the left, and number 9, the one in the midline between number 7 and number 8, it will be [[- dominant hand][- subordinate hand]]. We will see later why we jump from 1 2 3 at the top to 7 8 9 in the middle and to 4 5 6 at the bottom. If we keep on going down horizontally, we will get to the bottom of the scheme and we will classify those relative regions in the same way we did with the previous ones. The smallest number will correspond to the relative region at the bottom on the right, number 4, and it will be [+ dominant hand], the location at the bottom on the left will be number 5, and it will be [+subordinate hand], and the Relative Region at the bottom in between the previous ones will be number 6, and it will be [[- dominant hand][- subordinate hand]]. So, vertically from top to bottom, 1, 7 and 4 are [+ dominant hand], 2, 8 and 5 are [+subordinate hand], and 3, 9 and 6 [[- dominant hand][- subordinate hand]]. So, vertically from top to bottom:

1, 7, 4 are [+ dominant hand]
2, 8, 5, are [+subordinate hand]
3, 9, 6 are [[- dominant hand][- subordinate hand]]

That classification has been done taking into account just Place of Articulation. But if we take into account Height, that is what we get. We will go from the top of the scheme to the bottom. That is, the three Relative Regions on the top of the scheme are 1, 2 and 3 and share the feature [+high]; 4, 5, and 6, which are not in the following line, but in the bottom one share the feature [+low]. If the scheme were divided in four cells, we would not need that many features, but we do need those two features to classify them because we have another line in between where we find 7, 8 and 9, which are [[-high][-low]].

In the case a deaf or a deaf-blind is left-handed, the same scheme will be used, but with a little difference: that instead of organising the Relative Regions as follows, 2, 3, 1; they will be 1, 3, 2. The numbers will be the same and the features that describe them will be the same, but in a different order. In what concerns to Height, nothing changes, so we will have 1, 3, 2, at the top, 7, 9, 8 at the middle and 4, 6, 5 at the bottom. So, the scheme for both right handed and left handed people is the same, but with a change in the order of Place of Articulation, and it will not affect Height at all.

1	3	2		2	3	1
7	9	8		8	9	7
4	6	5		5	6	4

(8) *Scheme for a left-handed and scheme for a right-handed*

As we can see in the schemes above, the numbers are the same, so the features are the same. For instance, if we analyze the scheme for the chest, Chst 1, both for right handed and for left handed people, will be [+high] and [+ dominant hand]. Though, we have to bear in mind that for right handed people it will be on the right and for left handed people it will be on the left.

1.[+ dominant hand] [+high]
2.[+subordinate hand] [+high]
3.[[- dominant hand][- subordinate hand]] [+high]
4.[+ dominant hand] [+low]
5.[+subordinate hand] [+low]
6.[[- dominant hand][- subordinate hand]] [+low]
7.[+ dominant hand] [[-high][-low]]
8.[+subordinate hand] [[-high][-low]]
9.[[- dominant hand][- subordinate hand]] [[-high][-low]]

Now we will analyze the locations in the chest to see how does the system work. For doing so, we will use, as we said before, a scheme that shows the Absolute Region Chest and that is formed by nine bits or Relative Regions, that is, nine different locations on the chest.

1	3	2		2	3	1
7	9	8		8	9	7
4	6	5		5	6	4

(9) *Scheme for a left-handed and scheme for a right-handed*

Chst 1.[+ dominant hand] [+high]
Chst 2.[+subordinate hand] [+high]
Chst 3.[[- dominant hand][- subordinate hand]] [+high]
Chst 4.[+ dominant hand] [+low]
Chst 5. .[+subordinate hand] [+low]
Chst 6. .[[- dominant hand][- subordinate hand]] [+low]
Chst 7.[+ dominant hand] [[-high][-low]]
Chst 8.[+subordinate hand] [[-high][-low]]
Chst 9.[[- dominant hand][- subordinate hand]] [[-high][-low]]

The system is so easy, since the only thing that needs to be changed is what we put before each number. That is, in order to differentiate the Relative Regions of each Absolute Region, we will use numbers, and in order to differ the Absolute Regions from one another, we will use a mark for each one. For the head we will use the abbreviation Hd; for the face, as it is such a used region and as it is full of different locations, and it is so difficult to describe, we will divide it into three Absolute Regions, Fcf when we refer to the highest part of the face or forehead area, Fcc when refering to the lowest part of the face or chin, and Fcn for the middle part of the face or nose area; for the neck Nck, for the cheast Chst, for the stomach Stch, for the arm Rm and aaarmf for the forearm; and for the hand we will use Hndp when referring to the hand palm and Hndf when referring to the fingers.

5. Conclusions

To conclude, the system is in the process of being developed, but once the inventory of all the possible locations is given, it should help to show the Universality of Sign Language Parameter Location. However, I have an intuition that the Universality of Sign Language Parameter Location can not be proved just by classifying all the possible locations in the KHK. We should do another Cartography of all the possible non contact locations, that is, we should do a map of the locations´projection in front of the body and then see what happens in both cases in our mind/brain. That is, it would be interesting to see the way the brain works when using the KHK and when using the projection of it in front of the body. It could also be interesting to see if the brain/mind of a deaf and of a deaf-blind works in different ways in what concerns to language. All that would help us see how a 0 Dimensional ente like Location turns to be a 1 Dimensional element when we touch any point of the KHK with the tip of the finger; how we need time to establish the signing area in the body, a 2 Dimensional element; how from a 2 Dimensional element we go to a non contact location, to a 3 Dimensional element, the hand in the non contact signing area; and by applying time, how a 0 Dimensional ente becomes a 4 Dimensional element. So, if all this is right, deaf and deaf-blind children develop the notion of Dimension together with psychomotor skills, among other skills they develop. So, the KHK will offer the deaf and deaf-blind communities a tool for their children to learn their language, to develop the notion of themselves and to know the world. All this gets us back to ourselves, to the brain and the mind.We need 0-D entes to get to know 4-D elements, as well as we need time, experience and contact with other human beings in order to develop our knowledge of language, but we need 4-D elements in order to understand how the brain works and how those 0-D entes function in our mind.

This proposal comes to enrich and specify some other proposals offered up to now. It is more specific, not maybe more economic, but this might be because the language requires so, and it is more systematic than other proposals. Maybe the same should be done with all the Parameters that form a sign, and it could be included in the proposal by Herrero (2003) So, if my proposal is correct, and if this is the classification used by all the deaf all over the world, that will give us a clue to the Universality of Location, and we will be closer in understanding how the brain works.

However, more research needs to be done in order to prove all that, because the locations we are classifying are of contact, but they can also be of non contact, as it has just been said. We could also see what happens if we take a different Hand Shape, say the feast or if we take into more detail the Relative Regions and if we divide them into smaller regions. However, even if we can not prove the Universality of Sign Language Location, we will help in the literacy of the deaf and deaf-blind because the KHK can be used as a tool in the literacy of the deaf and deaf-blind, since it can be a good tool for creating new didactic materials for them to learn about their language, their body and themselves and they can learn it together with colours, numbers, spelling and textures. It can also be so helpful when teaching Sign Language to hearing people or to people who is losing hearing. So, you will have to wait until XXII AJL to see the results I get. But I am sure all signers all over the world use the same contact signing areas and Regions, Absolute and Relative, when signing, and even if the KHK might present mistakes, the system can be improved.

Now, I just can do two things, to hope that you have at least a general view on Sign Language Cherology and on the KHK, and to thank the organising committe for giving me this chance to talk about the Cherology of Sign Language and about the System I am developing and to congratulate them for the work they have done in organising this event.

Notas

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[2] Cherology is for Sign Language.what Phonology is for Oral Language.

[3] A chereme is to Sign Language what a phoneme is to Oral Language.

[4]According to Sommerstein (1980) a feature is the real basic unit, a system of features defines two types of phonemes, the ones that have the feature, and the ones that do not have it. According to Hyman (1981) a feature is a minimal unit that can function to distinguish meaning. It is not a sound or even a group of sounds, but an abstraction, a theoretical ente in the phonological level which is defined in terms of its contrast in a system.

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