

Event categorization in sign languages

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Abstract

Spoken languages share the property of *discrete infinity*: an infinite number of meaningful expressions is generated from a finite repertoire of basic meaningful forms. Classifier predicates of sign languages, at first blush, represent events of motion and location in a continuous way, by exploiting handshape movements and locations in the signing space. Since movement and locations are regarded as basic components of signs, it seems that classifier predicates are based on a potentially infinite number of basic meaningful components. I examine different accounts of classifier predicates and argue that, in fact, they may be assimilated to demonstrative predicates of spoken languages.

1 Categorization in spoken languages

In the Italian lexicon, the words “declivio” and “scoscendimento” refer, respectively, to the class of slight slopes and to the class of steep slopes. Thus, for example, 45° slopes, 46° slopes, 47° slopes all qualify as *scoscendimenti*, while 7° slopes, 8° slopes, 9° are *declivi*. It may happen that other languages lack lexical items corresponding to these Italian words. What does not happen, however, is that there are spoken languages that, for each rational number n between, say, 45 and 47, have a different word in the lexicon for the class of n° slopes. In natural languages, to talk about all these different kinds of slopes, we have to use combinations of lexical elements, like the expressions “ 45° slope”, “ 45.1° slope”, “ 45.01° slope”, etc. This fact is an instance of the property of *discrete infinity* (Chomsky 1988) shared by all spoken languages: while their lexicon is finite, the grammar of these languages is capable of generating an infinite number of meaningful complex expressions.

While spoken languages share the property of discrete infinity, this is no necessary property of communication systems. Imagine a population that communicates, in part, with drawings. They need not be very naturalistic drawings. Conventions may have evolved by which men are drawn as in Figure 1,



Fig. 1

movement of objects is indicated by an arrow, as in Figure 2, and so on.



Fig. 2

There may also be a convention by which the shape of the arrow reproduces the path followed by a real world object and every variation in the shape of the arrow may in principle signal a variation in the path of the object. Thus, for instance, while Figure 2 tells us that the man followed a straight path, Figure 3 tells us that the man followed an S-shaped path, where the shape of the S provides information about the way in which the path deviates from a straight line.



Fig. 3

Clearly, a communication system of this kind lacks the property of discrete infinity: since every variation in the shape of the arrow potentially indicates a variation in the shape of the path, the system is built on a potentially infinite number of basic signals (the arrows of different shapes).

Communication systems of this sort are attested in nature, one well-known example is the “dance language” of bees described by von Frisch (1965). In the “tail-wagging dance” that forager bees perform in the hive, the angle by which the waggle component of the dance deflects, to the left

or to the right, from the vertical corresponds to the angle by which the path from the hive to the feeding place deviates, to the left or to the right, from the path from the hive to the sun. Again, the system is built on a potentially infinite number of basic signals, the potentially infinite ways in which the tail-wagging run can deflect from the vertical.

The property of discrete infinity seems thus to set human natural languages apart from other communication systems found in nature, or from a priori conceivable communication systems, like the one of the drawing population described above. Yet, there is one class of human natural languages, that, at least on the surface, does not fit in this picture easily, since languages in this class bear a striking resemblance to the language of our drawing population: the sign languages developed by deaf communities. In the next section, I show why they have trouble to fit in.

2 Categorization of events in sign languages

Sign languages have a class of predicates known as *classifier predicates*.¹ Here is an example from American Sign Language (ASL) described by Valli and Lucas (2000, pp. 79-80) (figure captions mine):

In ASL, when a signer describes how a car drove past, the sign CAR is used, followed by a sign with a 3 handshape, moving from right to left in front of the signer, with the palm facing in. A sign with the same handshape can be used to talk about the movement of a boat or a bicycle. The movement, orientation, and location can change to show how the car or boat or bicycle moved. This same handshape, used for all three signs, has the general meaning of VEHICLE. The 3 handshape is an example of a classifier: it is a symbol for a class of objects. The 3 handshape is the symbol for the class of objects VEHICLE. A classifier in ASL is a handshape that is combined with location, orientation, movement, and nonmanual signals to form a predicate. The English sentence *The car drove past* would be signed in ASL as CAR 3-CL (move from right to left of signer with palm facing in). The predicate is VEHICLE-DRIVE-BY, and the classifier is the handshape of the predicate.

¹I call them “predicates” rather than “verbs”, because at this point I want to remain neutral about their lexical status. The term “classifier predicate” is used, among others, by Valli and Lucas (2000), Cogill-Koez (2000a,b), Davidson (2015).

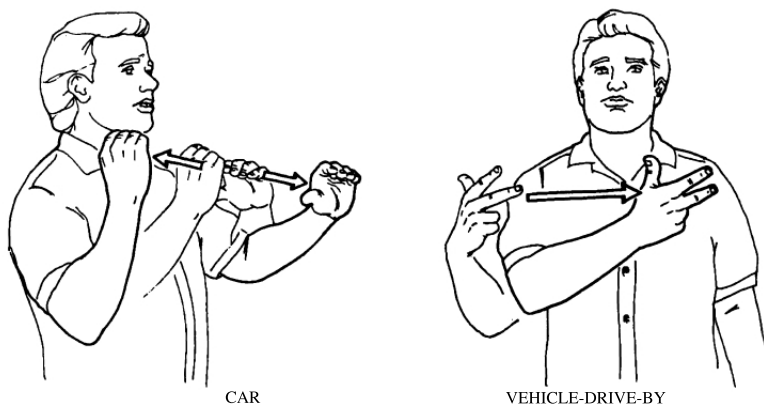


Fig. 4 (from Valli and Lucas 2000)

According to this description, a classifier predicate may be seen as made up by two components that are simultaneously articulated:

1. a handshape specific for a class of objects,
2. a movement of the handshape in the signing space.²

In classifier predicates describing events of motion, as is the case for the example of classifier reported above, the movement of the handshape in the signing space depicts the kind of movement performed in reality by an object the class designated by the handshape. Predicates of this sort are reported to occur in almost all sign languages (Zwitserslood 2012). Since in principle any variation of the handshape movement may signal a variation in the movement of the real world object, sign languages resemble the communication system of the drawing population described in the previous section, where any variation in the shape of the arrow may signal a variation in the shape of the path of a real world object. Since handshape movement is usually taken to be one of the basic components of the linguistic sign, it appears that classifier predicates, and thus sign languages, are based on a potentially infinite number of basic meaningful components, contrary to what is required by the property of discrete infinity.

A qualification is in order here. In sign language communication it is not the case that any slight variation of the handshape movement actually signals a variation in the movement of the real world object. In any given

²More precisely, the second component may be seen as the combination of parameters like location, movement, orientation of the handshape and, possibly, non manual signs.

context, what is required for communication purposes is that *some* mapping from the signing space to the real space it represents be taken for granted.³ So, it may very well be the case that slight differences between handshape movements are regarded as non significant in a context. The point, however, is that *in principle* there is no limit to how fine-grained a mapping may be presupposed, the only bound being imposed by physical limitations in perceiving or producing too small a variation.⁴ So, for any mapping from signing space to real space, we may imagine signers to select a finer-grained mapping and use classifier predicates to argue about finer differences in the movement of real space objects, as long as these differences can be perceived and physically reproduced by handshape movement.⁵

A similar situation may be observed for classifier predicates describing locations of real world objects. Valli and Lucas observe:

If the signer produces a classifier predicate with a 3 handshape and a contact movement root [a short downward movement followed by a hold] in a particular point in space, the meaning is that a vehicle is located at that point in three-dimensional space. . . . The exact point in space has meaning and refers to a point in real three-dimensional space. (Valli and Lucas 2000, p. 83)

³See Emmorey and Herzig (2003, p. 222) for discussion of this point.

⁴This is also the case for the tail wagging dance of the bees and for the language of our imaginary drawing population.

⁵An actually occurring example of this is reported by Cogill-Koez (2000b, p. 182). While Supalla (1982, 1986) observes that in ASL one arc movement is used and Engberg-Pedersen (1993) observes that in Danish Sign Language two arc movements occur (a semicircular arc and a quarter-circle arc), Cogill-Koez reports that informants of Australian Sign Language (Auslan), presented with the task of reporting about a child on a swing that swings, swings higher, and swings higher still, “have unhesitatingly produced three sizes of arc on the same axis.” One may conjecture that, if signers are presented with the task of reporting four clearly distinguishable arcs, they would produce four sizes of arc, and so on, until differences in arc size become hard to reproduce or to perceive. An example of signers’ making a four-way distinction for slopes comes from the Italian Sign Language test described in section 5.

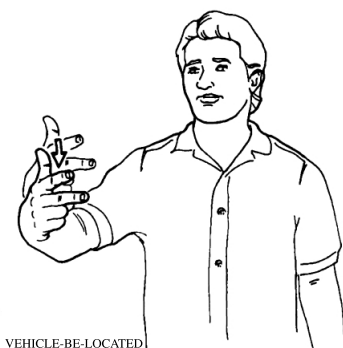


Fig. 5 (from Valli and Lucas 2000)

The point in the signing space in which the downward movement + hold is performed is thus meaningful, in the sense that it corresponds to a position of the vehicle in the portion of real space onto which the signing space is mapped. Again, since the signing space contains an infinite number of points, and location is usually taken to be one of the basic components of the linguistic sign, classifier predicates of location seem to show that sign languages are based on a potentially infinite number of basic meaningful components.


3 Dual-representation languages

Much of the linguistic research in the last 50 years has shown that sign languages, despite the difference in modality (visual vs. auditory), make use of grammatical systems that are to a large extent comparable to those of spoken languages and that can be investigated by using the same tools deployed for the study of spoken languages. However, classifier predicates seem to belong to a mode of conveying information which cannot be naturally accommodated in the grammatical system of spoken languages. Given their properties described in the previous section, classification of motion events and locative events through sign language classifier predicates is continuous (in the qualified sense mentioned above) and is apparently achieved through a potentially infinite number of basic meaningful units (the movement and location components of classifier predicates). For these reasons, some authors have claimed that sign languages, unlike spoken languages, are *dual-representation languages* (Macken, Perry, and Haas 1993), in that they use two different ways of conveying information, a linguistic one (in the sense of spoken languages) and a depictive one. Cogill-Koez (2000b, p.


155) phrases the claim thus:⁶

There are. . . very broad grounds of evidence supporting the view that signed language classifier predicates represent a new form of communication. It is concluded that classifier predicates are best modeled, not as linguistic, but as systems of schematized visual representation created on the hands. If this is true, then fluent signers do indeed differ from speakers, commanding not one, but two discrete-combinatorial communication systems; a linguistic one, expressed most clearly in frozen sign at its ‘purest’, and a pictorial one, expressed most clearly (though not necessarily exclusively) in the ‘purest’ classifier predicates.

Notice that, according to the proponents of the dual-representation view, the pictorial mode, instantiated at its purest by classifier predicates, is characterized here as schematic, in the sense that it is assembled from simple handshapes and movements drawn from a finite set, which may be conventionally determined. As in the drawing language sketched in section 1, in which men are conventionally drawn as in Figure 1, movement is indicated by arrows, and so on, in sign languages a convention may have evolved to the effect that certain handshapes stand for certain classes of objects, certain movements of these handshapes in the signing space represent movements of real objects, and so on. Some of these handshapes and movements, however, are “elastic” in the sense that they may be deformed along certain conventionally established dimensions and their deformation determines a change of meaning in a systematic and predictable way. For example, if the signer produces an arc movement to describe the movement of an object, a variation in the angle subtended by the arc may indicate a corresponding variation on the movement of the object. Thus, in the visual mode of representation, unlike in the linguistic mode, the signer must see the structural correspondence between the form and the referent in order to understand its meaning.

It is worth pointing out that the claim here is not that all items involved in the schematized visual mode of representation allow the kind of meaningful internal deformation just described. Both for classifier handshapes and movements, there are instances that do not allow it and instances that do. For example, the 3 handshape  meaning vehicle in ASL is “frozen”, in the sense that it cannot be internally deformed in a meaningful way to reflect

⁶An earlier version of this view is given by DeMatteo (1977), who suggests that classifier predicates are not linguistic morphemes, but visual images.

the properties of its referent. On the other hand, ASL has a C handshape classifier  for three-dimensional round objects where the size of the gap between the fingers and the thumb can be varied to reflect the shape and size of the object. Similarly, the movement of the locative classifier predicate in Figure 5 cannot be deformed to reflect the movement of the vehicle, since in fact the predicate holds of stationary objects. On the other hand, as we saw, an arc movement may be varied to reflect variations in the movement of real world objects. And the point in the signing space in which locative classifier predicates like the one in 5 are held may be varied in a meaningful way.

4 Classifier predicates as poli-morphemic

While Cogill-Koez and Macken et al. analyze classifier predicates as non linguistic and as belonging instead to a pictorial mode of representation, an analysis of classifier predicates as fully linguistic items was proposed by Supalla (1982, 1990). According to his analysis, classifier predicates are combinations of morphemes that are simultaneously articulated. For example, the classifier predicate VEHICLE-DRIVE-BY in Figure 6 is analyzed as composed by two morphemes: the *linear* root (hand moving through a straight path) meaning “move straight” and the articulatory morpheme (the classifier) constituted by the 3 handshape meaning “vehicle”.



Fig. 6 (from Valli and Lucas 2000)

Other root morphemes are the *arc* root and the *circular* root with the mean-

ing of “move in arc” and “move in circle”, respectively. More complex movements are obtained by combining these morphemes or by adding other morphemes (affixes) describing the manner of movement. According to Supalla, all morphemes classifier predicates are composed of are drawn from a finite repertoire, much like the morphemes of spoken languages.

While this analysis may succeed in accounting for a wide variety of movements found in classifier predicates, it runs into trouble in accounting for the deformation possibilities of the basic roots. For example, given that, according to Supalla, there is only one arc root, it is not clear how his analysis can account for the fact that a variation in the angle subtended by the arc may indicate a corresponding variation in the movement of the object. The only possible way to mimic the elasticity of movement in his account is to assume that the root morphemes may contain not one but several arcs. As we observed above, this may be adequate for representation needs in a particular context, but it is far from obvious that there is a limit imposed by the grammar on the potentially meaningful deformations rather than a limit determined by physical limitations in producing or perceiving finer deformations. And, if the grammar imposes no such limit, it is false that the morphemes used in classifier predicates of sign languages are drawn from a finite set.

For similar reasons, it is not obvious how Supalla’s analysis can account for classifier predicates describing locations of real world objects. Since the location where the movement is on hold in Figure 5 is significant, under a linguistic account of classifier predicates it should be treated as morphemic. Yet, there is a potentially infinite number of locations in the signing space, and this leads, again, to the conclusion that, unlike linguistic morphemes, basic units endowed with meaning in classifier predicates are not drawn from a finite set.

5 The double life of classifier predicates

The proposals examined so far treat classifier predicates either as linguistic items or as items belonging to a schematic-pictorial mode of representation. In fact, there is evidence that neither claim is correct and that different components of classifier predicates may fall on different sides of the linguistic/non linguistic divide. Experimental data from different studies converge on the conclusion that there is a substantial difference between the deformation possibilities of classifier handshapes on the one hand and the variations in location and movement of these handshapes on the other, and this differ-

ence is relevant for assigning linguistic/non linguistic status.

Emmorey and Herzig (2003) report some tests in which ASL classifier handshape is deformed to reflect the size of the represented objects. In one experiment, signers were shown a video in which an ASL signer described the shape of medallions of different sizes hanging from a necklace by producing a series of ten handshapes from a squeezed F (where the index finger contacts the base of the thumb) to a wide baby C handshape. Along with the video, pictures of medallions of ten different sizes were shown hanging from a necklace. The signers were asked to rate the appropriateness of the handshapes to reproduce the different medallion sizes. The handshapes and the stickers that were placed at the end of the necklace are shown in Figure 7 below:

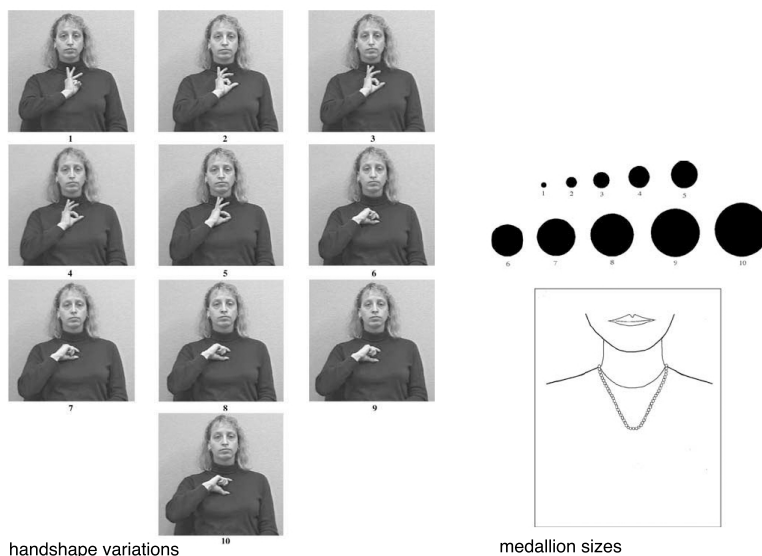


Fig. 7 (from Emmorey and Herzig 2003)

For each target handshape, signers rated a range of medallion sizes (and not just a single size) as fully acceptable.

In another experiment, a signer produced a classifier for a dot in different points in space with respect to a classifier for a bar whose position remained fixed. Other signers were asked to rate the appropriateness of the positions of these classifiers to describe the positions of a dot with respect to a bar in a picture:

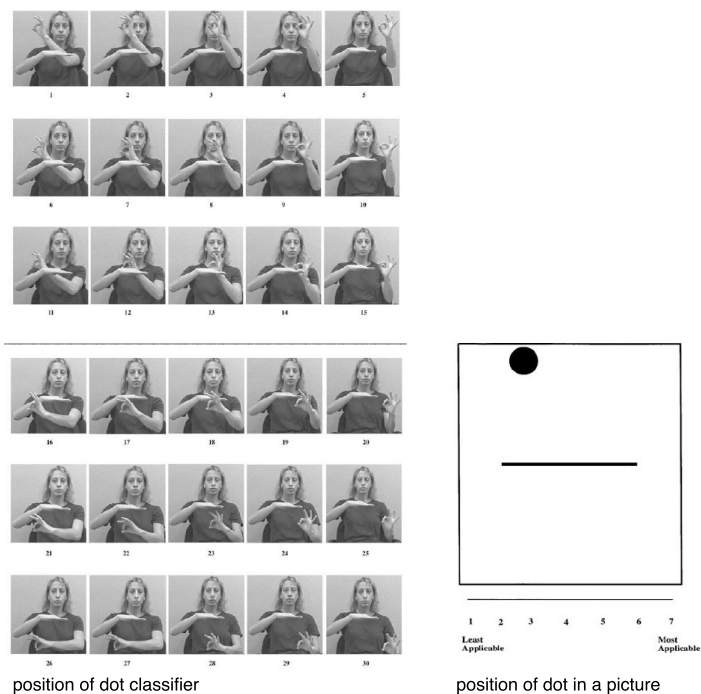


Fig. 8 (from Emmorey and Herzig 2003)

In this case, the location of the dot classifier that corresponds to the location of the dot in the picture was always rated best.

The first experiment suggests that not every variation of classifier handshape yields a difference in meaning. Classifier handshape deformation works on a par with the lexical items of spoken languages like “declivio” and “scoscendimento”. As each of these lexical items refers not just to a slope of a specified degree but to a whole a class of slopes of different degrees, so the each handshape in Figure 7 refers to a class of medallions of different sizes. By contrast, the second experiment is evidence that the location of classifier handshape in the signing space works quite differently: in this case each variation of the point in which the classifier handshape is signed yields a difference in meaning, namely it indicates a difference in the position of the dot in the picture. In Emmorey and Herzig’s terms, variations in classifier handshape location, unlike lexical items of spoken languages, belong to a *analogical system*, in which the variations form a continuum and there is a systematic relationship between variations and meaning. On the other hand, internal deformations of classifier handshapes, very much like lexical

items of spoken languages, seem to belong to a *categorical system*, in which this systematic relationship is missing.

How does the movement component of classifier predicates fare with respect to the analogical/categorical distinction that has been observed between classifier handshape deformation and location? While Emmorey and Herzig provide no direct data regarding movement variation in classifier predicates, the fact that each variation in handshape location may indicate a meaning difference suggest that movement should behave the same: since movement amounts to occupying different spatial positions over time, it would be surprising if handshape movement were categorical in Emmorey and Herzig's sense. Some preliminary data that handshape movement variation contrasts with handshape deformation with respect to the analogical/categorical distinction comes from Giacomello (2007). Giacomello tested 20 deaf signers by showing them some videos of actions that they were asked to reproduce in Italian Sign Language (LIS). Among the videos, one series showed an agent taking books from a shelf and then trying to put them back. The books came in three degrees of thickness (thin, medium and thick). Another series of videos showed a toy car which, after receiving a push, rolled down an inclined plane. The plane was inclined at 4 different angles, as shown in Figure 9:

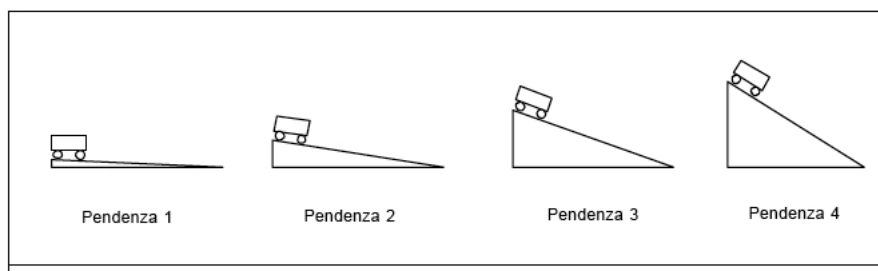


Fig. 9 (from Giacomello 2007)

Although the intermediate inclinations were similar and this made evaluation of the difference in signing hard, the general assessment of the evaluators was that, in reproducing the toy car series, all subjects that used a classifier (3 out of twenty made use of eye gaze instead) tried to reproduce 4 distinct inclinations. On the other hand, in reproducing the book series by varying the classifier handshape, even though the test only introduced three degrees of book thickness, 8 subjects out of 19 made no distinction between thin and medium thickness. The contrast between handshape vari-

ation and movement variation suggests that, while there is a tendency to use the classifier (handshape) categorically, the movement of the classifier is not categorical. These data are only preliminary evidence that handshape movement variation displays non-categorical properties, because of the small number of variations in the stimuli. Yet, the contrast between handshape variation and movement variation in reproducing the scenes is clearly present.

These data indicate that, contrary to what either analyses of classifier predicates we have considered claim, classifier predicates are hybrid creatures: classifier handshapes are linguistic morphemes,⁷ movement and location of these handshapes, on the other hand, are not. Independent evidence for this conclusion comes from neuroimaging studies. Emmorey, McCullough, Mehta, Ponto, and Grabowski (2013) (henceforth Emmorey et al.) designed an experimental setting to “tease apart what neural regions are involved when native deaf signers produce different components of classifier constructions.” Based on the data they found, they argued that “unlike the location and motion component of classifier construction, classifier handshapes are categorical morphemes that are retrieved via left hemisphere language regions.”

In Emmorey et al.’s experiment, native deaf signers were shown different series of drawings:⁸

1. a series in which the same object was appearing in different locations;
2. a series in which the same object was performing different movements;
3. a series in which different objects were appearing in the same location;

In response to these stimuli, the signers produced:

- 1’. classifier constructions that varied only in the location of the handshape;
- 2’. classifier constructions that varied only in the movement of the handshape;
- 3’. (a) classifier constructions that varied only in the type of handshape;

⁷Further evidence that classifier handshapes are linguistic morphemes is that the categories of classifiers enter in the formulation of certain grammatical constraints. See Benedicto and Brentari (2004) for discussion.

⁸Further experimental conditions were present that I do not describe here. See Emmorey et al.’s paper for a complete description.

(b) constructions that varied only in the type of lexical sign.

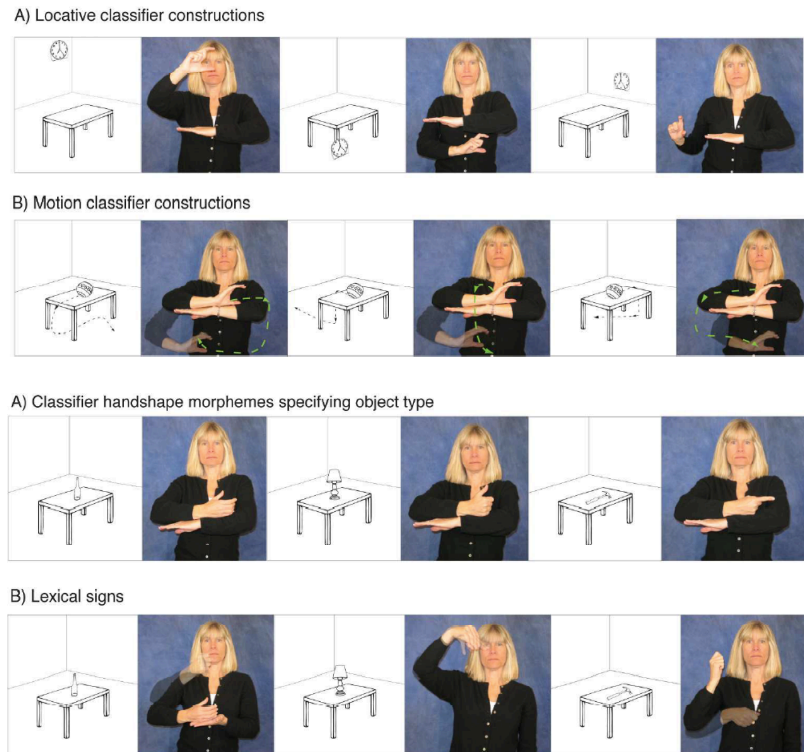


Fig. 10 (from Emmorey et al. 2013)

When signers concentrated on the movement or location change task, there was greater bilateral activation of the superior parietal lobule (SPL), known to be involved in non linguistic tasks such as online control of programming of reach movement to target locations in space and in the control of visual spatial attention. When signers concentrated on the handshape change task or lexical sign change task, there was greater activation of the left inferior frontal gyrus (IFG), known to be associated with linguistic tasks such as lexical retrieval/selection and phonological encoding.

Again, these data are evidence that the handshape component of classifier predicates is a linguistic morpheme, but classifier handshape position and classifier handshape movement are not: indeed, if classifier handshape position and classifier handshape movement were morphemic, we would ex-

pect them to activate the IFG for lexical retrieval on a par with classifier handshape change and lexical sign change, but they don't.

Notice that, if the conclusions on which these data converge are correct, they argue against the linguistic account proposed by Supalla, since classifier movement is not morphemic. On the other hand, the view that sign languages are dual-representation languages combining two different ways of representing information, a linguistic one and a pictorial one, is compatible with these conclusions. While the psycholinguistic evidence reviewed here suggests that Cogill-Koez is wrong in regarding handshape deformations as belonging to the pictorial mode on a par with movement deformation and location variation, the hybrid nature of classifier predicates might be taken as evidence that linguistic items may be integrated into a pictorial way of representation. This integration, according to Cogill-Koez, is something that we often find anyhow in systems of depiction, for example the X drawn on a map to mean "something is here" is an abstract conventional symbol integrated in a pictorial representation. Thus, the hybrid nature of classifier predicates, part linguistic part pictorial, does not necessarily pose a problem for the dual-representation hypothesis.

Yet, notice that, in Cogill-Koez's view, "classifier predicates and frozen signs are held to be the best exemplars of formal systems that work most purely in the visual and the linguistic mode respectively". She does think that other aspects of sign languages, like role shift and verbal inflection, "show both linguistic and pictorial pattern of phenomena". However, as she admits, these constructions are analyzable at best as integrating the two modes.⁹ Thus, the evidence for a distinct mode of pictorial representation is weakened once we recognize the hybrid nature of classifier predicates.

One alternative approach which recognizes their hybrid nature is the one proposed in Liddell (2003a,b). According to Liddell, classifier predicates (or depictive verbs, as he calls them) have both a morphemic component and an analogical component which is not morphemic. The meaning of the lexical verb (the morphemic component) is what is left when we subtract the analogical features of the predicate. For example, the location of the handshape in the classifier predicate in Figure 5 is analogical thus it must be removed in order to obtain the meaning of the lexical verb. What is left in this case is a verb meaning like "vehicle is located at". The analogical element, in this case the handshape position in the signing space, with which the verb is combined provides a visual depiction of where the vehicle is

⁹A proposal that analyzes verb agreement as involving both a linguistic and a gestural component is given for example in Rathmann, Mathur, and Meier (2003).

located. Apart from Liddell’s specific applications of his analysis to derive the lexical meanings of particular classifier predicates, one question that the analysis raises is how the analogical component is combined with the meaning of the verb to yield the meaning of the classifier predicate. Liddell’s gloss for the verb meaning seems to suggest that the location for the classifier handshape in Figure 5 provides an argument for the lexical verb. However, given that location is not a morpheme, it is not obvious how it can combine with the verb to yield the classifier predicate meaning. In the next section, I present an approach to classifier predicates that provides an answer to this question.

6 Classifier predicates as demonstrative predicates

The evidence reviewed so far leads to the conclusion that, unlike classifier handshape, handshape location and movement in classifier predicates are not linguistic morphemes nor combinations of linguistic morphemes. This is puzzling. How can linguistic morphemes combine with non linguistic items to yield the meanings of classifier predicates? As we saw in section 2, the meaning of classifier predicates is to some extent compositionally derived from the meaning of its parts. The classifier handshape determines the domain of application of the predicate (namely, whether it applies to vehicles, persons, etc.), while movement and location tell us, respectively, how individuals the predicate applies to move and are located. However, compositionality in natural language semantics concerns how the meanings of linguistic morphemes are combined together to yield complex meanings. Do we have to invent a new way of semantic composition for sign languages in order to derive the meanings of classifier predicates by combining linguistic morphemes with non linguistic components?

In fact, there is a way of dealing with classifier predicates which requires introducing no new way of semantic composition, by assimilating these predicates to certain predicates of spoken languages. The idea is that classifier predicates are *demonstrative predicates*. A proposal based on this view was originally suggested in Zucchi, Cecchetto, and Geraci (2011), Zucchi (2012), and a version of the same view has been recently elaborated in Davidson (2015). Here, I’ll sketch what the general idea is without discussing these different implementations in detail.¹⁰

In spoken languages, we may form complex predicates containing a

¹⁰A different way to deal with classifier predicates was also proposed in Schlenker (2011). I shall not discuss it here.

demonstrative (for brevity, let's call them *demonstrative predicates*). Consider sentence (1), for example:

(1) yesterday, I saw that man on the beach.

The predicate “saw that man” must be associated with a demonstration, a gesture (finger pointing, eyegaze, or other) that singles out a man. The gesture is not a linguistic morpheme, but is required in order to be able to interpret (1), since it identifies the referent of the demonstrative “that man”. There is nothing particularly mysterious about the way the meaning of the predicate “saw that man” is compositionally derived in a context in which (1) is uttered: the verb “see” must combine with an argument referring to an individual, the demonstration identifies the individual to which the demonstrative “that” refers in the context of utterance.

Sometimes, I may point at an object that is moving in order to refer to the way it moves, as when I utter (2) by pointing at a ball that moves along a curved path:

(2) A chip is a shot in which the ball moves like that.

Or I may utter (3) and demonstrate the kind of movement I mean by tracing an arc with my hand:

(3) A chip is a shot in which the ball moves like this.

In the latter case, my gesture, the demonstration itself, provides an instance of the kind of movement I mean to refer with the demonstrative “this”. The claim is now that classifier predicates like the one in Figure 6 above are demonstrative predicates, similar in meaning to the English predicate in (4) (in technical terms, sharing a similar logical form):

(4) is a vehicle that moves in a way similar to this way in which the vehicle handshape moves.

The movement in the classifier predicate in Figure 6 plays the same role as the demonstration accompanying my utterance of (3), it illustrates the kind of movement the demonstrative component of the predicate refers to. Similarly, the classifier predicate of location in Figure 5 is similar in meaning to the English predicate in (5):

(5) is a vehicle located at a position similar to this position in which the vehicle handshape is held.

Notice, again, that, if classifier predicates are assimilated to demonstrative predicates like (4) and (5), their hybrid nature is no longer puzzling: movement and location are demonstrations providing a referent for the demonstrative component of the linguistic predicate.

While according to this proposal handshape movements and locations are like demonstrations associated with complex demonstratives like in (4) and (5), at least two relevant differences should be noticed. Handshape movements and locations are constrained in ways in which the demonstrations associated with demonstratives of spoken languages are not. First, the former are restricted to the *neutral space*, namely the area in front of the torso, while the latter may be performed in other areas as well.¹¹ I may demonstrate the referent of a spoken language demonstrative by putting my index finger near my ankle and by pointing at a particular spot. Even for demonstratives like those in (4) and (5), it is in principle possible to use demonstrations that occur outside the neutral space (suppose I accompany an utterance of (4) and demonstrate the movement of the vehicle by moving the 3 handshape along my bent knee to show that the vehicle fell off a cliff). This tells us that in sign languages the similarity between classifier handshape movement and movement of a real world object is always *relative to some mapping of the neutral space onto the real space*. This is one relevant way in which classifier handshape movement and location are conventionalized in sign languages, and demonstrations associated to spoken language demonstratives are not.

Second, in classifier predicates describing events of motion, handshape movement is semantically constrained by the handshape type in ways that demonstrations associated to spoken language demonstratives predicates like (4) are not. The form of spoken language demonstratives may determine whether the demonstration can pick out an object close to the speaker or not (the contrast between *this* and *that* reflects this semantic difference), but it does not impose any condition on the type of movement performed in the demonstration. Thus, for predicates like (4), the type of handshape movement is unconstrained. For classifier predicates, handshape type may determine whether classifier movement refers to the path or the manner of motion. For example, Supalla (1990) points out that the ASL classifier referring to the legs of a human agent (formed by two index fingers extending downward in front of the body) can combine with a movement describing a manner of walking, but not with a movement describing a path of walking. If a human agent is walking uphill in a zigzag course, it is ungrammatical in

¹¹See Cogill-Koez (2000a, pp. 214-15) for discussion of this point.

ASL to describe an event of this kind by moving the legs classifier upward along a zig zag path. In order to convey the desired information, first the signer must move that classifier with the hands remaining in place in front of the signer body to indicate walking, and then a different classifier must be used, for example a whole entity classifier for person (index finger of one hand with the palm facing outward), to describe the path. Supalla points out that there are no physical limitations that prevent that the classifier for the legs of a human agent be moved upward along a zig zag path. This means that the restriction of this classifier handshape to movements that represent the manner of motion is a conventional restriction which is part of the classifier handshape meaning.

So, while assimilating classifier handshape movement and location to demonstrations associated to demonstrative predicates of spoken languages allows one to make sense of the hybrid nature of classifier predicates, some constraints on handshape movement and location are specific to sign languages.

7 Summary

Classifier predicates of sign languages, at least on the surface, classify events of motion and location in a continuous way. As they seem to be based on a potentially infinite number of basic meaningful components, they apparently lack the property of discrete infinity, a characterizing property of human spoken languages. Since the attempt to analyze these predicates as entirely composed of linguistic morphemes drawn from a finite lexicon runs into difficulties, some scholars have suggested that sign languages, unlike spoken languages, are dual-representation languages using both a linguistic way of representing information and a pictorial way. Recent experimental findings, however, do not support the existence of distinct mode of pictorial representation, since classifier predicates regarded as the prototypical example of this mode turn out to be hybrid, part linguistic part pictorial. This hybrid nature is accounted for if we analyze them on a par with demonstrative predicates of spoken languages, with classifier handshape location and movement playing the role of demonstrations. If this proposal is along the right lines, lexical classification of events in sign languages, as in spoken languages, is categorical and not analogical.

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