Encoding and Capturing Productive Morphology

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Productive morphology in British Sign Language (BSL) and indeed within a wide range of sign languages, requires much further analysis and description before convincing generalisations about the nature of morphological patterning can be made. This presentation discusses some of the ways in which a multi-media database, or more appropriately a set of databases, may help us arrive at more in-depth descriptions which in turn can provide the bases for new analyses.

Multi-media technology is a tool which has the power to facilitate new types of analysis, although it can also make existing analyses more efficient and user-friendly. The work described here developed in part from morphological and lexicographical work undertaken over a number of years, primarily within the Deaf Studies Research Unit at the University of Durham, but more recently also within the University of Edinburgh and at the University of Central Lancashire. While new technology has the potential to contribute significantly to the fields of morphology and lexicography, it is currently used in a number of commercial products in ways which ignore the very real linguistic development which have taken place over the last decade. Several so-called 'Dictionaries of British Sign Language (BSL)' available in multi-media formats are simply sign-word lists, presented in new formats. They do indeed provide movies of signs, and thus allow the user to have direct access to the form of the sign. However, they often operate as if providing a mere English label, a gloss of the sign, will provide an account of the meaning of that signs. Such glossing, however, may serve to distort the nature and meaning of the signed examples.

The work in Durham began with the development of the text/graphic *Dictionary of BSL/English* (Brien, 1992). This dictionary was significant in that the editorial team attempted to develop a dictionary based on clear linguistic principles. Definitions, for example, were based directly upon the meanings of the individual signs, rather than the English words associated with them. Many so-called sign dictionaries rather surprisingly do not make this distinction clear. Thus a dictionary which labels the sign in Movie One as 'DEAF', but adds nothing further to the meaning, may well imply that the meaning of this sign is the same as the English word 'deaf'. This is not the case.

Movie One

The Durham team tackled a number of issues relevant to the present discussion. Prominent amongst these were the following:

Did English glosses have a role in the dictionary?

What difficulties were associated with the use of glosses?

How should one deal with sign modifications?

How should one deal with productive forms?

Several of these issues are more directly relevant to discussions of lexicography, rather than morphology. Nevertheless some of the problems straddle the two areas. The dictionary was ordered according to the formational properties of BSL: an ordering deriving in part from the work of Stokoe et al in the 1960s (Stokoe et al, 1965). However, the dictionary also used an alphabetic ordering of glosses which allowed a sign, or several signs, associated with a particular gloss to be identified. One of the difficulties which arose related to when one should regard two signs with slightly different but clearly related formational properties and meanings as being different modified versions of the same sign and when they should be regarded as different. The editorial team constantly tried to keep alert to the danger of recognising two different signs just because there were two different commonly ascribed glosses.

Productive Forms

The situation in relation to productive forms was even more complex, given that these forms do not have a stable realisation, but are created 'as required' by the signer. For some sign lexicographers, such forms do not have a place in a dictionary. However, once again, the team recognised that sometimes what might otherwise be described as a productive form might find its way into the dictionary as a 'frozen' or established form simply because of the existence of a gloss. Brien and Turner (1994) discuss the 'lemma dilemma' associated with the sign shown in Movie Two.

Movie Two

The sign is glossed in the Dictionary of BSL/English as CATERPILLAR and as CATERPILLAR CRAWLING UP A THIN OBJECT. As Brien and Turner comment:

"How does one capture in a gloss what is actually visually encoded in the sign - does CATERPILLAR CRAWLING UP A THIN OBJECT cover it? Since it is conventionally associated with the English word *caterpillar,* many Deaf people also use the sign to mean just that...The longer gloss is also included; for this is the element-by element truth about what is actually visually salient within this sign as used in more usual interaction by Deaf signers."

Brien and Turner, 1994, p.

Indeed, one might want to go further and say that the sign could be glossed as VERY SMALL WORM-LIKE ANIMAL CRAWLING UP A THIN OBJECT.

There are several different issues here: has this form become 'lexicalised' as part of the established lexicon of BSL, or do we assume that it has because there is a corresponding English gloss? If we are in doubt about its established status, should it be dealt with in a dictionary? Do productive forms have a place in a dictionary? How important is it for linguists to capture the visual encoding inherent within the sign form?

In this presentation, I want to focus primarily on the last two issues, while stressing that the use of glosses as a prime means of identification is highly likely to obscure not only the full meaning of a sign but our understanding of how sign languages work. The constant filtering of the complex visual reality of signs through the gauze of written glosses continues to do a disservice to the richness of signed language.

However, the Brien and Turner comment also focuses on another key dynamic of sign structure: visual salience. It is this more than anything else which is regularly concealed by the routine allocation of glosses to signs. It is as if the allocation of a spoken language name blots out the nature of the sign. This is true for both established and productive forms.

The importance of visual motivation and visual encoding within signed language has been stressed by some sign linguists (Brennan,1997a; 1997b) but given relatively little recognition or indeed been rejected by others.

Work in Durham on a multi-media *Dictionary of Deaf Community and Culture* aimed to begin with the signs which Deaf people actually used and then work towards definitions of those signs developed by deaf people themselves in BSL. The development of English translations of definitions and 'glosses' of signs was seen as the final part of the process, rather than as all too

often the starting point. A motivating factor in the development of the database described here and in Thoutenhoofd (2000, in preparation) was the need to probe the nature of productive morphology in BSL more fully. Several key areas of linguistic controversy converge here. Almost inevitably when examining the nature of productive morphology it is necessary to examine the following issues:

Is the nature of morphologically complex signs influenced by the visual-gestural modality?

To what extent are productive forms motivated?

Should productive signs be included in sign language dictionaries?

Can we establish the component parts of productive forms as 'morphemes' in the traditional sense?

Are we able to designate 'root' morphemes?

A further influence on the development of the Productive Lexicon Database was the claim, expounded in several publications (Brennan, 1992; Brennan, 1997a; Brennan, 1997b) that the majority of the BSL lexicon is inherently motivated rather than arbitrary. Much of the mainstream sign language literature has been resistant to this hypothesis, with linguists arguing often on psycholinguistic grounds that sign languages are no more motivated than spoken languages.

The importance of this claim within the context of productive morphology is that, in arguing for the motivated status of the component morphemes, we are essentially giving motivation a major role in the creation of new forms. It is suggested here that motivation is the engine driving the production of new forms. In ignoring the pervasiveness and power of motivation within signed language morphology and lexis, we are continuing to look at sign languages through the lens of spoken language. Thus most sign linguists have tended to argue that sign languages conform to the more general rules of human languages and are thus characterised primarily by arbitrary patterning. While my own view is that the evidence strongly supports the non-arbitrary basis of the BSL lexicon at least, and most probably those of other sign languages, I acknowledge that to date the arguments for and against such a position have been limited by the fairly narrow sets of data used to support specific claims. The potential for the kinds of morphological databases described here to throw light on this issue is enormous.

The Frequency of Productive Forms

A further related claim is that productive forms constitute a much greater proportion of vocabulary usage than has traditionally been recognised. It has sometimes been suggested that while such forms occur frequently within sign language narrative discourse and within transparently creative discourse such as poetry, the use of productive forms within other types of discourse is typically much more limited. However, work on various projects, including the Access to Justice for Deaf People project led the Durham team to predict that certain types of discourse, including medical and scientific discourse, would also be likely to include high percentages of productive forms. As we shall see, PLD can contribute to more detailed findings with respect to frequency.

What are Productive Forms?

The term 'productive' is always a rather loaded one within linguistics, since it is used in a number of different ways, especially within the fields of morphology and lexicography.

Here the term is used in a direct and rather simple sense in that a productive form is one that can be used in the creation of new signs. Virtually all morphemes have the potential to be used in the creation of new signs. However, it is predicted that several different categories of morpheme play a specific role. Bauer(1988) describes a productive morphological process similarly as 'one that can be used in the creation of new forms in the language'. (Bauer, 1988, p. 251). Traditionally, spoken language linguists have tended to exclude productive forms from the lexicon:

"...the lexicon contains a list of morphemes, and also a list of words, formed by unproductive morphological processes, but does not contain words produced by productive processes whose meanings can be determined solely from the meanings of their components."
Spencer, 1991,p49

However, as Spencer goes on to say, even in relation to spoken languages,

"...there remain interesting problems with the notion of productivity, so the question of what the lexicon contains can't be said to be settled.

Spencer, 1991,p49

Here it is accepted that there is a distinction between ‘actual’ and ‘potential’ words, but that an understanding of the potential of morphology within any language requires us to look at actual realisations of morphological processes. Put at its most basic, the suggestion is that if we want to understand how new signs are created, we need to look at examples and not just a few selected examples, but a considerable number in order to determine the recurring kinds of patterning and thence in turn the operation of specific rules of patterning.

Thee term ‘new’ is as problematic as ‘productive’. Is a ‘new’ sign a productive form that has been lexicalised, or are productive forms themselves intrinsically and inevitably ‘new’?

It will be useful to explore this notion by looking at some specific examples.

Movie 3 (MS10)

The first question we need to ask here How many signs are there in this piece of discourse? We have two hands each realising what I would call a size and shape classifier, here representing a spherical object, namely a head. The context in which this occurs could be translated as ‘Nothing (the name of the character) saw his reflection in the water.’ The fact that we use the English word ‘reflection’ should not necessarily lead us to assume that we should treat this patterning as a single sign (meaning reflection) made up of several sub-lexical components, i.e. morphemes. Interestingly, the signer produces almost exactly the same manual form several times within the utterance, although the non-manual accompaniments change somewhat.

Movie 4.

Here the hunched shoulders shows and tilting of the body indicate that the actor is bending over to look at the reflection. Indeed the whole set of manual and non-manual elements leads us to the conclusion that this is a multi-morphemic verb form. It fits with accounts of classifier and polysynthetic verbs. We have two distinct issues here: the fact that the verb form itself can be created as required from elements - morphemes- which can be brought together for such purposes; secondly the fact that within the course of this piece of discourse, we may see a ‘new sign’ emerging which means something like ‘reflection of one’s face’. As suggested in the Brien and Turner quotation, the sign has ‘visual salience’: it is not just reflection that is represented, but a specific type of reflection.

A main impetus for developing the PLD was to try to explore the inter-relationships of motivation, visual encoding and visual salience. Many signs are motivated in the de Saussurian sense: their forms have a non-arbitrary relationship with their meanings. Signed languages typically encode real-world visual information as a matter of course: productive forms are one key way in which such visual encoding is expressed. Any given sign may have a particular visual focus or salience which creates a particular image for the addressee.

The work of David McNeill (1992) in his explorations of the complex inter-relationship between spoken language and co-verbal gesture, has reflected upon the importance of gesture in expressing imagery:

"A spoken text, through its gestures, makes the imagery of discourse explicit,"

McNeill, 1992, p.40

McNeill argues that typically communication is a combination of word and image, with the word being expressed through the linguistic system and the image through the gesture. It is suggested here that in a signed language we have the combination of word and image in a single form. A sign is both a set of conventional elements - location, handshape, movement, non-manual elements etc. - and the vehicle for expressing an image.
Let us explore this a little further using a specific PLD entry.

Movie Five

Movie Five shows a form in which the manual morphemes represent two handling classifiers: the literal translation would be something like 'get hold of a flat surface and pull apart': interestingly, as with Movie Three, the arrangement of the two hands is important. In context, the sign means 'open up the abdomen and examine it'. The latter is expressed through the non-manual activity of head nodding and downward eye-gaze which jointly suggest peering into the opening. A further complication is that the signer seems to deliberately use a sign which gives the image of the hands, as opposed to surgical instruments, pulling apart the abdomen, even though it is not thereby implied that surgical instruments were not used. Again we can note the importance of visual salience: part of the impact of this section of signed discourse relates to this rather brutal image. It seems fairly clear that we are dealing here not only with a productive verb form but with a salient visual focus: an image.

The Database and its Functions

The Productive Lexicon Database (PLD) has provided a tool, indeed a set of tools for exploring these interrelationships further. The initial starting point for the database described here was a recognition of the need to find ways of 'capturing' the productive lexicon: the need to identify and as it were 'pin down' the productive lexical resources of the language. The database provides us with a major tool which is capable of storing and manipulating a large set of digitised movies of productive signs and related information. The Durham team had already worked on the development of a sign language database known as SIGNBASE database, along with colleagues in the Netherlands (Brien, Schermer, Thoutenhoofd, Collins and Brennan, forthcoming). While the SIGNBASE database was not aimed primarily at capturing information on productive forms, the experience of working on SIGNBASE was invaluable in developing the new database. Indeed one of the key features of the current database, the signatures file, evolved from work on SIGNBASE (see further below).

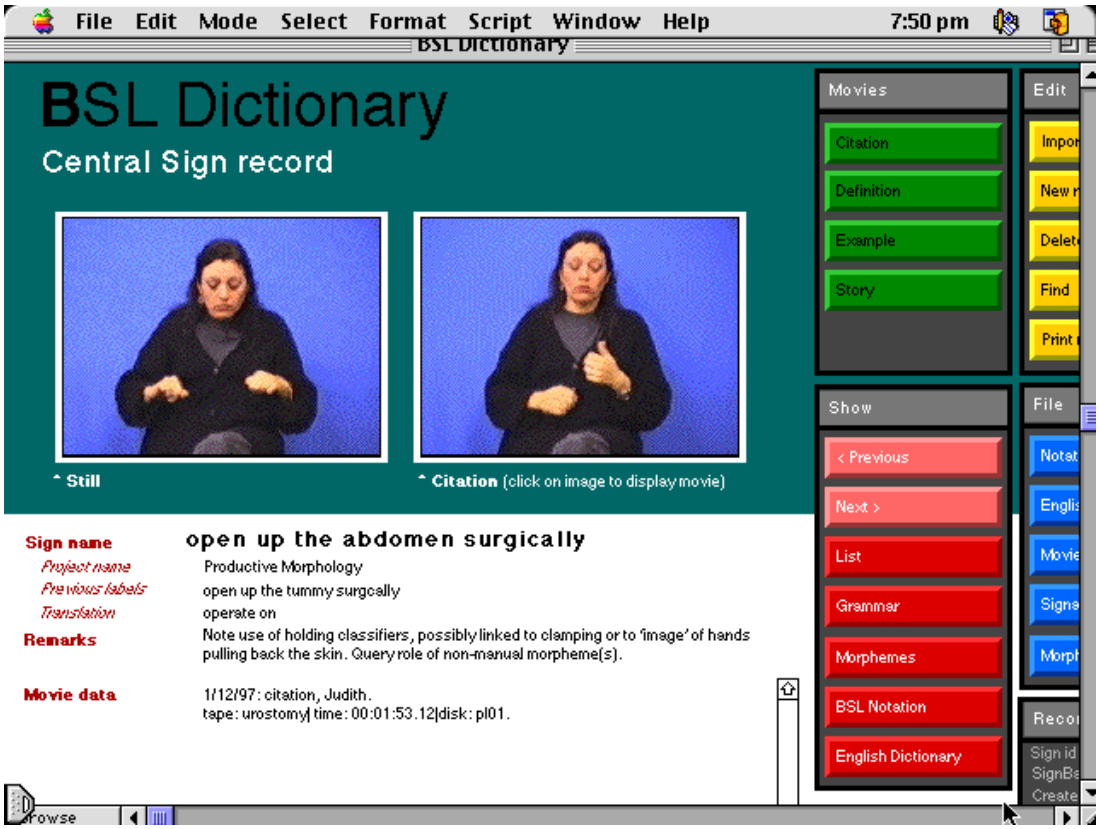
From the very beginning the research team recognised that we were dealing with what we had come to think of as the 'flexible lexicon'. The forms we would be inputting presumably were created through stable rules, but these forms were not part of the frozen lexicon. Incidentally, it is recognised that the established lexicon is not frozen in the sense that its forms are not capable of modification. Items within the established lexicon are able to take inflections and modifications. Nevertheless, the 'flexible lexicon' enables the signer to create with ease signs that have never been used before but which are immediately understandable. The construction of the PLD Database was carried out by Ernst Thoutenhoofd, in ongoing consultation with other members of the team who were carrying out the linguistic analysis. It was recognised that it was essential to develop a relational database which could allow us to examine different types of co-occurrences and patterning. The functions of the database are currently being extended further, but this account will focus only on some key types of information which can be encoded at present.

Given that a much more detailed account of PLD is given in Thoutenhoofd (this volume), the following is merely a brief summary of PLD's key features. PLD exploits commercially available software, Claris Filemaker Pro. The database is made up of a relatively large number of database files: these can be added to as required. However, currently there are several key files: the BSL Dictionary File; the Movies File; the Signatures File; the Morphemes File; the Notations File and the English Dictionary File. As Thoutenhoofd explains:

"The BSL Dictionary File stores information on the signs themselves, including

morphological, syntactic, semantic and usage information, as well as information relating to English equivalence. The BSL Dictionary file is best viewed as the central reservoir of information about the sign. The user/administrator can easily access related files from the central BSL dictionary listing or from the central record of an individual sign. This central file also allows links to several different types of movie: a citation form; a BSL example sentence; a BSL definition and a BSL story (ie chunk of discourse)...The BSL Dictionary File serves as a central reservoir of information: it reproduces, from all other files, only that which the group of users wish to use."
Thoutenhoofd, 1997

An indication of the resources available to the user can be seen in **PLD Extract 1: the Central Sign Record**



PLD Extract 1: the Central Sign Record

The Morphemes File

This file contains detailed information on each individual morpheme represented in the signature file. The numbering of morphemes is linked to the positioning in the signature file - again making for ease of co-referencing. The morpheme record includes information on the phonological structure of the morpheme; its categorial status ('SASS classifier'; handling classifier; metaphor morpheme etc), as well as more detailed information on the precise function of the morpheme within the complex sign. Not surprisingly, as this information is in a sense the core of the database, the categories have been subject to some change as more work is done in relation to particular examples.

The Notations File

This includes transcriptions for the complete lexical units, the signs. The transcription system is essentially that developed on the basis of Stokoe's work and presented in Brennan et al (1984) Some further elaborations as developed by the editorial team of Brien (1992) and by Ernst Thoutenhoofd in his adaptations for use within this database have been added. Thoutenhoofd has also incorporated an English interpretation which is generated automatically once the notation has been entered. This allows the user to read an English version of the notation as in the following example:

The Movies File

This contains all the movies associated with each sign record. Different types of movies, such as example movies (ie clips from extended discourse), definition movies and story (extended discourse) can be added. This allows the user to look both at an individual example clipped from extended discourse and a section of the extended discourse itself. As with all other Files, the administrator can choose to add a Movie type. One type currently being considered is a Notes category. This would allow additional information about the example to be presented in BSL, rather than relying on English notes.

The English Dictionary File

This includes English vocabulary which can be seen as in some sense 'equivalent to' the signs included within the database. It is not simply a Dictionary of English.

The Signatures File

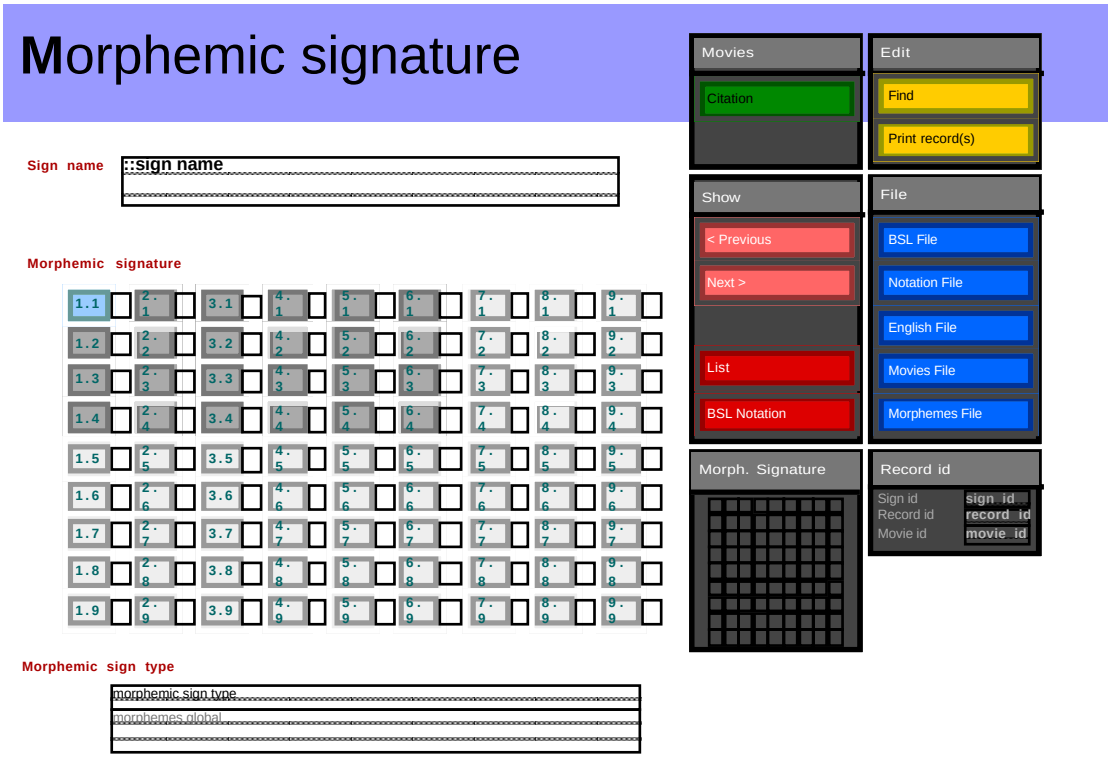
This file is a particularly important part of the PLD database. The concept, developed in this format by Ernst Thoutenhoofd, evolved from attempts within the SIGNBASE database to account for the sequential and simultaneous complexity of multi-morphemic signs. It was hypothesised that any given multi-morphemic sign could have the components arranged either

sequentially or simultaneously or both. What is more, at this stage of our investigations we needed to err on the side of assuming greater complexity than might in fact exist. Thus although we know that there have been predictions within the literature that compound signs will be maximally made up of two free morphemes, Brennan has argued for more than this, although the 'free' status of the third morpheme has sometimes been questioned. In relation to multi-morphemic productive forms, it is suggested here that we have not yet recorded details of a sufficient number of signs to be able to make accurate predictions. Of course, the situation is made even more complex given the discrepancies in labelling which occur amongst researchers. These in turn are linked to theoretical differences in view as to what may or may not constitute a morpheme. This problem emerges most acutely in the literature in relation to non-manual information, but is also problematic in relation to claims concerning classifier and metaphor morphemes (see the relevant paragraphs below). The view taken by the Durham team was that we should over-estimate rather than under-estimate the potential number of co-occurring sequential and simultaneous morphemes. In our earlier versions of PLD, we worked on a grid of four sequential and four simultaneous morphemes. This does not mean that we would anticipate all 16 slots being filled, but that we needed to allow for four sequential slots and at any of these points, we may be dealing with up to four simultaneous morphemes. We later decided to extend this as we identified signed forms which, at least in our initial analysis seemed to go beyond these limits (see for example the discussion of non-manual forms below).

Every sign in the database thus has a signature. The signature essentially gives us a visual clue to the sequential-simultaneous patterning of the sign. We can see at a glance whether we are dealing with a sign containing three sequential morphemes: one containing initially five simultaneously occurring morphemes followed by a single sequential morpheme and so on.

However, the signature is not unique, although the realisations of the signature components will render the sign unique. The existence of the signatures allows signs which share the same signature to be grouped together. The different types of signature can be seen in the following examples:

PLD Extract 2: Signature:



PLD Extract 3: Signature:

PLD Extract 4: Signature:

PLD Extract 5: Signature:

While Extracts 2-4 all have different signatures, 4 and 5 share the same signature. Thus they have the same patterning of sequential and simultaneous morphemes.

Initially, the ordering of morphemes within the horizontal and vertical axes was not significant. However, in current work on PLD, we are trying to explore ways of making the signatures more easily comparable, by exploiting a stricter ordering of morphemes. So far, this has not been fully successful, given that morphemes may be of very different types. Most typically within productive forms all of the morphemes are essentially bound morphemes: they cannot occur independently. However, we have to leave open the possibility that a single morpheme may be a free form, made up of location, handshape, movement etc. The bound forms will

themselves be examples primarily of location morphemes, handshape morphemes, movement morphemes and non-manual morphemes. It would seem logical therefore when inputting information about a given sign to record the information in a regular order, even though the morphemes may be occurring simultaneously. Thus if we always knew that reading downwards the first morpheme was a location morpheme, the second a handshape morpheme and so on, this would allow an easy comparison to be made across sign signatures. The difficulty that arises is that we cannot predict how many of any type of morpheme there may be in a single simultaneous column. While it is most common to have a single location, it is possible to have two separate locations - eg each realised through the differing location of the two hands. It is common in productive forms to have more than one handshape morpheme, more than one movement morpheme and more than one non-manual morpheme. Thus it is not possible to assume that the third morpheme will always be a movement morpheme, or the fourth a non-manual morpheme. Currently we are exploiting different ways of approaching this issue. Adopting a particular order can help those involved in the analysis of the data.

Analysis of the Data

Identification of Productive Forms

As indicated earlier, PLD is being used to store and manipulate data relating to individual productive forms. The first step involves identifying productive forms within ongoing videotaped discourse and separating these out from 'frozen' or 'established' signs. To date, the discourse analysed has been primarily medical and religious (including religious narratives), but currently further types of discourse are being added. These items are clipped from the video, digitized and stored. Each productive form is then broken down into its component morphemes.

Some Key Issues in Categorisation

As Thoutenhoofd argues (Thoutenhoofd, this volume), new technology can allow us to take an imaginative leap which moves us beyond the confines of conventional linguistic repositories such as spoken language dictionaries. What Thoutenhoofd describes as 'flexible open data-modelling' allows the user a potentially high degree of flexibility:

"When considered in modular terms, repositories storing different kinds of information may nevertheless be reconfigured and recombined into applications for varying needs and audiences."

Thoutenhoofd, 2000, p. 17

In developing the original versions of PLD, the team were very much aware of the fragility of certain categorisations and specifications. PLD allows us the freedom to store 'working descriptions, which may later be re-analysed. We can even enter several different versions of our analysis, by duplicating selected files and labelling them accordingly. Once a sufficient number of items have been stored, we can exploit search functions to discern types of patterning. We can then compare the outputs of say three different versions of our analyses. Whilst this is of course time consuming, the potential is there to carry out large-scale comparative analyses.

When is a sign not a sign?

So far the database has been used primarily to analyse individual signs (word-forms) clipped from on-going discourse. Again and again one is faced with decisions about what constitutes a single sign or a single lexical item. Within accounts of spoken languages, it is usually recognised that lexical items may consist of more than one word. may consist of more than one word. Key mechanisms for deciding on lexical status include exploring patterns of substitutability.

It is also assumed that it is indeed possible to specify the number and nature of morphemes within multi-morphemic signs. However, the potential to create new forms through the productive manipulation of morphemes is so considerable, that so far it has been difficult to arrive at convincing categories of sign-forms based on different types of combination of morphemes. Thus Wallin comments:

"The morphological structure of polysynthetic signs is much more complex than that of citation form signs. The number of meaning-carrying units varies so much that it is impossible to make a simple division of polysynthetic signs into categories according to the number of morphemes, as was possible for mon-- and bimorphemic signs. We are instead dealing with signs that are created according to productive rules by putting together several morphemes, one of which is a root of verbal character and at least one morpheme of nominal character."

Wallin, 1994, p.4

PLD can allow hundreds, indeed thousands of morpheme combinations to be entered into the database. Search facilities will then allow for plotting patterns of co-occurrence. As we carry out

such analyses again and again, it is quite likely that we will begin to see patterning which forces us to re-assess the morphemic status of specific elements. As we shall see, so far this re-analysis has encouraged a rethink of the status of certain non-manual elements. It may also help to clarify whether combinations of manual and non-manual activity can be seen as constituting single or multiple morphemes.

In clipping examples for inclusion in the database, we have found that initial judgements that 'X is a single sign-form' have not been borne out. In many cases, there is uncertainty as to how many signs we are dealing with. The type of problems involved can be seen in two signs initially labelled as 'sting diminishing'.

Movie X 02.087 'sting diminishing 1'

Movie X 02.088 'sting diminishing 2'

The first sign was initially analysed as consisting of the following morphemes:

Location Morpheme: Arm:. Physical Location: On Arm

Metaphor Morpheme: THROB: Handshape plus movement.

Aspectual/Manner Inflection Morpheme: 'diminish over time'.

NMF 'diminish over time': stretched lips moving to rounded, with gradual air exhalation.

However, a closer look at the sign form showed two phases of activity; the first could be translated as 'The wound was throbbing with pain'; the second phase as 'The throbbing gradually decreased'. The re-analysis is as follows:

Sign One
Location Morpheme: Arm:. Physical Location: On Arm

Metaphor Morpheme: THROB: Handshape plus movement.

NMF Morpheme: Intensity: stretched lips/ head tilt/ eyes closed/eyebrows knitted.

Sign Two
Location Morpheme: Arm:. Physical Location: On Arm

Metaphor Morpheme: THROB: Handshape plus movement.

Aspectual/Manner inflection: Internal plus directional movement: ‘diminish over time.

NMF ‘diminish over time’: lips stretched to round; air exhalation.

A very similar re-analysis was required for MovieX ‘sting diminishing 2’. Here the morpheme structure is almost identical.

MovieX ‘sting diminishing 2’

Sign One
Location Morpheme: Head:. Physical Location: On head

Metaphor Morpheme: THROB: Handshape plus movement.

Metaphor Morpheme: Spread: Internal plus directional movement.

NMF Morpheme: Intensity: stretched lips/ head tilt/ eyes closed/eyebrows knitted.

Sign Two
Location Morpheme: Head:. Physical Location: On head

Metaphor Morpheme: THROB: Handshape plus movement.

Aspectual/Manner inflection: Internal plus directional movement: ‘diminish over time.

NMF ‘diminish over time’: lips stretched to round; air exhalation.

Almost every one of the above labels is open to discussion. What we are dealing with here are in effect working analyses. In the final example, it appears that we have two morphemes which are each expressing the same meaning: multiple marking of a given meaning is of course quite familiar to us within spoken languages. Nevertheless, it remains unclear whether we should

regard the manual movement activity and the non-manual activity as two separate elements or as two sides of the same coin. One way of exploring this is to begin by treating these forms as having separate morphemic status. Then by searching for all instances say of the non-manual form, we can see whether it always co-occurs with a manual representation of 'diminish' or whether it can co-occur with other morphemes which do not include this meaning.

Similarly the non-manual morpheme 'stretched lips' appears often to be accompanied by knitting of the eyebrows. It is not fully clear whether we should regard head tilt and eyes lowered as part of the same morpheme or as an additional morpheme. We do know that head tilt can co-occur with other markers of intensity such as puffed cheeks or sucked in cheeks and lip-rounding. Again the database can allow us to plot patterns of co-occurrence which can contribute to decisions on morphemic status.

Classifiers

Classifiers play a major role within productive forms. However, there is clearly variation in how the term classifier is used within the literature and indeed some questioning as to the appropriateness of the term (Engberg-Pedersen, 1993). My own definition of classifier forms has been described by Sutton-Spence and Woll as being 'very broad' and thereby 'weakening the use of the specialist term classifier'. (Sutton-Spence and Woll p.47). These authors go on to claim that:

"Most sign linguists in the USA and elsewhere restrict the use of the term classifier to elements that meet the following criteria:

(a) they refer to a group that share some common features;

(b) they are proforms (that is they substitute for more specific signs);

(c) they occur in verbs of motion and location."

Sutton-Spence and Woll, 1998, p.48

The author provide no argumentation to support the use of these criteria, other than this is how most linguists use the term. There is not space here to give an adequate account of the way in which the term has been used historically and its motivation. What we can say is that almost every linguist who has exploited the term has also recognised that classifiers in signed language

do not operate in the same way as classifiers in spoken language. Moreover, the early elaboration of classifiers included a rather haphazard mix of forms. Newport (1992) lists the following classifiers:
human [index and middle finger extended from a closed fist; finger orientation down];
small animal [index and middle fingers closed, extended and bent]; vehicle [thumb, index and middle fingers extended and spread; hand held vertically];
airplane [thumb, index finger and pinkie extended from closed fist];
unattached mass [thumb extended from closed fist; hand vertical]
tree [all fingers extended and spread: finger orientation, up].

With hindsight, after many years of analysing productive forms, it is easy to question this early account. Presumably the handshape given the designation of 'airplane' can also be used to represent other objects which can be classified as having two extensions at either side of a mass. The discussion in Kyle and Woll (1985) includes the following comment:

"As well as appearing in verb stems, classifiers also appear in a wide range of nouns where the handshape of the nouns indicates its class membership. For example, the hand with fingers extended and together, is found in many signs referring to flat wide objects: FLOOR, DOOR, TABLE, WALL, BOX SIDES, CORRIDOR, SKY. Signs with index and middle fingers extended and spread refer to an object with two straight extensions: LEGS, SNAKE (its tongue),SCISSORS, GAZE (figurative extension based on rays extending from the eyes), OFFICER (stripes). New words are introduced into the language by drawing on their classifier system."

Kyle and Woll, 1985

The early part of this quotation is not that different from the following definition given in Brennan (1992), p.121:

'Classifiers are linguistic units which indicate what kind of group or category a particular referent belongs to. They may signal that an item belongs to the class of humans, the class of round things, the class of flat things and so on. BSL classifiers are expressed in BSL by means of the handshape and are usually motivated: the configuration of the hand has some link with what it represents."

The classifier table presented in Brennan (1992) pp 53 - 67 is an attempt to demonstrate that far from constituting a small group of components within morphology, almost every handshape of BSL can operate as classifier and enter into the creation of new signs. Kyle and Woll's comment above actually recognises some of the key features later elaborated in Brennan(1992): classifiers are used to create 'new' signs; the remnants of these productive classifier forms can be found in the established lexicon (CORRIDOR, SKY etc) and classifiers are used in both verbs and nominals.

The criteria cited by Sutton-Spence and Woll can indeed be examined by exploiting the potential of the PLD Database. In fact, the first criterion would seem to accord with the definition above (Brennan, 1992) although it is expressed rather more vaguely. The claim made by a number of researchers, that classifier forms are always 'pro-forms' is certainly brought into question by some of the analyses carried out exploiting PLD. In our own usage of PLD, most of the signs have been clipped directly from ongoing discourse and it is therefore possible to mark a form as having a full referent elsewhere in the discourse. Indeed, even on the basis of the material entered so far, it is possible to demonstrate that full forms do not necessarily occur in the same discourse. Putting it crudely, the ratio of productive forms to established forms in certain kinds of discourse simply makes it impossible for full- forms to keep pace. In 1997, Ernst Thoutehoofd undertook some frequency analysis of productive versus established forms within a specific set of signed texts. The productive forms within these texts were analysed and fed into the 1997 version of PLD. Thoutenhoofd comments:

'One signed narrative, the biblical story about the Good Samaritan (taken from a bible study video) features twenty five productive sign forms per minute of signing, that is one productive sign every 2.4 seconds...One example ...in which violent attackers rummage through the belongings of their victim, contains reference to handling a pouch of money in which a productive sign occurs every 8.5 frames - one productive sign in every one and a half second. Such sequences can be considered as creatively signed action-events, as analogons of actually possible action-events in which no frozen or established BSL forms necessarily occur, but which are nevertheless linguistically produced rather than dramatically or mimically enacted.'

Thoutenhoofd, 1997, pp.10-11

As we develop more sophisticated analyses and input more and more data into PLD, we should be able to give more precise information on the relationship between established and productive

forms. In many cases, it is difficult to decide what the established form on which the classifier form is supposedly based, could possibly be.

The third criterion, that 'classifiers occur in verbs of motion and location' is also testable, but it also means that we need to be aware of how widely or narrowly we define 'verbs of motion and location'. Certainly many of the examples so far entered into PLD Databases would fit into one of the categories elaborated by Valli and Lucas (1991). Indeed much of the literature on classifiers has suggested that they enter primarily into predicate forms. Wallin's account of polysynthetic verbs in Swedish suggests that the root form is a verbal predicate with a nominal attached. While Brennan (1990, 1992) has also argued that classifiers enter into new nominal signs, the possibility that such nominals derive from productive predicate forms may again be examined at least in part through the use of the PLD database.

Metaphor Morphemes

Initial accounts of the concept of 'metaphor morphemes' (Brennan, 1988; 1990) were viewed somewhat sceptically. While it was generally accepted that metaphors occurred in signed language and that individual signs could be extended metaphorically, the concept of sub-lexical elements operating metaphorically seemed rather suspect. As with many other of the labelling dilemmas within sign linguistics, the problem lies partly in taking an accepted term, deriving from spoken and written language and literature, and re-applying it to signed language. Just as the early use of the term 'classifier' revealed a major insight into the operations of sign morphology, despite the problems of applying the term directly, so the use of the metaphor label captured a reality that had often been ignored by sign linguists. Nevertheless our understanding and application of the term is now being further refined as we are able to look more closely at specific examples - see, for example, the work of Wilcox (1993) and Taub (1997) in relation to ASL.

Brennan (1990, 1992) developed an account in which it was claimed that it was possible to establish specific 'metaphor sets'. Thus the grasp set of metaphors is based on the metaphor that abstract ideas and concepts are objects which can be grasped. In BSL, GRASP may be realised by a closing action of the hand(s). The recognition of metaphor sets in BSL extends the influence of motivation beyond the representation of physical states and actions. Metaphors are also visually motivated, but they frequently express abstract meanings. As metaphors, they operate as if these abstract notions had physical reality. As Sutton-Spence and Woll comment,

"Signs like LEARN, LISTEN, TAKE-IN-BY-SIGHT, ACQUISITION and CATCH-AN-ILLNESS represent taking in abstract things as if they were solid."

Sutton-Spence and Woll, 1998, p. 193

A major group of metaphor sets proposed by Brennan (1990) exploit spatial patterning. Thus the 'opposition' set make use of the two hands in opposing positions to represent the metaphorical opposition in meanings such as COMPETITION and ARGUE. The interaction set exploit the interchanging of the two hands to represent the participants within an interaction in signs with meanings linked to dialogue and communication.

In earlier accounts these would have been regarded as arbitrary signs: the above analysis suggests that they both realise metaphor and are motivated. Within the current version of the PLD Database these forms would be categorised as exploiting metaphor morphemes realised by spatial patterning , ie essentially hand arrangement and movement. By entering the information in this way, we should be able to determine whether such forms are genuinely productive or whether they simply happen to occur in several frozen signs. We can also note the patterns of co-occurrence with other types of morpheme.

Much of the critique of the notion of metaphor sets has revolved around the interplay of motivation or iconicity and the metaphors themselves. Commenting on Brennan's 1990 analysis, Wilcox, for example, comments:
"If a source domain, such as the light paradigm, is used to extend referential mapping to a target domain, such as the abstract notion of magic, then a 'visual metaphor' may be correctly assumed. But to label the spreading action of the hands as a 'basic metaphor' is to confuse the issue. Iconic is not metaphoric."

Wilcox, 1993, p.82

There is no doubt that we can distinguish between iconicity and metaphor. The word 'grasp' in the English expression "I've just grasped what you meant." exploits a metaphor [Ideas are viewed as objects which can be grasped], but its form is not motivated. In contrast, the comparable form in BSL actually exploits a grasping action of the hand: it is clearly motivated. PLD allows us to choose how we mark such forms. Thus we can mark a form separately for the expression of metaphor and for 'motivation'. We should then be able to determine whether

the claim I have made elsewhere (Brennan, 1997a) is borne out within a large scale analysis of sign-forms.

Non-Manual Morphemes

A further ongoing difficulty has been the status of non-manual elements within productive forms. Can these be seen as having morphemic status or do they operate more like intonation patterns in English? Within the version of PLD exploited here, it is possible to encode non-manual components which have morphemic status: it is not possible to deal with patterning occurring beyond the level of the individual sign. Non-manual components do often have what might be regarded as an adverbial function, but within the sign, rather than at clause level. The non-manual forms modelled by Frances Elton in Brien (1992) play a key role, with a small subset occurring very frequently. However, in practice, the identification of the function of non-manual elements initially throws up a number of problems. Among the many problems that occur is the interpretation of eye-gaze changes which can occur at any point, but in the data so far encoded, occur most frequently at the beginning or end of a sign. Note again that we are here dealing with forms clipped from continuous discourse and not with citation forms produced in isolation. (The 'citation movie' in this case is the form of the sign as it occurred in the given discourse). Eye-gaze appears at time to have an intensifying function, for example stressing location. At other times it's role seems to be affirming. In many cases treating eye-gaze as having morphemic status seems counter-intuitive. Yet by treating it as such - for the moment - within PLD, we can perhaps discern it more precise role.

Chickens and Eggs

It may seem from the above that we are dealing with a chicken and egg situation in relation to categorisation. The database allows us, for example, to categorise forms as classifier morphemes (of different types) and metaphor morphemes (again of different types), yet we are also simultaneously trying to test out criteria for such labelling. The suggestion here is that at the very least the database will allow is to test out the reliability of or labelling by extracting and re-examining groups of signs with identical labels. However, PLD can enable us to be rather more creative.

It has been argued, for example, that some of the morphemes labelled as metaphor may best be described as classifier forms, which are then extended metaphorically. This would be comparable to the way in which the form: Person Classifier: HIT WITH CLOSED FIST, often glossed as HIT can now be extended to mean 'hit' or 'impact' in the abstract sense: 'that

comment really hit me'. PLD would allow us to trial different categorisations to see whether common patterning emerged. Thus it is possible to 'clone' the whole database or part of the database. One might explicitly do this in order to test out how slight changes in categorisation may effect patterns of co-occurrence. We are still at an early stage in this work but there is considerable potential. PLD is indeed flexible enough to allow us to trial what we can regard as the most pared down categorisation as well as the most rich categorisation, with a range of possibilities in between.

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