

# Simultaneity vs Sequentiality: Developing a transcription system of Hong Kong Sign Language acquisition data

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## Abstract

Sign languages are characterized with a wide range of constructions which encode information of various linguistic levels simultaneously in different autonomous channels. Specifically, the signs produced by the two manual articulators may exhibit a varying degree of relatedness or integration with respect to their semantic, morphological, or syntactic characteristics. In a two-handed lexical sign, the two hands form a single morphemic unit which cannot be further decomposed morphologically. In a typical two-handed classifier construction that is made up of two independent classifiers, the handshape, movement, and location of each of the two hands bear a morphemic status and these morphemes are put together to form a larger morphosyntactic complex. In a signing discourse, it is not uncommon to see the whole or part of a completed sign to be held in space in one hand, while another sign is produced by the other hand. In some cases, the held sign may bear no morphosyntactic relation with the co-occurring sign and its presence only serves a discourse or prosodic function. In some other cases, however, the held sign may combine with the co-occurring sign to constitute a larger morphosyntactic unit. This paper discusses how we devise a consistent transcription system to capture and differentiate these different types of simultaneity for our Hong Kong Sign Language Child Language Corpus in a way that would facilitate not only the viewing of the glosses, but also the analysis of morphosyntactic complexities of deaf children's signing production.

## 1. Introduction

It is a well-known fact that sign languages are characterized with a wide range of simultaneous constructions that make use of the availability of two manual articulators to form complex polymorphemic constructions. This paper discusses the transcription system we develop for the Hong Kong Sign Language Child Language Corpus, with specific focus on how simultaneous constructions involving the two manual articulators are glossed. Our discussion will proceed as follows. In Section 2 we will briefly introduce the basic features of our acquisition corpus. Section 3 discusses the types of simultaneous constructions we attempt to code and differentiate in our corpus. Section 4 presents our transcription system. Section 5 is the concluding remarks.

## 2. Hong Kong Sign Language Child Language Corpus: A basic description

We are currently developing a Hong Kong Sign Language (hereafter HKSL) acquisition corpus in which the data are transcribed with ELAN (EUDICO Linguistic Annotator), the multimedia annotation tool developed by the Max Plank Institute of Psycholinguistics, Nijmegen, The Netherlands.<sup>1</sup> The corpus contains digitized video recordings and transcriptions of sign language production by deaf children acquiring HKSL and the signing adults who interacted with them. At this initial stage of development, the corpus includes two tiers of basic glosses, an utterance tier which mainly serves to mark sentence/utterance delimitations and a morphosyntactic

tier that contains information about the grammatical categories of the signs. The tiers for glosses and morphosyntactic information require manual input, whereas the utterance tier is basically generated via an interface program that can systematically and automatically combine information from the glossing and morphosyntactic tiers in a format transferable and readable in CLAN, the data analyzing programme in CHILDES.<sup>2</sup> The symbols and features we use in the transcription system are compatible with CHILDES in order to facilitate cross-platform sharing of the data once the corpus is completed.<sup>3,4</sup>

## 3. Simultaneous constructions involving two manual articulators

In a signing discourse, signs produced by the two manual articulators may exhibit a varying degree of relatedness or integration with respect to their semantic, morphological, or syntactic characteristics. In a two-handed lexical sign, the two hands form a single morphemic unit which cannot be further decomposed morphologically. In addition, signers may produce a lexical sign and a gesture at the same time. Signers may also simultaneously produce two lexical signs which are usually presented sequentially. For

<sup>1</sup> The first batch of our transcribed data will be released in CHILDES by the end of this year.

<sup>2</sup> The acronym CLAN stands for 'Computerized Language Analysis'. It is a program that is designed specifically by Leonid Spector at Carnegie Mellon University to analyze data transcribed in CHAT, the format of the Child Language Data Exchange System (CHILDES).

<sup>3</sup> For example, symbols that stand for repetition and substitution in our data are adopted from the CHAT format of CHILDES.

<sup>4</sup> Details of the utterance tier will be given in another poster presentation from our colleagues.

instance, instead of signing *IX\_3 MALE* ('that man') (i.e. a pointing determiner followed by a lexical noun), a signer may produce these two one-handed signs at the same time. These two lexical signs are free morphemes in and of themselves, but are syntactically related as they combine to form a noun phrase. In a typical two-handed classifier construction, for example, *put+CL\_hand:cup+CL\_sass:table* [= a cup on a table], the handshape, movement, and location of each of the two hands bear a morphemic status and these morphemes are put together to form a larger morphosyntactic complex that represents a single, static event.<sup>5,6</sup> In a signing discourse, it is also not uncommon to see the whole or part of a completed sign to be held in space in one hand, while another sign is produced by the other hand. In some cases, the held sign may bear no morphosyntactic relation with the co-occurring sign and its presence only serves a discourse or prosodic function. In some other cases, however, the held sign may combine with the co-occurring sign to constitute a larger morphosyntactic unit. What complicates the picture further is that the held sign may remain dormant for some time, but become active again later in the discourse. These several types of simultaneity with respect to the two manual articulators show a varying degree of complexities at different linguistic levels, and such information are of great value when researchers probe into the sign language development of deaf children. In constructing a sign language acquisition corpus, we therefore deem it necessary to differentiate and code them explicitly in our transcription system.

#### 4. Representation of Simultaneity in the Hong Kong Sign Language Child Language Corpus

##### 4.1 The two glossing tiers for the two manual articulators

In the sign language literature, diverse labels have been adopted to name the glossing tiers that transcribe the linguistic information encoded by the two manual articulators, e.g. left-hand vs right-hand (e.g. Nyst, 2007; Anna-Lena Nilsson, 2007; Vermeerbergen and Demey, 2007), dominant-hand vs non-dominant hand (Leeson & Saeed, 2007), or main gloss vs non-dominant hand gloss (MacLaughlin, Neidle and Greenfield, 2000). In our corpus, however, we have decided to use 'gloss 1' and 'gloss 2' instead of these commonly-used labels due to the following reasons.

<sup>5</sup> In our corpus, classifier handshapes are divided into four types in the HKSL acquisition data, including (i) *CL\_sem* for semantic classifier handshapes; (ii) *CL\_sass* for size and shape classifiers; (iii) *CL\_hand* for handling classifiers; and (iv) *CL\_body* for both bodypart classifiers (i.e. handshape that stands for a body part) and body classifiers (i.e. the signer's body represents a referent's body).

<sup>6</sup> At this initial stage of data transcription, only verb roots and classifier handshapes of classifier predicates are coded explicitly. We plan to include other morphemic units, such as location and manner, in the future development of the corpus.

The division of left-hand and right-hand may be a good option for transcribing situations in which each of the two manual articulators produces independent morphological units, e.g. one-handed lexical sign or classifier predicate, but it cannot effectively label two-handed lexical signs. Researcher may need to set up a separate tier, e.g. both-hand, for coding two-handed lexical signs, or state the same gloss twice, one on the left-hand tier and the other the right-hand tier. The first option creates an extra tier in the transcription system, and this makes viewing of glosses difficult and inconvenient because the glosses would be scattered among three different tiers. Representing the same gloss twice is equally problematic, because this may mistakenly lead to an impression that the deaf child is producing two morphologically independent units and as such over-estimate a child's language development if quantitative analyses such as frequency count or MLU are conducted. Most importantly, except for a few signs (e.g. *LEFT* and *RIGHT*), handedness of a sign is usually linguistically insignificant, at least in HKSL. As our corpus aims at representing the grammatical development of deaf children rather than the phonetic interaction of the two manual articulators, we leave the left-hand/right-hand dichotomy to later research.

The dominant/non-dominant hand distinction, on the other hand, may be useful in representing the phonetic relation between the dominant and weak hand in a two-handed lexical sign, two-handed classifier constructions consisting of a figure (i.e. dominant hand) and a ground (i.e. non-dominant hand), or situations in which a sign is produced by the active signing hand (i.e. dominant) in the presence of the maintenance of a previously completed sign in the non-active hand (non-dominant). Yet this pair of labels cannot be used to transcribe classifier constructions in which both hands represent figures actively involved in the predicate, or in cases where both hands are independent morphemes which are of equal significance morphosyntactically, as in the simultaneous production of two lexical signs, *IX\_3* and *MALE* (i.e. that man).

In view of the above problems, and in order to encompass as many types of simultaneous phenomena as possible, we have decided to dispense with these commonly used labels and adopt 'gloss 1' and 'gloss 2' instead, which are theoretically more neutral.

##### 4.2. Use of the 'gloss 1' tier in the transcription system

In our HKSL acquisition corpus, two separate tiers – 'gloss 1' and 'gloss 2' ('g1' and 'g2' in short form) – are set up for each signing participant to gloss the meaning of individual signs. A lexical sign, if produced independently without any co-occurring constituent, will be coded on the 'gloss 1' tier. It is glossed with the English words bearing the closest possible meaning.<sup>7</sup> Classifier

<sup>7</sup> Note that additional symbols are adapted from the CHAT specification of CHILDES for coding grammatical properties

predicates signifying the motion or locative property of a single referent are also coded on the ‘gloss 1’ tier.<sup>8</sup> Apart from the meaning of entire predicate, the verb root and the classifier handshape are only marked explicitly. For example, a classifier predicate which means “a person walks forward” is glossed as *walk+CL\_sem [= a person walks forward]*. Gestures, if produced manually, are coded on the ‘gloss 1’ tier, too. For instance, a hand-waving gesture signers commonly use to call other people’s attention is glossed as *gesture [= get someone’s attention]*.<sup>9</sup> Note that glosses for gestures are in small letter to distinguish them from lexical signs. The meaning of the gestures and the classifier predicates are enclosed in square brackets containing an equality symbol ‘[= ]’. Whether these lexical signs, classifier predicates and gestures are one-handed or two handed, left-handed or right-handed, is not a matter of concern in the transcription.

#### 4.3 Use of the ‘gloss 2’ tier in the transcription system

The ‘gloss 2’ tier is only invoked when the two manual articulators produce signs which are morphologically independent from each other. As discussed in Section 3, there are several types of simultaneous constructions which are differentiated and coded in our transcription system. They will be discussed one by one in the following sub-sections.

##### 4.3.1 Simultaneous production of a lexical sign plus a gesture

The first type of simultaneous construction that invokes the use of the ‘gloss 2’ tier involves the production of a gesture plus a lexical sign, as in the following example:

Example (1): “It is ashamed for you to become angry.”

*BRE	<IX_2~gesture [= get someone's attention]> [% sim] ANGRY ASHAMED IX_2
%mor@BRE	[n:pró IX_2~n:pró gesture adj ANGRY adj ASHAMED n:pró IX_2
%xg1@BRE	IX_2 ANGRY ASHAMED IX_2
%xg2@BRE	gesture [= get someone's attention]

Figure 1: Example for simultaneous articulation of a lexical sign plus a gesture

Note that the lexical sign and the gesture are not related morphologically and syntactically. On the utterance tier, they are separated by a tilde and are enclosed in angle brackets followed by ‘[% sim]’. This notation indicates that they are produced simultaneously but are morphosyntactically independent of each other.

##### 4.3.2 Simultaneous production of two lexical signs

The second possible type of simultaneous constructions involves two independent lexical signs produced simultaneously. The two lexical signs may or may not combine and form a larger syntactic constituent.

Example (2): “After being bitten (by the dog), (the cat) was frightened, in pain and (its body) bled.”

*CHI	BITE [*] gesture [= bite] <AFRAID~PAINFUL> [% sim] BLEED [*]
%mor@CHI	[v:agr BITE ges gesture adj AFRAID adj PAINFUL n BLEED
%xg1@CHI	BITE [*] AFRAID BLEED [*]
%xg2@CHI	gesture [= bite] PAINFUL

Figure 2: Example for simultaneous articulation of two lexical signs – CC 4;6;21<sup>10</sup>

In example (2) above, the child produces two lexical signs - *AFRAID* and *PAINFUL* - at the same time.<sup>11</sup> Although they are simultaneously produced, they represent two coordinated adjectival predicates that do not combine to form a larger syntactic constituent. On the utterance tier, these two signs are separated by a tilde and are enclosed in angle brackets followed by ‘[% sim]’. This notation indicates that the two lexical signs are produced simultaneously but are morphosyntactically independent of each other.

Example (3): “You just begin (to learn how to ride a bicycle). The bicycle will move along a zigzag path when you ride it on your own.”

specific to sign languages. Examples include agreement markings (e.g. *GIVE-IS&Sub* stands for the sign GIVE inflected for 1st person singular agreement) and spatial markings on verbs (e.g. *PUT-a*, *PUT-b*, *PUT-c* stands for three instances of the spatial verb PUT at location ‘a’, ‘b’ and ‘c’) and mouthing for spoken words.

<sup>8</sup> Occasionally a classifier predicate denoting a single referent may involve two hands. For instance, in *swim+CL\_body:jelly\_fish [= a jelly fish swims by moving its tentacles]*, the classifier for the jellyfish consists of a spread-5 handshape with flexed fingers representing the top, and another spread-5 handshape with laxly flexed fingers representing the tentacles. In cases like this, the classifier predicate is still given a single gloss on the ‘gloss 1’ tier.

<sup>9</sup> Gestures which are included in the transcription include those related to discourse information only, such as head nod indicating a reply. These gestures subjects to appear independently on the ‘gesture’ tier at the next stage of development.

<sup>10</sup> CC is the short form for the name of a longitudinal subject in the corpus.

<sup>11</sup> Note that *AFRAID* is placed on the ‘gloss 1’ tier because its onset time is earlier than that of *PAINFUL*. If two signs begin at the same time, they will be placed on the ‘gloss 1’ and ‘gloss 2’ tier by random.

*KEN	BEGIN <IX 2-SELF> [% sim] move+CL_sem [= a bicycle moves along a zigzag path] IX 2 SELF .
%mor@KEN	v:pl BEGIN n:pro IX 2-n:pro SELF cl +v move+c CL_sem n:pro IX 2 n:pro SELF .
%xg1@KEN	BEGIN (IX 2) move+CL_sem [= a bicycle moves along a zigzag path] IX 2   SELF .
%xg2@KEN	SELF

Figure 3: Example for simultaneous articulation of two lexical signs

In example (3) above, the indexical sign is a determiner. It combines with the lexical noun *SELF* form a noun phrase. On the utterance tier, the two signs are joined together by a plus sign '+' to indicate that they are produced simultaneously and they combine to form a larger syntactic constituent.

**4.3.3 Classifier predicates involving classifiers for two independent referents**

The third situation invoking the 'gloss 2' tier is complex classifier predicates involving two classifiers for independent referents. The two classifiers may combine together to form a single event, as in example (4), or they represent separate but coordinated events, as in example (5):

Example (4): "Put the tea bag into the cup; pour water into the cup and (the water) changes to brown."

*BRE	TEA+CL_hand:tea_bag+CL_hand:cup [= put a tea bag into the cup] &[=CL_hand:cup_pour+
%mor@BRE	n TEA cl +v put+c CL_hand+c CL_hand:cl +v pour+c CL_hand+c CL_hand n WATER
%xg1@BRE	TEA  put+CL_hand:tea_bag [= put a tea bag into the cup]  pour+CL_hand:pot [= pour some water
%xg2@BRE	be_located+CL_hand:cup  CL_hand:cup

(cont'd)

*BRE	CL_hand:pot+CL_hand:cup [= pour some water into the cup] WATER become_fall+CL_sass:
%mor@BRE	cl +v become_fall+c CL_sass+c CL_hand v:pl CHANGE 1 adj BROWN.
%xg1@BRE	into the cup   WATER   become_fall+CL_sass:water [= water in the cup becomes full]
%xg2@BRE	>   CL_hand:cup

(cont'd)

*BRE	water+CL_hand:cup [= water in the cup becomes full] CHANGE 1-a BROWN &[=CL_hand:cup
%mor@BRE	
%xg1@BRE	CHANGE 1-a   BROWN.
%xg2@BRE	>

Figure 4: Example of two independent classifiers which combine together to form a single event

Example (5): "Many birds flew together with the plane."

*KEN	fly+CL_sem:plane &[=CL_sem:plane HAVE MANY BIRD <fly+CL_sem:plane- fly+
%mor@KEN	cl +v fly+c CL_sem v:pl HAVE quant MANY n BIRD
%xg1@KEN	fly+CL_sem:plane [= a plane fly in the sky] >
%xg2@KEN	HAVE    MANY

\*KEN CL\_sem:birds [= many bird fly together with the plane]> [% sim] &[=CL\_sem:plane.

%mor@KEN	cl +v fly+c CL_sem-cl +v fly+c CL_sem
%xg1@KEN	fly+CL_sem:plane
%xg2@KEN	BIRD fly+CL_sem:birds [= many birds fly together with the plane].

Figure 5: Example for two independent referents forming a single event (from Tang et al. 2007)

In example (4), two handle classifiers are produced to stand for the tea-bag and the cup. They are listed as *put+CL\_hand:tea\_bag* [=put a tea bag into the cup] and *be\_located+CL-hand:cup* on the 'gloss 1' and 'gloss 2' tier respectively. On the utterance tier, these two glosses are linked up by '+' to indicate that they combine to form a complex classifier predicate.

In example (5), two classifier predicates – *fly+CL\_sem:plane* and *fly+CL\_sem:birds* [=many birds fly together with the plane] – are produced at the same time to represent two co-temporal events. As these two classifier predicates are structurally independent from each other, the two glosses are linked by a tilde and are enclosed in angle brackets followed by a comment '[% sim]'. In other words, their representation is the same as the simultaneous articulation of two independent lexical signs. They may be perceived as conjoined constructions.

**4.3.4 A phonetic suspension of a completed sign in the presence of other morphosyntactically unrelated signs**

The fourth type of simultaneity to be coded by the two glossing tiers involves the suspension of the handshape of a completed sign in one hand while the other hand continues to sign. In the literature, the phonetic maintenance of a completed sign is commonly marked by an arrow sign '>', but this symbol does not specify whether the held sign is morphosyntactically related to the co-occurring signs. As our transcription system aims at capturing the morphosyntactic complexities of the sign language production of deaf children, we restrict the use of '>' to a suspension of a completed sign which does not relate morphosyntactically to the co-occurring signs, as in example (6) below:

Example (6): "There is (a person wearing) a headscarf. There is a witch."

*CHI	HAVE [*] ONE tie+CL_hand [= a headscarf] HAVE WITCH HAVE .
%mor@CHI	v:pl HAVE num ONE cl +v tie+c CL_hand v:pl HAVE n WITCH v:pl HAVE .
%xg1@CHI	HAVE [*]   ONE   CL_hand [= a headscarf]   HAVE >   HAVE .
%xg2@CHI	WITCH

Figure 6: Example of phonetic suspension of a completed sign – CC 4;6;21

In the above example, *HAVE* is held by one hand while the other hand signs *WITCH*, which is morphosyntactically independent from *HAVE*. Note also that in the transcription the beginning of the gloss entry for '>' overlaps with the ending of *HAVE*. This kind of simultaneity is not specifically highlighted on the utterance tier.

**4.3.5 A previously held sign being reactivated and combining morphosyntactically with the co-occurring sign**

If a previously-held sign is reactivated again and

combines with another co-occurring sign to form a larger morphosyntactic unit, an entirely new gloss with semantic and/or syntactic content will be provided. An example is provided below to illustrate this situation:

Example (7): “The man (thief) is shot by the police and the bullet streaks towards him.”

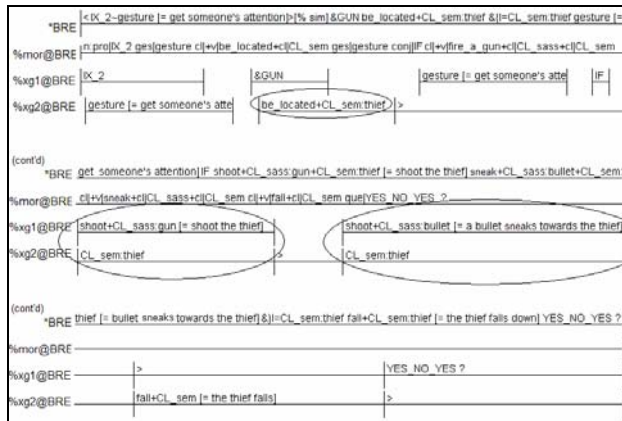


Figure 7: Example of a previously suspended sign being reactivated and combining morphosyntactically with the co-occurring sign

In example (7) above, the semantic classifier that stands for the thief (i.e. *be\_located+CL\_sem:thief*) is first held phonetically in the signing space while the signer continues to produce a gesture and the lexical sign *IF*. This kind of suspension is indicated by '>' in the transcription. After that the same semantic classifier becomes an argument of the predicate 'shoot the thief' (i.e. *shoot+CL\_sass:gun*). As the semantic classifier is morphosyntactically active, it is glossed again in the transcription. The same classifier is also a component of the predicate “a bullet streaks towards the thief” (*shoot+CL\_sass:bullet*) and is therefore glossed once again. In order to show the articulatory continuity of *CL\_sem:thief*, the five consecutive glosses, namely, *be\_located+CL\_sem:thief*, >, *CL\_sem:thief*, > and *CL\_sem:thief*, are connected to each other without any separation. One advantage of this method of representation is that we can capture the fact that a sign, when being held in space, may perform different morphosyntactic functions in relation to other co-occurring constituents. Note further that when a held sign forms a morphosyntactic unit with a co-occurring sign, the two gloss entries will be time aligned. One more example is given below:

Example (8): “Put the tea bag into the cup; pour the water and it changes to brown.”

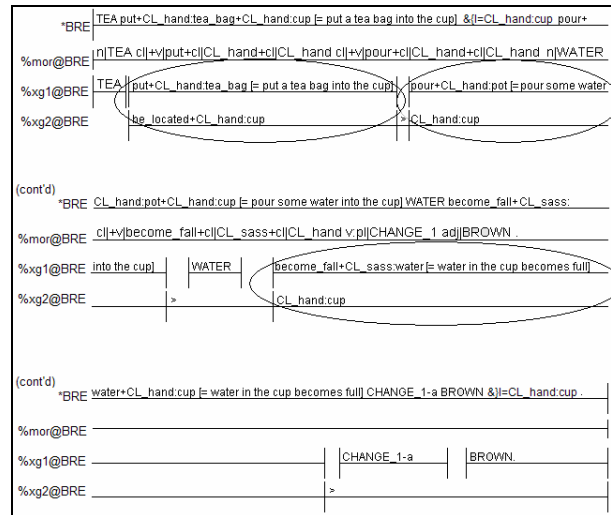


Figure 8: Example of a previously suspended sign being reactivated and combining morphosyntactically with the co-occurring sign

In the above example, the sign *CL\_hand:cup* is glossed again when it is morphosyntactically re-activated to be part of the predicate of “pour some water into the cup” and “water in the cup becomes full”. The six glosses on the ‘gloss 2’ tier are connected to each other in order to show the articulatory continuity of *CL\_hand:cup*.

In our transcription, if a certain sign is held in space and is reactivated some time later, two sets of symbols – ‘&{|=sign’ and ‘&}|=sign’ are used to delimit the scope of its phonetic persistence. In example (7), the semantic classifier for the thief (i.e. *CL\_sem:thief*) is held in space for a string of predicates. On the utterance tier, the first appearance of *be\_located+CL\_sem:thief* is followed by *&{|=CL\_sem:thief*, indicating that the classifier handshape is held in space. The holding of the semantic classifier ends before *fall+CL\_sem:thief*, which is preceded by *&}|=CL\_sem:thief* on the utterance tier.

### 5. Conclusion

Our transcription system can clearly capture and distinguish between different types of simultaneous constructions produced by the two manual articulators. Two glossing tiers are used whenever the signs produced by the two manual articulators form separate morpheme(s). If two co-occurring signs are syntactically related, that is, they combine to form a larger syntactic constituent, the two signs are linked up by a ‘+’ sign on the utterance tier. If the two signs only co-exist temporally without any morphosyntactic relation, they are enclosed in angle brackets on the utterance tier.

Note further that in our proposed glossing system, ‘>’ is restricted to suspension of a sign which does not interact morphosyntactically with other co-occurring signs. A new gloss is provided if a previously-held sign is reactivated in combination with other co-occurring signs to form a larger morphosyntactic unit. Such a coding system can

draw a distinction between spatially held signs with active morphosyntactic content and those whose maintenance in space only serve a discourse or prosodic function. This system can also capture the fact that a sign, when held in space, may perform different morphosyntactic or discourse roles depending on the type of co-occurring signs the held sign enter into a relationship with.

One major disadvantage of our proposed transcription system is that a sign which is held in space may be split up into several glosses. Although the articulatory continuity is still indicated by the timing connection of the gloss entries, researchers who are interested in how signs are held in discourse cannot rely on the search function of ELAN to extract the quantitative information on this phenomenon, e.g. how long is a sign held in space, how often are signs held in space, etc. This has to be done manually.

Another inadequacy of our current transcription system is that not all simultaneously presented morphemic units are coded explicitly at this stage of development. For example, the locative or manner morphemes are left unspecified. Hopefully these types of missing information will be coded as we continue to develop our corpus in the future.

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