Sign language linguistics, Part I: Phonology and morphology

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Two modalities of language

**Spoken language**

- **Articulators:** Mouth/tongue
- **Signal:** Linear, acoustic waveform
- **Perception:** Auditory (ears)

**Sign language**

- **Articulators:** Hands/face
- **Signal:** Multi-dimensional image
- **Perception:** Visual system (eyes)
Some myths about sign language

- **Myth 1:** Sign language is mime.

- Sign languages can talk about non-tangible things: ideas, philosophy, mathematics, ...

- Words are arbitrary:
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  - American Sign Language: ‘where’
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American Sign Language: ‘where’
French Sign Language: ‘not’
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- Words are arbitrary:
  - American Sign Language: ‘where’
  - French Sign Language: ‘not’
  - Israeli Sign Language: ‘who’
Some myths about sign language

- **Myth 1:** Sign language is mime.

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- Words are arbitrary:

  - American Sign Language: ‘where’
  - French Sign Language: ‘not’
  - Israeli Sign Language: ‘who’
  - Japanese Sign Language: ‘what’
Some myths about sign language

- Myth 2: There is one sign language.

Dr. Peter Hauser (right) presenting in ASL at TISLR 11, simultaneously being translated into English, British Sign Language (left), and various other sign languages (across the bottom of the stage).
Some myths about sign language

From airbnb.com:
Some myths about sign language

- **Myth 3:** ASL is signed English.
- Sign languages have their own grammar.
- In fact...
  - ASL and BSL (British SL) are different languages!
  - ASL is descended from LSF (French SL).
  - So: it would be easier for an American signer to understand a French signer than a British signer!
In short...

- Sign language is a **natural human language**.
- We see the same grammatical patterns that we see in spoken language.
  - Syntax, semantics, morphology, .... even phonology!
  - **Conclusion**: the same underlying cognitive system.
- But, several places where ‘modality matters’.
  - What can you do with signs that you can’t with speech?
Section 2

Sign language ‘phonetics’
Parameters of sign language

- Recall our first description of spoken language phonology...
- Three phonetic parameters:
  - Place of articulation
  - Manner of articulation
  - Voicing
- Sign language is exactly parallel
- Four phonetic parameters:
  - Handshape
  - Location
  - Movement
  - Orientation
In spoken language, we can find **minimal pairs** for each parameter.

**Spoken language:**
- Place of articulation: /pap/, /kap/, /tap/
- Manner of articulation: /dɛd/, /nɛd/, /zɛd/
- Voicing: /bʌg/, /pʌg/

In sign language, we can also find minimal pairs.
Handshape
Minimal pairs: handshape

THINK ∼ KNOW

TWIN ∼ RESTAURANT ∼ ISRAEL
Minimal pair: orientation

NAME ∼ CHAIR

STAR ∼ SOCKS
Minimal pairs: location

FATHER ~ MOTHER ~ FINE

DRY ~ SUMMER ~ UGLY
Minimal pair: motion

TRAIN ~ CHAIR

COFFEE ~ MAKE
Practice: minimal pairs

LUCKY ~ SMART

SCIENCE ~ CHEMISTRY

BROOKLYN ~ BOSTON ~ BLUE

MARRY ~ PROOF
Non-manual markers

- JOHN LIKE ICECREAM

Does John like icecream?

The function of non-manuals

- Grammatical: Y/N questions, wh-questions, negation, conditionals. (Similar to intonation in spoken language.)
- Affective (adverbial): repeatedly, slowly, carefully...

Non-manuals articulated concurrently with manual signs.

Modality-specific effects (both today and tomorrow).
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  ‘John likes icecream.’

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  Modality-specific effects (both today and tomorrow).
In both spoken language and sign language, we can break down phonological parameters into features.

- **Spoken language:**
  - **Place** =
    - \([\pm\text{coronoal}], [\pm\text{velar}], [\pm\text{anterior}], [\pm\text{labial}], \ldots\)

- **Spoken language:**
  - **Handshape** =
    - \([\pm\text{thumb}], [\pm\text{bent}], [\pm\text{ulnar}], [\pm\text{one}], \ldots\)
Section 3

Phonology
Phonological processes

- So far, a first approximation of sign language phonetics.
- Now: we look at phonology: rules and patterns.

- The cognitive status of natural classes:
  1. They are a phonetically coherent group of sounds.
     (E.g. [+high] vowels produced with a raised tongue).
  2. They can be targeted by phonological rules.
     (E.g. [+high] vowels devoiced in Japanese.)
Today, we will look at two processes in sign language:

- Weak-hand drop
- Assimilation

Throughout: parallels to spoken language.
Weak-hand drop

Weak-drop

- TEACH + ER = TEACHER
- SCIENCE + ER = SCIENTIST
- LEARN + ER = STUDENT

A phonological process in a phonological environment.

What's the rule?

- LAW + ER = LAWYER
- MANAGE + ER = MANAGER
Weak-hand drop

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Assimilation in English (Review)

- **Assimilation** is the phonological process where one sound becomes *similar to* an adjacent segment.

- Example: nasal place assimilation in English
  - *interminable* /n/ → [n]
  - *intangible*
  - *intolerant*
  - *impossible* /n/ → [m]
  - *implausible*
  - *impolite*
  - *inconceivable* /n/ → [ŋ]
  - *incongruous*
  - *incomplete*
Assimilation in English

An optional process of nasal assimilation:

- $\text{in} + \text{kəmpli}t \rightarrow \text{iŋkəmpli}t$

- More schematized:

  \[
  \begin{align*}
  n & + k & = & \eta & k \\
  [+\text{nasal}] & & [-\text{voice}] & & [+\text{nasal}] & [-\text{voice}] \\
  [+\text{coronal}] & & [+\text{velar}] & & [+\text{velar}] & [+\text{velar}]
  \end{align*}
  \]
An optional process of nasal assimilation:

- $\text{in} + k\text{mplit} \rightarrow \text{in}[^+\text{nasal}] k[^-\text{voice}]\text{mplit}$

- More schematized:

\[
\begin{align*}
\text{n} & \quad + \quad \text{k} & = & \quad \text{ŋ} & \quad \text{k} \\
[+\text{nasal}] & \quad [-\text{voice}] & \quad [+\text{nasal}] & \quad [-\text{voice}] \\
[+\text{coronal}] & \quad [+\text{velar}] & \quad [+\text{velar}] & \quad [+\text{velar}] 
\end{align*}
\]
Assimilation in English

An optional process of nasal assimilation:

- \( \text{in} + \text{k\text{amplit}} \rightarrow \text{inj\text{k\text{amplit}}} \)

- More schematized:

  \[
  n + k = \eta k
  \]

  \([+\text{nasal}] [−\text{voice}] [+\text{nasal}] [−\text{voice}]\)

  \([+\text{coronal}] [+\text{velar}] [+\text{velar}] [+\text{velar}]\)

- **Generalization:** the /n/ of ‘in-’ changes its place to match the following consonant.

  \(/n/ \rightarrow [+\text{velar}] / \_\_ [+\text{velar}]\)
Assimilation in sign language

- Handshape assimilation in sign language:
  - RED + CHOP = TOMATO
Assimilation in sign language

- Handshape assimilation in sign language:
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Handshape assimilation in sign language:

RED + CHOP = TOMATO

Assimilation of the entire handshape.
Handshape assimilation

- Partial assimilation:

\[
\text{THINK} + \text{SELF} = '\text{think for yourself}'
\]

\[
\begin{align*}
[+\text{index}] & \quad [-\text{index}] & \quad [+\text{index}] & \quad [-\text{index}] \\
[-\text{thumb}] & \quad [+\text{thumb}] & \quad [+\text{thumb}] & \quad [+\text{thumb}]
\end{align*}
\]

A new handshape is produced!

Just like \([n] + [k]\) produced \([N]\).
Handshape assimilation

- Partial assimilation:

\[
\text{THINK} + \text{SELF} = \text{‘think for yourself’}
\]

\[
[+\text{index}] 
+ [-\text{index}] 
= [+\text{index}] 
\]

\[
[-\text{thumb}] 
+ [+\text{thumb}] 
= [+\text{thumb}] 
\]

\[
\text{A new handshape is produced!}
\]

\[
\text{Just like} \ [n] + \ [k] \text{ produced} \ N.
\]
Handshape assimilation

▶ Partial assimilation:

\[
\text{THINK} + \text{SELF} = \text{‘think for yourself’}
\]

\[
\begin{align*}
[+\text{index}] &+ [-\text{index}] = [+\text{index}] \\
[-\text{thumb}] &+ [+\text{thumb}] = [+\text{thumb}]
\end{align*}
\]

▶ A new handshape is produced!
▶ Just like [n] + [k] produced [ŋ].
Handshape assimilation

- Partial assimilation:

\[
\text{TIME} + \text{SAME} = \text{‘simultaneous’}
\]

\[
\begin{align*}
[+\text{index}] &+ [-\text{thumb}] &+ [+\text{thumb}] &+ [+\text{pinky}] \\
[-\text{pinky}] &+ [-\text{index}] &+ [+\text{thumb}] &+ [+\text{pinky}]
\end{align*}
\]
Handshape assimilation

- Partial assimilation:

\[ \text{TIME} \quad + \quad \text{SAME} \quad = \quad \text{‘simultaneous’} \]

\[
\begin{align*}
\text{TIME} & \quad [+\text{index}] \\
\text{SAME} & \quad [+\text{thumb}] \\
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\]

\[
\begin{align*}
\text{TIME} & \quad [-\text{thumb}] \\
\text{SAME} & \quad [-\text{pinky}] \\
\text{SAME} & \quad [+\text{pinky}] \\
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\[
\begin{align*}
\text{TIME} & \quad [+\text{index}] \\
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\text{TIME} & \quad [-\text{index}] \\
\text{SAME} & \quad [+\text{thumb}] \\
\text{SAME} & \quad [+\text{pinky}] \\
\end{align*}
\]
Like with English velars, assimilation may be optional:

*Example:*

BELIEVE (= THINK + MARRY) has two forms.

We can represent the pattern as an optional rule:
Section 5

Simultaneity in morphology
Simultaneity

- Although hands are independent articulators, we never use simultaneous, two-handed compounds.
- FATHER + MOTHER = PARENTS
- Signed in succession with a single hand, not simultaneously with two.

(not possible)
Simultaneity

- A possible exception:

- Brazilian sign language has some lexical signs which are entirely non-manual.
  - SEX (cheek puff)
  - STEAL (lip lick)
Simultaneity

- **A possible exception:**
  - Brazilian sign language has some lexical signs which are entirely non-manual.
    - **SEX** (cheek puff)
    - **STEAL** (lip lick)

- **Simultaneous compounds in Brazilian Sign Language?**
  - **HONEYMOON** = **SEX** + **TRAVEL**
  - **MOTEL** = **SEX** + **HOTEL**
  - **ENRAPTURE** = **STEAL** + **GET-ATTENTION**

(Data courtesy of Aline Garcia Rodero Takahira)
Simultaneity

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  - HONEYMOON = SEX + TRAVEL
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- Why?
Simultaneity

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- Brazilian sign language has some lexical signs which are entirely non-manual.
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- Why? Non-manuals easier to dissociate than H1 and H2?
Section 6

Epenthesis (if there’s time)
Section 7

Summary
Sign language, too, has linguistic patterns.

Sign language segments categorized by four parameters:

- Handshape
- Location
- Movement
- Orientation

Within each parameter, further featural-breakdown.

Phonological rules may target specific features.

- Weak-drop
- Assimilation
- (Epenthesis)

Occasionally: modality-specific effects.