The Cross-Linguistic Distribution of Sign Language Parameters

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This material is based upon work supported by the National Science Foundation Graduate Research Fellowship under Grant No. DGE-1256082.

Outline

1) Overview
2) Background
3) Methodology
4) Findings
5) Discussion

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1) **Overview**
   - Research questions
2) Background
3) Methodology
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Overview: Research Questions

- Informed by background in spoken language phonetics and phonology
- Primary question: How are parameters (the sub-lexical units of sign, similar to phonological features) distributed across the world's signed languages?
  - Note: “Parameters” in this sense is unrelated to “principles and parameters”
- Secondary questions:
  - Are any/some/all parameters universal cross-linguistically?
  - How do parameters pattern together?
  - Are any parameters highly marked?
  - What *isn't* used as a parameter?

Outline

1) Overview
2) **Background**
   - Parameters: history and evidence
   - Markedness
   - Cross-linguistic investigations
3) Methodology
4) Findings
5) Discussion
6) Future work

Background: Parameters: History and evidence

- Parameters are the sub-lexical units used to encode meaning in sign languages. Many signs differ only by a single parameter.

Parameter	Proposed By	Minimal Pair (from ASL)
Movement	Stokoe (1960)	SIT – CHAIR - TRAIN
Handshape	Stokoe (1960)	SOUR – APPLE
Location	Stokoe (1960)	APPLE – ONION
Number of Hands	Bellugi & Fischer (1972)	PARTY – PURPLE
Non-Manual Component (Lexical facial expressions)	Lidell (1978)	LATE – NOT YET
Contact	Klima & Bellugi (1979)	WINE – ?WINE(away from cheek)
Palm Orientation	Friedman (1975)	MAYBE – BALANCE

Background: Markedness

- "Markedness" has been used in a variety of contexts, including:
  - Phonological systems
  - Historical linguistics
  - Language processing
  - L1 and L2 acquisition
  - Language disorders
  - Cross-linguistic distribution
  - See Haspelmath (2006) and Rice (2007) for further discussion
- For the purposes of this project, "more marked" is taken to mean
  - "rarer cross-linguistically", after Crothers (1978)
  - higher in an implicational hierarchy, after Greenburg (1966)

Background: Cross-linguistic investigations

- There have been cross-linguistic investigations of phoneme/feature distribution in spoken languages:
  - The World Atlas of Linguistic Structure (Dryer & Haspelmath 2013)
    - Zeshen (2013) looked signed languages, but not the distribution of parameters
  - The Phonetics Information Base and Lexicon (Moran & Wright 2009).
- There have also been some cross-linguistic investigation of parameters sign language
  - Comparison of handshape inventories between signed languages (e.g. Rozelle 2003, Mandel 1979)
- But there has been no previous study looking specifically at how the parameters *themselves* are distributed, i.e. does a sign language use handshape or not?

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1) Overview
2) Background
3) **Methodology**
   - The SLAY database
   - Advantages and limitations
4) Findings
5) Discussion
6) Future work

Methodology: The SLAY Database

- This project used the information in the Signed Language AnalYses (SLAY) Database (Tatman 2014)
- SLAY contains information on the parameters of 87 signed languages, taken from various academic sources
- SLAY is publicly available through SQLShare, courtesy of the University of Washington (Howe et al. 2012)

Methodology: Advantages and Limitations

- Advantages:
  - Good coverage (over 60% of signed languages included)
  - Works from a variety of disciplines and traditions provide converging evidence
  - Coding of present/ absent/ not discussed for each parameter

- Limitations:
  - Includes only secondary sources
  - Not all analyses done by trained linguists
  - Differing terminology necessitated some additional input analysis

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1) Overview
2) Background
3) Methodology
4) **Findings**
   - Overview
   - Distribution& Universals
   - Parameter patterns (implicational hierarchy)
   - Highly marked parameters
5) Discussion
6) Future work

Findings: Overview

- Research questions:
  - How are parameters (the sub-lexical units of sign) distributed across the world's signed languages?
  - Are any/some/all parameters universal cross-linguistically?
  - How do parameters pattern together?
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  - What *isn't* used as a parameter?

Findings: Overview

- Research questions:
  - **How are parameters (the sub-lexical units of sign) distributed across the world's signed languages?**
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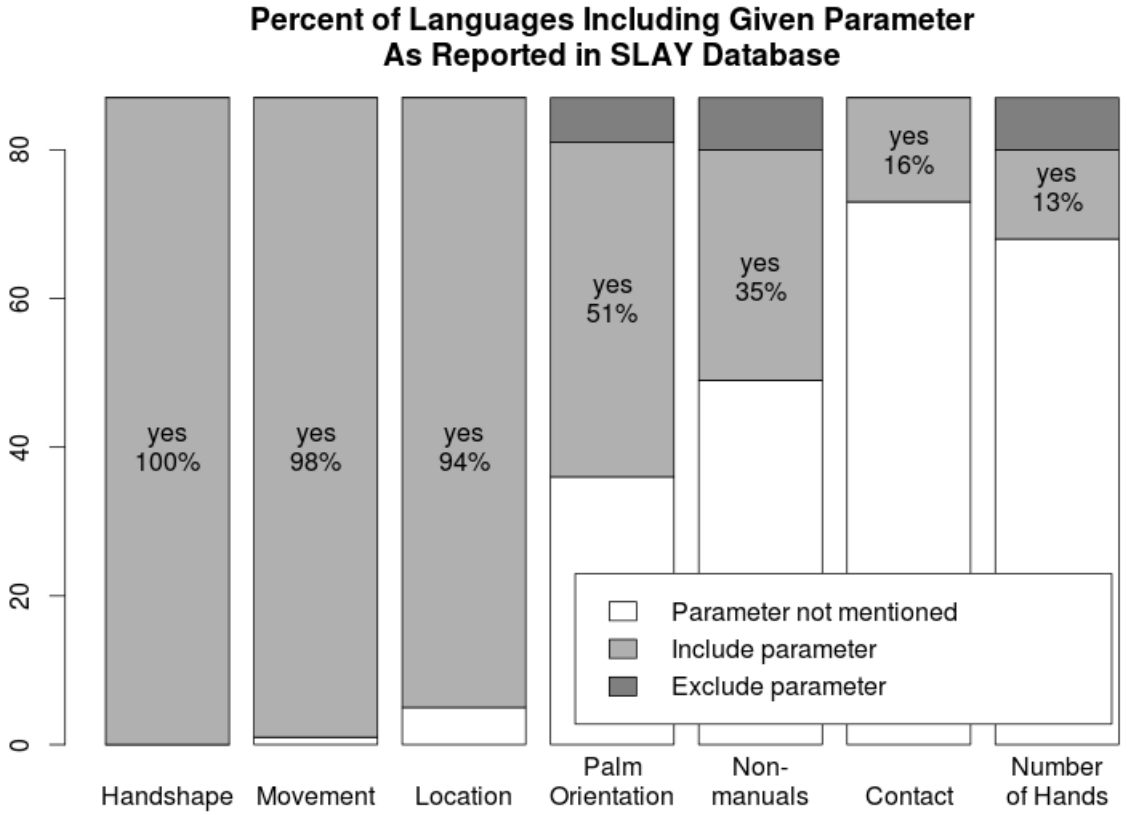
Findings: Distribution

Parameter	Present	Absent	Not discussed
Handshape	100%	0%	0%
Movement	98.86%	0%	1.14%
Location	94.25%	0%	5.74%
Palm Orientation	51.14%	6.89%	41.37%
Contact	15.91%	0%	84.09%
Non-manuals	35.23%	8.04%	56.32%
Number of Hands	13.64%	8.04%	78.32%

Findings: Towards Universals

- Almost all languages (94%) included handshape, movement and location and none specifically excluded them
- Other parameters (palm orientation, non-manuals, contact and number of hands) much rarer
  - Except for contact, all were looked for and not found



Findings: Overview

- Research questions:
  - How are parameters (the sub-lexical units of sign) distributed across the world's signed languages?
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Findings: Parameter Patterns

- An implicational hierarchy emerged during analysis of the database
- Some caveats:
  - Explicitly arguing *against* parameters is relatively rare; only around 8% of analyses argue against one or more parameter
  - The database does not yet have 100% coverage, which may change these results
  - Some rankings are supported by only one or two languages
- Reading the chart:
  - (light) Blue = argued for
  - (dark) Red = argued against
  - White = not discussed

Findings: Relative Markedness

Handshape	Movement	Location	Palm Orientation	Contact	Non-manuals	Number of Hands	# of Langs.
yes	yes	yes	yes	excluded	excluded	excluded	20
yes	yes	yes	excluded	excluded	excluded	excluded	14
yes	yes	yes	yes	excluded	yes	excluded	14
yes	yes	yes	excluded	excluded	yes	excluded	6
yes	yes	yes	excluded	yes	excluded	excluded	4
yes	yes	yes	excluded	excluded	excluded	yes	4
yes	yes	yes	no	excluded	no	no	4
yes	yes	yes	excluded	yes	yes	yes	2
yes	yes	yes	yes	excluded	excluded	yes	2
yes	excluded	excluded	excluded	excluded	yes	excluded	1
yes	yes	excluded	excluded	yes	excluded	excluded	1
yes	yes	excluded	excluded	yes	excluded	yes	1
yes	yes	excluded	yes	excluded	yes	excluded	1
yes	yes	excluded	yes	excluded	excluded	no	1
yes	yes	yes	excluded	yes	yes	excluded	1
yes	yes	yes	excluded	excluded	yes	no	1
yes	yes	yes	excluded	excluded	yes	yes	1
yes	yes	yes	no	excluded	excluded	excluded	1
yes	yes	yes	no	excluded	no	excluded	1
yes	yes	yes	yes	excluded	no	excluded	1
yes	yes	yes	yes	yes	excluded	excluded	1
yes	yes	yes	yes	yes	no	excluded	1
yes	yes	yes	yes	yes	yes	excluded	1
yes	yes	yes	yes	yes	yes	no	1
yes	yes	yes	yes	excluded	yes	yes	1
yes	yes	yes	yes	yes	yes	yes	1

Finding: Markedness Hierarchy

Handshape, Movement, Location > Palm Orientation, Contact > Non-manuals > Number of Hands

Findings: Overview

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Findings: Extremely Marked Parameters

- Two additional parameters occurred very rarely
- Duration:
  - Palestinian sign language has a minimal pair HONEY and CRUSHED-SESAME (Abdel-Fattah 2005)
  - It has been proposed as a parameter for Auslan (Johnston & Schembr 2007), but perhaps only as a minor one
- Which hand is used:
  - Turkish Sign Language has a finger-spelling system that uses only the non-dominant hand, which is arguably not part of the language (Kubuş 2008)

Findings: Unused Parameters

- Example: Feet
  - Used in homesign (non-linguistic gesture systems used by deaf children with no access to sign) (Hunsicker & Goldin-Meadow 2013)
  - Not used as articulators by any sign language in the database (although occasionally as a location, e.g. in Adamorobe Sign Language (Nyst 2007))
- Gives us bounds on the types of tools used by sign languages

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5) **Discussion**
   - Information, not explanation
   - Review of main findings

Discussion: Information, not explanation

- While this study offers information about *what* the distribution of sign language parameters is, we still don't know *why*
- Some possibilities for explaining variation in more-marked parameters:
  - *Age*: As signed languages develop, they may include change the number of parameters they use
  - *Status as a village sign language*: Village sign languages may make different use of parameters
  - *Cultural factors*: Taboos on eye contact may limit used of lexical non-manuals such as eye gaze, etc.
  - *Investigator bias:* Some researchers incorrectly identify or fail to find existent parameters

Discussion: Main Findings

- Handshape, movement and location may be universal sign language parameters
- Markedness hierarchy:
  - Handshape, Movement, Location > Palm Orientation, Contact > Non-manuals > Number of Hands
- Sign languages make use of a relatively small number of parameters for encoding lexical information

Citations

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Thank you!

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Al Sayyid Bedouin Sign Language?

- Does it have parameters?
  - "ABSL exhibit[s] the most variation in the formation of handshapes, ISL next, and ASL showing the least … ABSL signers are aiming for a holistic iconic image, and that discrete phonological categories are not yet robust in the language"[1]
- For the purposes of this project, yes
  - Working definition: sub-lexical units used to encode meaning in sign languages
  - ABSL signers *are* using handshape, location and movement to encode meaning, but the grammatical system is still emerging
- Other researchers agree. Al-Fityani (2007) compared signs across Arab sign languages based on handshape, movement, location and orientation[2].

1 – Israel, A., & Sandler, W. (2011). Phonological category resolution in a new sign language: A comparative study of handshapes. Formational units in sign languages, 177-202.
2 – Al-Fityani, K. (2007). Arab sign languages: A lexical comparison. Center for Research in Language Technical Reports, 19(1), 3-13.

Table of Conditional Probabilities

	Handshape	*Movement*	*Location*	*Palm Orientation*	*Contact*	*Non-manuals*	*Number of Hands*	*Total* ***prob:***
Handshape	X	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	**100.00%**
Movement	98.86%	X	100.00%	100.00%	100.00%	96.77%	100.00%	**98.86%**
Location	94.32%	95.40%	X	91.11%	85.71%	93.55%	83.33%	**93.18%**
Palm Orientation	51.14%	51.72%	52.44%	X	35.71%	*61.29%	*33.33%	**51.14%**
Contact	18.18%	16.09%	51.22%	11.11%	X	19.35%	33.33%	**15.91%**
Non-manuals	35.23%	35.63%	35.37%	*6.66%	42.86%	X	*41.66%	**35.23%**
Number of Hands	13.64%	13.79%	13.41%	*8.89%	28.57%	*16.12%	X	**13.64%**

Table of the conditional probabilities of certain parameter being included in an analysis. The table may be read as follows: “Given that an analysis says that a language has [column value] there is a [cell value] percent chance that it will also include [row value].” Note that only analyses that claim a language does have a particular parameter were included for the counts, so analyses against and excluding a parameter were included together. Cells marked with an asterisk indicate that those probabilities are significant ($p < 0.001$). Significance tests include all three judgments: “yes”, “no” and “excluded”. Handshape had only one level and was thus excluded from significance testing.

Implications for Sign Phonology

- If handshape, movement and location are universals, then should that be reflected in phonological models?
- Hand Tier model (Sandler & Lillo-Martin 2006)
  - Includes movement, location and handshape as primitives
- Movement Hold Model (Lidell & Johnson 1989)
  - Could be modified by removing orientation information from the holds, but would leave some languages (e.g. ASL) underspecified
- Prosodic model (Brentari 1998)
  - Uses movement as the nuclear (sonorant) unit in sign language phonology, handshape and location less central

All Hierarchies

- Markedness Hierarchy:
  - Handshape, Movement, Location > Palm Orientation, Contact > Non-manuals > Number of Hands
- Frequency Ranking:
  - Handshape > Movement > Location > Palm Orientation > Non-manual > Contact, Number of Hands
  - More analyses discuss number of hands, whether for or against, (19 vs. 14) but more explicitly include contact than number of hands (14 vs. 12)
- Combined Ranking (possibly of limited usefulness):
  - Frequency used to resolve free ordering in markedness hierarchy
  - Handshape > Movement > Location > Palm Orientation > Contact > Non-manuals > Number of Hands