Phonetics, Phonology, and Transcription Practices in American Sign Language

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Video data of a young child and his mother were transcribed using four different notation systems. The resulting transcriptions were compared to each other and to the original data, and used to analyze the frequency and co-occurrence of different features and handshapes. We tested the ability of each notation system to encode information about the organization of hand features in ASL and the ways in which each system may have contributed to current assumptions about ASL phonology. We have begun to investigate the extent to which previous ideas about the identity and features of different handshapes are accurate descriptions of naturalistic signed data.

Comparison of Systems

Four different transcription systems were used to transcribe the same ASL data. The systems that include more phonetic-level details allow for accurate representation of nonstandard productions. Differences and commonalities between similar productions are easy to identify and quantify.

		1	2	3	4
		S	MHM	P	ASLP
a		3	L+12v+	UT-^;#	UEE< 1hEEE 〈 2EEE < 3FFe = 4fee
b		V	n-12v+	U^;#	OFF= cpd3 1hEE 〈 2EEE < 3FFe = 4fee
c		V	n-12v+	U^;#	OFF< cpd3na 1hEE 〈 2EE < 3FFE = 4Ffh
d		V or K	n-12K	Uk;#	OFF= cpd3 1EEE < 2fE < 3FFE = 4Fff
e		K	b+c12K	Uk;T;#	PFE= cpd2ra 1EEE < 2FEE < 3FFE = 4FFf

Stokoe (1965)

There are 45 different handshape phonemes, some with allophonic variants listed. Some features (e.g. joint flexion, lateral thumb extension) are described with diacritics, but no complete phonetic feature analysis is attempted. Only handshapes used in ASL signs are included.

Prosodic Model (Brentari 1998, Eccarius & Brentari 2008)

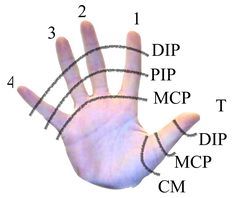
Each handshape consists of lower-level features. Lower-level features occur on several hierarchical levels and are phonological rather than phonetic (not all possible physical configurations are describable; the system is designed to represent attested contrast). Handshapes used in 10 different signed languages are included.

MHM: Movement-Hold Model (Liddell and Johnson 1989)

Each handshape (called "hand configuration" here) consists of 13 lower-level features. Lower-level features are mostly binary and mostly phonetic, although some phonological categorizations are used. Features are intended to describe all possible phonemic-level (contrastive) hand configurations in any signed language.

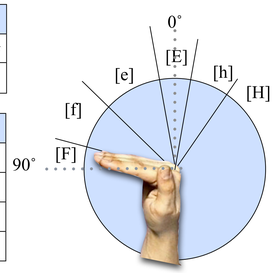
ASLP: Architecture of Signed Language Phonetics (Johnson and Liddell in progress)

Each hand configuration is described by phonetic-level articulatory features. Features describe the position of each joint on each digit, any contact between digits, and the lateral adduction/abduction of the digits. Features are intended to describe all possible phonetic-level (contrastive and noncontrastive) hand configurations in any signed language.



Digits				
Thumb	Index	Middle	Ring	Pinky
T	1	2	3	4

Joints	
DIP	distal interphalangeal joint
PIP	proximal interphalangeal joint
MCP	metacarpophalangeal joint
CM	carpometacarpal joint



Extension/flexion of the MCP joints						
description	fully flexed	partially flexed	partially extended	fully extended	partially hyperextended	fully hyperextended
symbol	F	f	e	E	h	H
prototype	+90˚	+60˚	+30˚	0˚	-23˚	-45˚
angles	> +75˚	+45˚ – +74˚	+10˚ – +44˚	-10˚ – +10˚	-35˚ – -11˚	< -35˚

Features that are noncontrastive in one language may be contrastive in another language. Additionally, features that are noncontrastive in a language may still appear in linguistically relevant patterns such as allophonic distribution. Finally, the same phone may be a member of more than one phoneme category. Only by transcribing data with a theoretically-neutral phonetic system can this kind of information emerge.

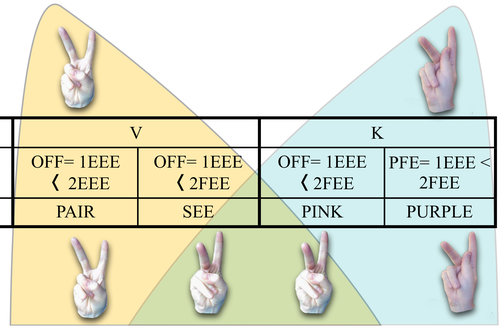
	SAE				Korean			
phoneme	/t/			/l/	/t/	[tʰ]	/l/	
phones	[t]	[tʰ]	[ɾ]	[l]	[t]	[tʰ]	[l]	[ɾ]

	SAE						
phoneme	/t/				/d/		
phone	[t]	[tʰ]	[ɾ]	[ʔ]	[d]	[t]	[ɾ]
as in	cat	too	writer	mitten	due	stopped	rider

Feature Distribution

Making preliminary theoretical assumptions about which features of signs are phonetic accidents and which features are phonologically important elements, before data has been coded, limits the ability to adequately capture the constraints, contents, contrasts, of any language, spoken or signed.

We found that using a phonetic-level transcription with no built-in phonological theory (ASLP) to code both contrastive and noncontrastive features provides access to details of production that are obscured by the broader transcriptions. For example, some noncontrastive features appear in allophonic distributions dependent on environment. Future studies will investigate whether these and other features (which are not contrastive in most varieties of ASL) may be contrastive in other dialects and/or other signed languages.

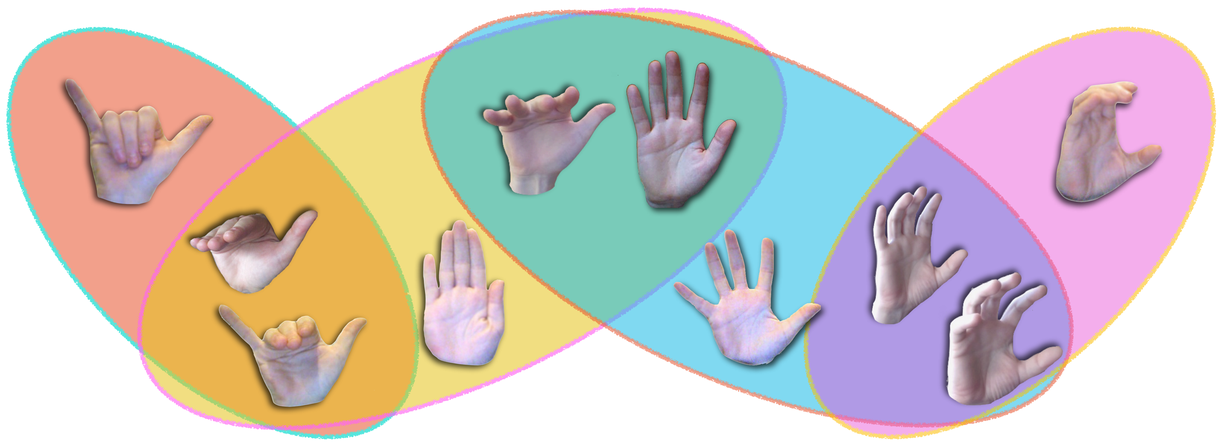


handshape	V		K	
T,F1,F2	OFF= 1EEE 〈 2EEE	OFF= 1EEE 〈 2FEE	OFF= 1EEE 〈 2FEE	PFE= 1EEE < 2FEE
as in	PAIR	SEE	PINK	PURPLE

SEE and PINK appear in our data set produced with the same hand configuration. If this is found to be a statistically significant pattern in larger corpora, it might indicate that a single phone in ASL is a member of multiple phonemic categories.

Handshape Categories

Using a feature-based phonetic description of multiple productions of hand configurations, we can start to see patterns in which features are obligatorily included in different signs and with different handshapes, which features may be deleted, and when these deletions and inclusions are or are not contrastive. We have begun to investigate the identity of phonemic-level handshape categories, the different phones included in each, and the feature-level and phone-level overlap between categories.



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