Research Into Tokenizing American Sign Language

How does ASL compare with spoken language?

ASL is a language completely separate and distinct from English. It contains all the fundamental features of a language, with its own rules for pronunciation, word formation, and word order. For example, English speakers may ask a question by raising the pitch of their voices and by adjusting word order; ASL users ask a question by raising their eyebrows, widening their eyes, and tilting their bodies forward.

These ways of expressing ideas can vary from user to user and even have regional accents and dialects. Just as certain English words are spoken differently in different parts of the country, ASL has regional variations in the rhythm of signing, pronunciation, slang, and signs used.

Facial Expressions and Sign Language

In ASL, facial expressions are used to express both linguistic information and emotions. For example, an eyebrow raise is necessary to mark general questions in most sign languages or if you sign the word "quiet," and add an exaggerated or intense facial expression, you are telling your audience to be "very quiet.".

Facial expressions are an example of a set of behaviors called "non-manual markers." Non-manual markers include facial expressions, head tilt, head nod, head shake, shoulder raising, mouth morphemes, and other non-signed signals that influence the meaning of your signs. At the same time, signers use the face to express emotions, either their own or when quoting someone else.

This is what can make ASL interpretation through software difficult. When grammar and emotions are important to the meaning of what is being signed, a program may not be able to correctly evaluate what a facial expression is conveying.

**Possible area of exploration:https://github.com/CMU-Perceptual-Computing-Lab/openpose

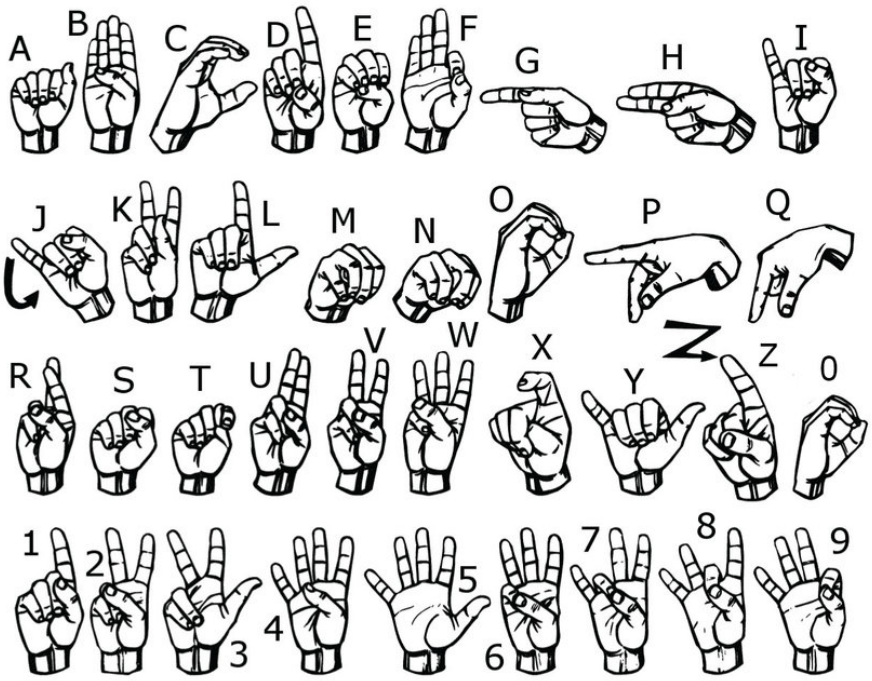
OpenPose software is the first real-time multi-person system to jointly detect human body, hand, facial, and foot keypoints on single images. It allows automatic tracking of hands, body, and facial features in 2D videos.

Pointing

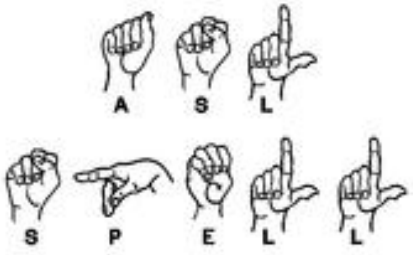
Pointing signs are used for pronominal reference (among many other functions) in sign languages. Pronominal signs can be used as pointing gestures or to indicate personal pronouns in ASL. For example, the sign for we/us in ASL is:

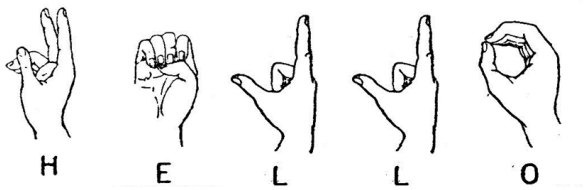
Proposed Progression of Interpretation

- **Letters & Numbers** - Recognizing the individual letters [American Manual Alphabet (AMA)] and numbers in the language

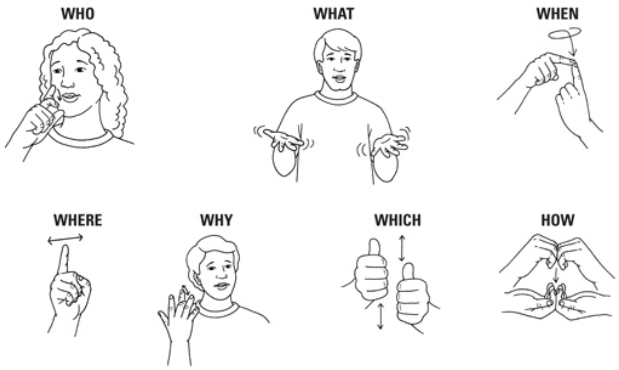


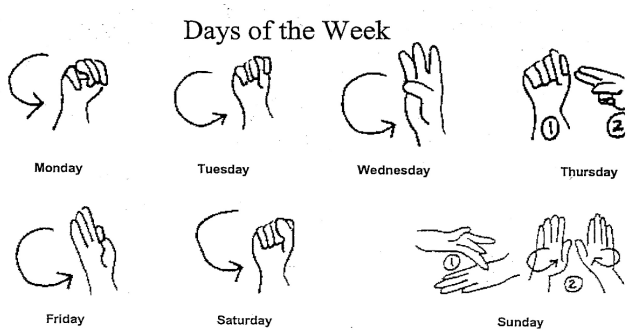
- **Fingerspelling** - Building upon recognizing the atoms of the language. This involves recognizing each atom and stringing them together to form a word.



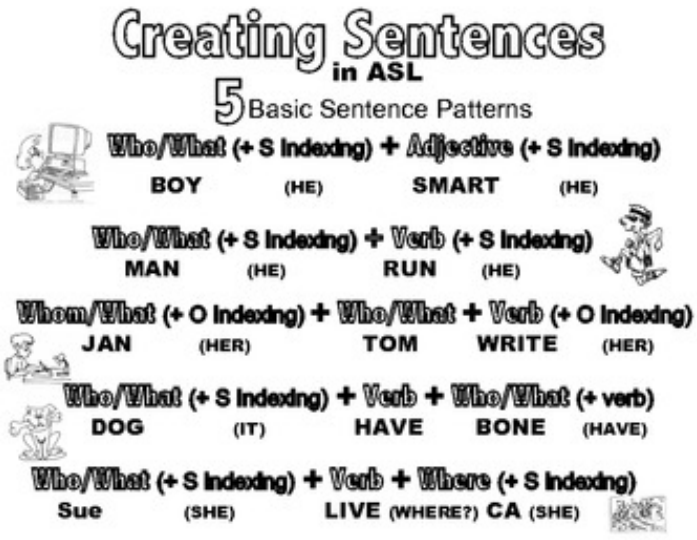


- **Word Recognition** - Beginning to recognize signs for specific words in ASL

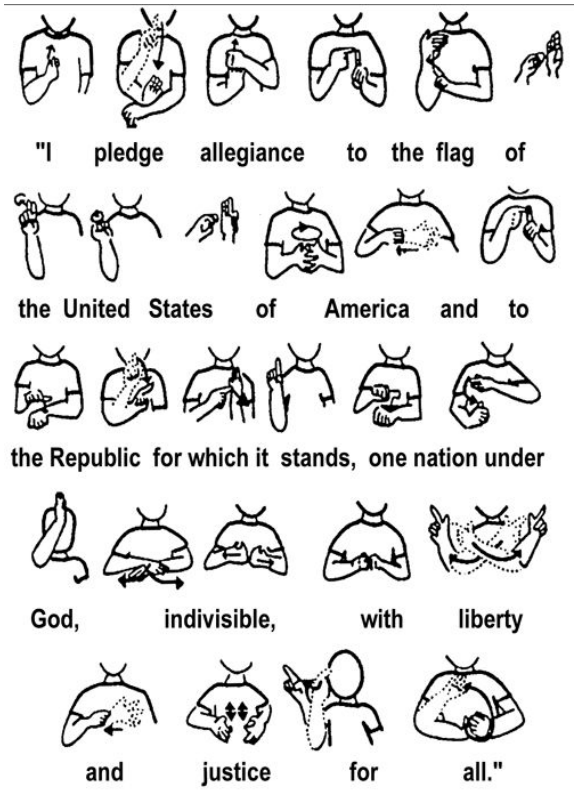




- **Phrase/Short Sentence Recognition**



- **Longer sentence/Paragraph recognition**



Sources:

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