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Computational Linguistics & Speech Processing Lab

Analyzing the Prosodic Forms and Functions of Non-manual Markers in American Sign Language

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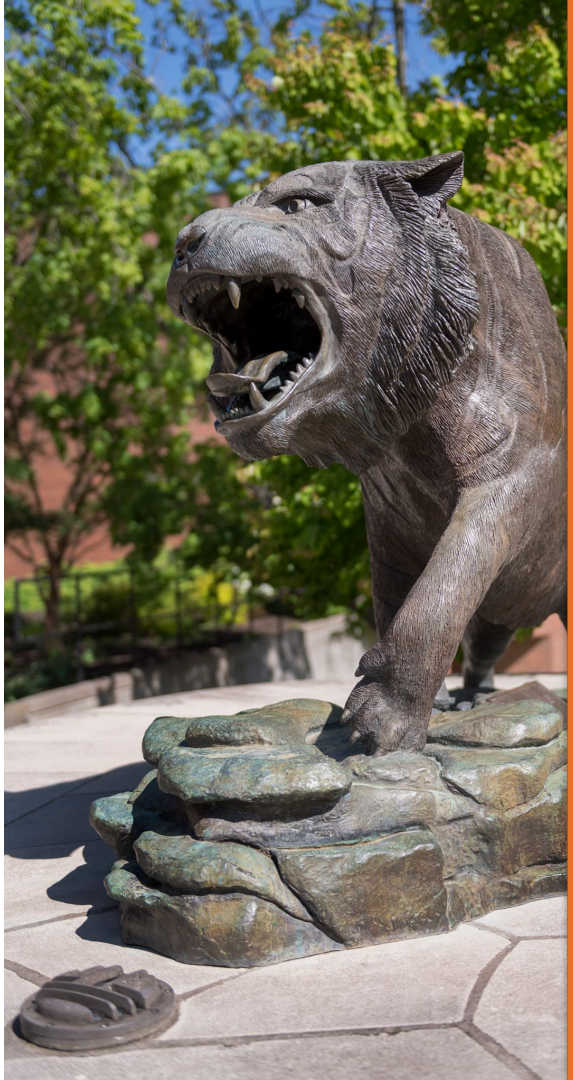

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Background

American Sign Language

- Prosody in signed languages involves speed, pauses, disfluencies, and **Non-Manual Markers** (NMMs) [6]

- NMMs are critical for accurate comprehension and translation [2]
  - Fluent ASL users of all language statuses utilize certain phonetic [1] and semantic [11] features, such as coarticulation when fingerspelling and final lengthening.

- Difference between **grammatical** NMMs and **prosodic** NMMs [12]
  - E.g. Speed [12] and Constructed Action [4]

Prosody in ASL

- **Unimodal Prosodic Cues**
  - E.g. Eyebrows in Sign Language of the Netherlands [5]

- Disambiguation cues include “repetition, emphatic lexical signs, and [other] **prosodic markers**.” [10]
  - Fluent ASL signers utilize fewer disambiguating cues than non-signers and signers of other languages [8]

- **Form and function** [3]
  - Complexity with classifiers and kinematics [9]
  - Bidirectional effects [7]

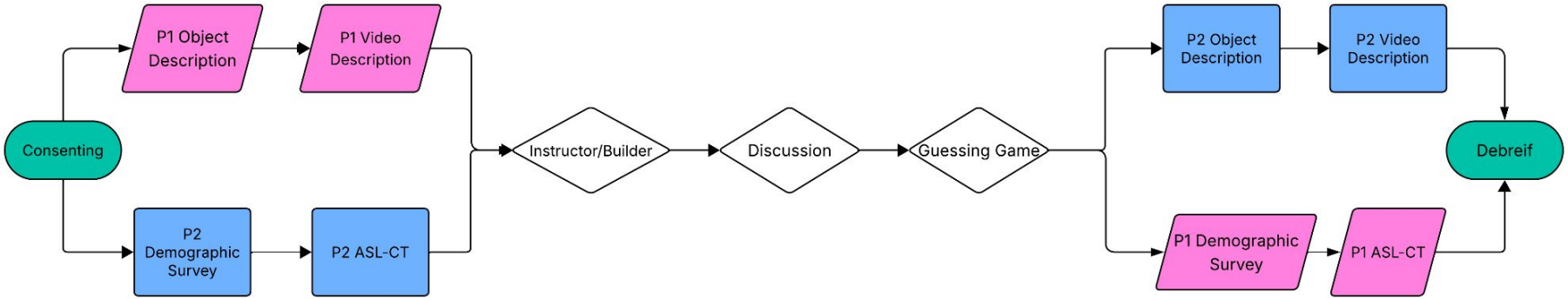
Research Questions

- **RQ1:** Which NMMs have prosodic functions in ASL?
- **RQ2:** What are the differences in form between the prosodic and grammatical functions of similar NMMs?
- **RQ3:** Is it possible to distinguish the function of a prosodic NMM from its form alone?

Methods

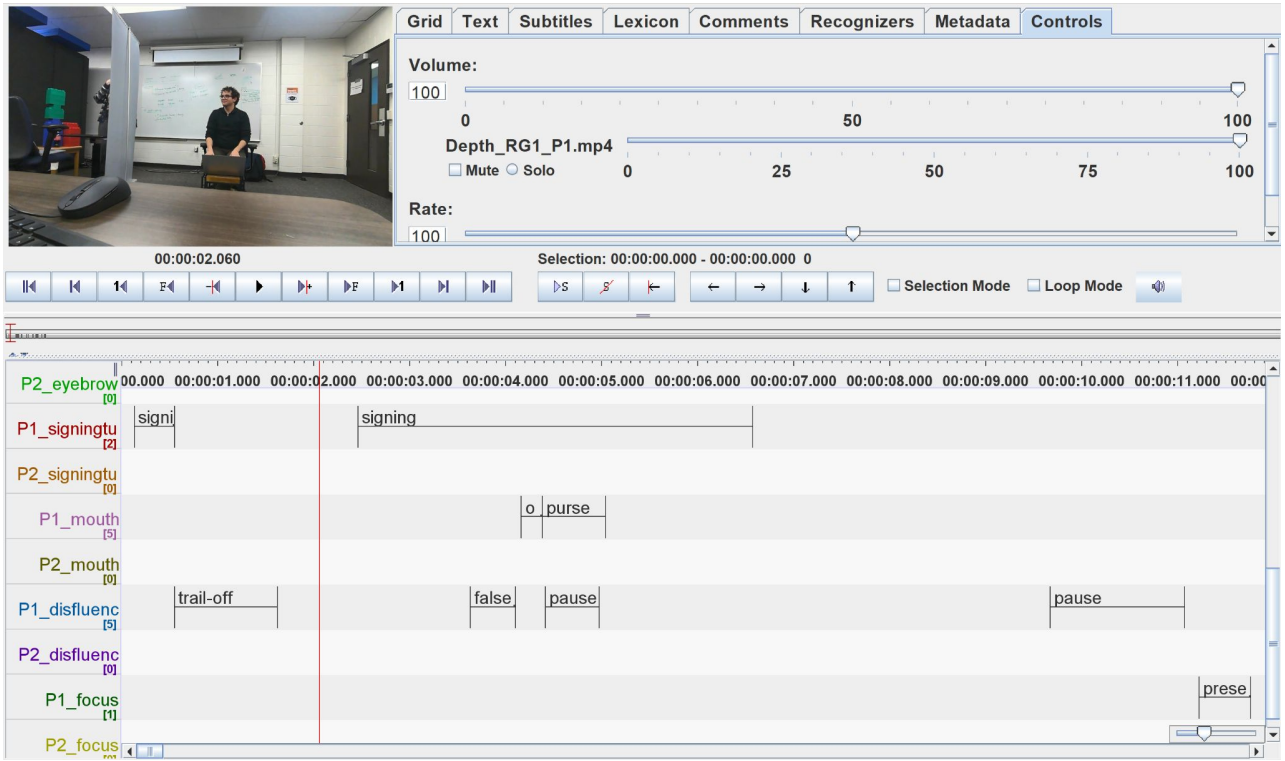
Experimental Setup

Procedure


P1 Object Description
P1 Video Description
Consenting
P2 Demographic Survey
P2 ASL-CT
Instructor/Builder
Discussion
Guessing Game
P2 Object Description
P2 Video Description
Debreif
P1 Demographic Survey
P1 ASL-CT

Preliminary Results

Annotations



Annotation example by Amber Hamilton

Analysis

- **RQ1**
  - Head nods, head tilts, body movement, and eyebrow height are salient prosodic cues
  - Not body tilt (unobserved) or turn taking (not a NMM)
  - Mouthing and disfluencies require further study

- **Reliability Metrics**
  - Cohen's Kappa for intra-rater reliability
  - Fleiss' Kappa for inter-rater reliability

Discussion

Conclusion

- **Strengths**
  - Exploratory study confirming prior research
  - Strong future directions

- **Limitations**
  - No current statistical significance
  - Only annotating for presence of NMMs, not different functions

- **Ethical Impact**
  - Under-studied language, language deprivation
  - Clear consent and debriefing process for public release
  - Collaboration with deaf researchers

Future Work

- **RQ2**
  - Collect data from 64 L1 signers
  - Annotate functions of NMMs with a high degree of reliability
    - Duration, amplitude, co-occurrence with manual elements [3]
    - Number of prosodic cues produced simultaneously [8]

- **RQ3**
  - Determining the line between ASL mouth morphemes and mouthing of English words alongside signs
  - Building a model to predict functions of NMMs from form
    - OpenFace Action Units, MediaPipe Face Mesh

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Questions?