Annotation for
Sign Language Processing

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Introduction

• Sign language processing
  – No written form - SignWriting processing
  – Oral form
    • Automatic recognition: image processing -> linguistic modelling
    • Automatic generation: body modelling -> linguistic modelling
    • Automatic translation: recognition + generation

• Methods
  – Corpus annotation
  – Analysis: qualitative, quantitative
  – Modelling: statistics -> formalisation
  – Evaluation
    • Recognition: only recognition rate, not on usability
    • Generation: lack of acceptability
      – non manual components

Need more knowledge
Non manual components

- Spatio-temporal structure
- Synchronisation with other components

- head, shoulders
- arms
- torso
- gaze
- eye aperture
- eyebrow
- blinking
- chin
- mouth
- tongue
- DictaSign

SLCN - Annotation
Examples: eyebrow, blinking, eye gaze

• Aim
  – Automatic generation
  – Image processing
  ➔ Fine description

• Corpora
  – LS-Colin: LSF narrations
  – Dicta-Sign: dialogues

• Method
  – Fine annotation of observables
    • Qualitative
    • Quantitative
  – Analysis
  – Formalisation (next workshop)
Qualitative annotation

- Annotation with symbols
  - Unique set of few symbols
  - Decomposition of movement
  - Use of colour for amplitude

- Example: eyebrow movement, eye aperture
  - LS-Colin corpus, Anvil software
  - Use of colour for the segments
  -> Very useful for a first global-visual analysis
  - Blue: eyebrow raised, opened eyes
  - Orange: eyes closed
  - Green: blinking
Quantitative annotation

• Annotation on video
  – Very time-consuming but
    • Needed for fine description
    • Should help designing automatic tracking tools
  – Computations

-> Curves, that can be aligned with other annotations

• Example: eyebrow movement
  – LS-Colin corpus, Anvil software
  – Example of results here ------>

• Eyebrow during shift roles, combination with other constraints (question, negation...)
Analysis

• Computations
  – Quantitative data on durations
  – Relation ships between body components

• Example: temporal relations between gaze directed toward signing space and manual components
  – Dicta-Sign corpus, iLex software
  – 2 tiers
    • Gaze target: ad, b:zone, sp, x, ?
      – Ad = addressee, b:zone = body: {hand, arm, other}, sp = signing space, x = other identified gaze, ? = unidentified gaze
    • Gaze interpretation: [AC] dim @id (:string)?
      – A = looking at an activated zone, or C = creation of a new @id zone
dim = p|l|s|v, point, line, surface, volume
@id = @[0-9]+, id of the entity in the signing sp.
string = optional quoted string (e.g. "cat")
      – Examples: Cs@6: "picture", Ap@6: "picture corner"
    – Computation of temporal relations between intervals (Allen)

<table>
<thead>
<tr>
<th>Relation</th>
<th>Illustration</th>
<th>Interpretation</th>
</tr>
</thead>
<tbody>
<tr>
<td>X&lt;Y</td>
<td>X</td>
<td>Y takes place before Y</td>
</tr>
<tr>
<td>Y&gt;X</td>
<td></td>
<td>X overlaps with Y</td>
</tr>
<tr>
<td>X_mY</td>
<td>X</td>
<td>X meets Y (m stands for meeting)</td>
</tr>
<tr>
<td>Y_miX</td>
<td></td>
<td>Y overlaps with X</td>
</tr>
<tr>
<td>X_oY</td>
<td>X</td>
<td>X starts Y</td>
</tr>
<tr>
<td>Y_oiX</td>
<td></td>
<td>Y starts X</td>
</tr>
<tr>
<td>X_fY</td>
<td>X</td>
<td>X finishes Y</td>
</tr>
<tr>
<td>Y_fiX</td>
<td></td>
<td>Y finishes X</td>
</tr>
<tr>
<td>X=X</td>
<td>X</td>
<td>X is equal to Y</td>
</tr>
</tbody>
</table>
Conclusion

Computers will not sign, or recognize, or translate without analysis of detailed annotations

- More body components
- More relations between components
- More figures

Useful for computer scientists but also for linguists
- annotation software: toward automatic processing
- linguistic modelling: new kind of knowledge