Spoken and Sign Languages
A Cross Modal Study

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Overview

• Introduction - Research in SLs
• Framework Adopted
• The Indian Sign Language
• Cross-modal Systems - Challenges
• INGIT – Issues and Solutions
• Summing Up
• Future Directions
Introduction

• Language – a multimodal construct
• Evolution of Sign Languages
  • Origin – ‘Deaf’ communities
  • Evolution – linguistic aspects
• Sociolinguistic Aspects - ISL
  • Geographical Variation
  • Status as a Minority Language
  • ISL in Education [Deshmukh96]
Introduction

• Past Research in SLs
  • Neuro-physiological
    • [Damasio86], [Gordon04]
  • Multi-modal [Petitto04]
  • Descriptive
    • [Stokoe60], [Sexton99]
  • Cross-modal
    • [Wray et al 04], [Zhao et al 00], [Speers02]
• The case of ISL
  • [Vasishta et al 86], [Zeshan00]
The Present Project

• Issues in cross-modality
  • Representations
  • Mappings

• Part of a larger endeavour
  • A description of ISL
  • A cross-modal translation system
Framework Adopted

• Construction Grammars [Kay, 2002]
  • The fly is buzzing.
  • What is the fly doing in my soup?
  • . . . fly in the ointment. . .

• Constructions
  • form – meaning maps at various levels
  • morphological, lexical, syntactic

• Unification based approach
Framework Adopted

• Fluid Construction Grammar (FCG)
  • Computational model of CG [De Beule and Steels, 2006]
  • Paired syntactic and Semantic Structures
  • Bidirectional rules, unification based approach
• Why Construction Grammars?
The Indian Sign Language

- Spatial Modality
- Extensive use of space
  - Iconic signs
  - Role play
  - Use of person and space deixis
  - Directional verbs
  - Non-manual markers
Ram gave Sita a cat
Does Ram love Sita?
Cross-Modal Issues

• Levels of Mapping
  • Constituent Level
    • Complete
      • गाडी सात बजे जाएगी → \{train time seven go\}
    • Partial
      • Constituent Deletion
        • राजधानी रात में चलती है → \{rAjdhAni night go\}
      • Constituent Insertion
        • आप दस रुपये दीजिए → \{money ten give {you me}\}
Cross-Modal Issues

• Levels of Mapping
  • Construction Level
    • Compositional
      • टिकट नहीं मिलेगा क्यौंकि वेंटिंग है \( \rightarrow @\text{neg} \{ \text{ticket get neg} \} \{ \text{Q-why} \} \{ \text{waiting-list} \} \)
    • Non-Compositional
      • \( X \text{ में } Y \text{ वेंटिंग है} \rightarrow \{ x \text{ waiting-list } y \} \)
Cross-Modal Issues

• Visuo-spatial nature of ISL
  • Yes-no Question vs. corresponding affirmative
  • Spatial Morphology – aspect, classifier

• Polysemous Expressions
  • attributive and existential senses of ‘है’
  • alienable vs. inalienable possession as in मेरी किताब and मेरा भाई
  • transactional and non-transactional senses of the verb ‘ले’
Cross-Modal Issues

• Elided Expressions
  • दस रुपये दीजिए → {ten rupees give {you me}}
  • Event semantics in ISL
• Anaphoric expressions
  • May be resolved to saturate event semantics
  • May be replaced with deictic signs
INGIT – Issues and Solutions

• Elided Expressions
  • Semantically mediated route
  • HPSG, CG …

• Mapping Levels
  • Morphological, lexical, sentential
  • Hybrid formulaic expressions

• … Construction Grammars
INGIT – Issues and Solutions

• Ellipsis and Anaphora
  • Ellipsis resolution module
    • Participants in transactional events
    • Subject in monadic/dyadic events
  • Some instances passed on to ISL using unit constructions

• Polysemous expressions: unit constructions
INGIT – Issues and Solutions

• Mapping Level problem
  • Complete constituent mapping: word-constituent mappings
  • Partial constituent mapping
    • Deletion: word-constituent mapping
    • Insertion: indeterminate process, unit constructions used

• Constructional Mapping: unit and compositional constructions
INGIT – Issues and Solutions

• Visuo-Spatial Nature of ISL
  • Output formatted in a manner so as to enable the rendering module to bring out directionality
  • Output String tagged for visual markers and deictics
Summing Up

• Semantically mediated procedure
• CG adapted to specific objectives
• Working implementation developed *

Future Directions

• Describe ISL in terms of a framework allowing parallel processing
  • Define such a framework and develop formalisms for the same

• Further explore representational and mapping issues

• Develop robust graphical front end

• Add support to take speech as an input
References

References


