Quantitative Comparative Interactional Linguistics

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Interactional Linguistics

What it is?

• how people are interacting with each other through language
• the study of the linguistic structures of such interaction

Focus on

• analysis of spontaneous spoken data
• objects studied are multidimensional (*lexis, syntax and prosody, ...*)
  • turn-taking, discourse particles, discourse syntactic positions, repairs, fragments, spoken language constructions

[Couper-Kuhlen and Selting, 2001]

Methods:

• Conversational Analysis
• light-weight quantitative descriptions (sometimes)
Comparative Interactional Linguistics

Contrastive Conversation Analysis [Maynard, 1990]
Studied multimodal backchannel behaviors in English and Japanese (aizuchi)
Says that backchannels in Japanese and English occurs in different contexts

- Corpus-based: about 2 hours of video
- Manual coding and analysis
- problem of 'equivalence': cannot rely on semantic equivalence through parallel data / sentences

[Clancy et al., 1996]: Mandarin, English, Japanese (25 minutes)
More Interactional? Linguistics: Discourse and semantic studies

- [Lambrecht, 1988]: SVO with lexicalized S and O is not the basic structure for spoken French
- [Traugott and Dasher, 2001]’s paths of semantic change
  - truth-conditional $\leadsto$ non-truth conditional (?)
  - content $\leadsto$ content-procedural $\leadsto$ procedural (?)
  - scope-within-proposition $\leadsto$ scope-over-proposition $\leadsto$ scope-over-discourse
  - nonsubjective $\leadsto$ subjective $\leadsto$ intersubjective
More Interactional Linguistics: Formal approaches to dialogue

[Ginzburg, 2012] accumulates example to justify

- the promotion of *tokens* (vs. *types*) as first-class citizens for grammar
- a grammar of performance
- the inclusion of a dialogue game board with public and private parts

Formalized (in an HPSG-style grammar boosted with situation semantics and expressed in *Type Theory with Records*) :

- short answers, clarification ellipses
- simple feedback
- disfluencies
Quantitative Comparative Interactional Linguistics

- *quantitative* requires significant amount of data (statistical significance)
- QCIL: Approach in a systematic data-driven way on large comparable corpora
- Existing works:
  - [Ward and Tsukahara, 2000]: Turn-taking and prosody in English and Japanese
  - [Levitan et al., 2015]: Entrainment in English, Mandarin, Spanish and Slovak
  - ...
General framework

Same situation encoded in comparable corpora

- same communicative needs
- same time pressure
- same interpersonnal relationships
- (remain interindividual variation)

Significant differences observed due to:

- linguistic / interactional structures
- socio-cultural constraints

Commonalitites / Universals ?

- At interactional level [Levinson, 2006]
- Related to findings on Broca’s area of processing complex hierarchical structures [Higuchi et al., 2009]
Overall characteristics of the ’orchid’ dataset

Size:

<table>
<thead>
<tr>
<th></th>
<th>lge</th>
<th>dur(m)</th>
<th>syll</th>
<th>tokens</th>
<th>PU</th>
<th>DU</th>
</tr>
</thead>
<tbody>
<tr>
<td>fr</td>
<td>89</td>
<td>23631</td>
<td>20233</td>
<td>6057</td>
<td>2130</td>
<td></td>
</tr>
<tr>
<td>tw</td>
<td>205</td>
<td>54615</td>
<td>37637</td>
<td>8563</td>
<td>5673</td>
<td></td>
</tr>
</tbody>
</table>

- face-to-face interaction, long conversation, without a very specific task
- recorded in good conditions

Domains:

<table>
<thead>
<tr>
<th>Description</th>
<th>Tier Name</th>
<th>Tier Content</th>
</tr>
</thead>
<tbody>
<tr>
<td>Syllable</td>
<td>Syllable</td>
<td>STRING-UTF8</td>
</tr>
<tr>
<td>Token</td>
<td>Word</td>
<td>STRING-UTF8</td>
</tr>
<tr>
<td>Part-Of-Speech</td>
<td>POS</td>
<td>STRING-UTF8</td>
</tr>
<tr>
<td>Prosodic Units</td>
<td>PU</td>
<td>’PU’</td>
</tr>
<tr>
<td>Discourse Units</td>
<td>DU</td>
<td>{ ’DU’, ’ADU’}</td>
</tr>
</tbody>
</table>
Creating prosodic units

French

- Both phonetic and phonological criteria have been used to segment
- 3 levels $\rightarrow$ First evaluation $\rightarrow$ Derive a less detailed but more reliable dataset
- Second Evaluation: $\kappa$-score of 0.71

Mandarin

- 1 level
- Cues: pitch reset (a shift upward in overall pitch level), lengthening, alternation of speech rate, occurrences of paralinguistic sounds
- Process
  - Train 3 labelers on 150 turns until a satisfactory consistency rate
  - Rest of the dataset was completed by the three labelers independently
Producing discourse units

- Discourse Segmentation guidelines inspired from [Muller et al., 2012] and [Chen, 2011]
- Combine
  - semantic criterion: main predicate (denoting an eventuality $\leadsto$ propositional content)
  - discourse criterion (presence of discourse markers)
  - pragmatic criterion (recognition of specific speech acts)
- Evaluation:
  - French: $0.74 \lt \kappa \lt 0.85$
  - Taiwan Mandarin: 0.86
Illustration

(1) French Discourse Units
[on y va avec des copains]$_{du}$ [on avait pris le ferry en Normandie]$_{du}$ [puisque j’avais un frère qui était en Normandie]$_{du}$ [on traverse]$_{du}$ [on avait passé une nuit épouvantable sur le ferry]$_{du}$
[we going there with friends]$_{du}$ [we took the ferry in Normandy]$_{du}$ [since I had a brother that was in Normandy]$_{du}$ [we cross]$_{du}$ [we spent a terrible night on the ferry]$_{du}$

(2) Mandarin discourse units
[qishi ta jiang de na ge ren yinwei ta you qu kai guo hui]$_{du}$ [ta hai you jiang]$_{du}$ [keneng shi ye bu zhidao wei she me]$_{du}$
[in fact the one he mentioned had the meeting]$_{du}$ [he said in addition]$_{du}$ [probably (he) did not know why, either]$_{du}$
Size of units

<table>
<thead>
<tr>
<th></th>
<th>dur (s)</th>
<th># syll</th>
<th>#tokens</th>
<th># PU</th>
</tr>
</thead>
<tbody>
<tr>
<td>PU-fr</td>
<td>0.88</td>
<td>3.9</td>
<td>3.3</td>
<td>-</td>
</tr>
<tr>
<td>PU-tw</td>
<td>1.44</td>
<td>6.4</td>
<td>4.4</td>
<td>-</td>
</tr>
<tr>
<td>DU-fr</td>
<td>2.51</td>
<td>11.1</td>
<td>9.5</td>
<td>2.8</td>
</tr>
<tr>
<td>DU-tw</td>
<td>2.17</td>
<td>9.6</td>
<td>6.6</td>
<td>1.5</td>
</tr>
</tbody>
</table>

**Table**: Comparative size of the units produced
Association of prosodic and discourse units

Figure: Distribution of PU/DU simplified association types
Syntactic categories at beginning boundaries

Figure: POS distribution at Initial matching boundaries
Syntactic categories at ending boundaries

**Figure**: POS distribution at Final matching boundaries
Observations

Initial and starting ’tokens’ fits more or less what is known a

- Mandarin
  - $\emptyset$-Anaphora extremely frequent in conversation
  - Initiale position = Topique (frequent construction)
  - Final particles are part of Mandarin grammar (aspect, mood,...)

- Français:
  - Initial Pronouns et Conjunctions (specially in conversation)
Chunks: a processing unit?

- Objective: define processing unit, "chunks" = first trial
- Hypothesis: *If chunks are processing units, the DUs and PUs across languages should remain similar in terms size-in-chunks distribution*
- Chunks: Created with hand-crafted rules based on POS tags
- Hypothesis not verified: different sizes across French and Taiwan Mandarin
  - Potential issue with sampling: turn-based selection vs. sequence-based selection
  - Comparability of the datasets?
Conclusion

- Very small differences in corpora design and annotation results in observable differences
- Comparable ’enough’ dataset of significant size requires
  - ideally joint design + mutual checks at each corpus building decision point
  - achievable on a unique site only or thought deep and continuous collaboration

Ongoing / starting work:
- Systematic investigation Mono-, bi- and tri-chunks PUs and DUs
- Radical approach to QCIL
Radical approach to QCIL

- Non-supervised endogenous segmentation for both spoken French and Mandarin (based on syllables)
- [Magistry and Sagot, 2012] approach and system
- 'spoken language' tagging, chunking and semantic analysis $\mapsto$ spoken structures
  - genre, putain : Discourse markers (not Nouns)
- cross-lingual mapping / comparison of spoken structures
  - made easier thanks to the radical approach sketched
  - through formal characterisations
Illustration of the first step

(3) et donc on s’installe un peu partout # on on allume les trucs
and so we settle down a bit everywhere # we we light up the things
a. [et donc on s’installe un peu partout] # [on on allume les trucs]
b. edo~k o~sU~stAl U~p@ pARtu o~n o~nAlym le tRyk

(4)
a. [edo~k/DM o~/Pro sU~stAl/V U~p@/R pARtu/R]
   [o~n/Pro o~/Pro Alym/V/ le/Det tRyk/N]

(5) [edo~k]_{DC} [o~ sU~stAl]_{VC} [U~p@ pARtu]_{RC} [o~n o~n Alym]_{VC}[le
tRyk]_{NC}
a. [edo~k/DC VC RC] [VC NC]
b. [edo~k/DC VC-action RC] [VC-action NC-generic]
The werewolf corpus
Comparative overview of a game

Actual Speaking Duration

# of simultaneous speakers
A new (?) Framework

An example

Werewolf

French illustration
A new (?) Framework

Corpus interesting for

- Fiercely spontaneous and interactional language structures
- Perfectly comparable (when protocol will be fixed)
- Attitudes, Emotion (laughter)
- Deceptive speech, Argumentation
- Linguistic management of group evolution through the interaction
References I

*Prosodic phrasing in Mandarin conversational discourse: A computational-acoustic perspective.*
PhD thesis, Graduate Institute of Linguistics, National Taiwan University.

The conversational use of reactive tokens in english, japanese, and mandarin.

Introducing interactional linguistics.
*Studies in interactional linguistics, 122.*

*The Interactive Stance: Meaning for Conversation.*
Oxford University Press.
References II


Unsupervised word segmentation: the case for Mandarin Chinese.


Manuel d’annotation en relations de discours du projet annodis.

Regularity in semantic change, volume 97.
Cambridge University Press.

Lexicon produced by the unsupervised segmenter for our French corpus

- si tu veux / ça doit / je crois / tu vois / tu sais
- et puis / non mais / enfin bon / ah ouais
- une fois / des fois
- pour faire
- en même temps
- comme si