Designing a corpus-based lexicon for spoken DRDs

SEMANTIC CONSIDERATIONS

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TextLink Final Action Conference, 19-21 March 2018, Toulouse
Overview of the talk

Introduction

• Variation of DRDs
• Existing DRD lexicons

Spoken corpus and functional classification

• Data
• Taxonomy in domains and functions

Proposal for the semantics of spoken DRDs

• Different types of polyfunctionality
• Next steps for the lexicon
Introduction

SYNTACTIC AND SEMANTIC VARIATION IN EXISTING LEXICONS
Variable terminology

- Written and spoken language is built upon relations of coherence
- These relations are often signalled by Discourse-Relational Devices (DRDs)
  - « connectives »: relation between two (or more) units, two-position markers (e.g., because)
  - « discourse markers »: not necessarily relational, one-position markers (e.g., I mean)

- « DRDs » as the umbrella term to cover formal and functional variability?
Variable form

- Typically short and fixed expressions with a (primarily) procedural meaning
- Common core: conjunctions (*and*, *but*, *although*) and adverbials (*so*, *however*, *in fact*)
- Other categories: verb phrases (*I mean*), interjections (*oh*)
- Other devices: alternative lexicalizations (*It results that*), syntactic forms (gerund)
Variable function

- DRDs are highly **polyfunctional** as a category: cause, contrast, specification, topic...
- Individual DRDs can be quite polyfunctional/ambiguous too: e.g. *actually, so, and*
  - depends on degree of granularity in semantic distinctions
- Translation equivalents are not necessarily used in the same way across languages
- Challenging to teach, to acquire and to translate
- Need for DRD lexicons to be consulted or applied automatically
Building lexicons

- Automatically extract information from annotated discourse banks
  - the case of the English section of Connective-Lex (PDTB)

- Manually inspecting texts and grammars
  - the case of LEXCONN (French) and DIMLex (German)

- Automatically extract information + manual verification and additions
  - the case of the *Diccionario de partículas discursivas del español – DPDE* (Spanish), *the LDM-PT* (Portuguese) and the CzeDLex (Czech)

- Most lexicons focus on written data: Czech, French, German, Italian, Portuguese

- Exceptions: the *DPDE and the Maschler Inventory of Hebrew Discourse Markers*
Encoding the polyfunctionality of DRDs in lexicons

- Different typologies to label the semantic relations expressed by DRDs:
  - LEXCONN $\rightarrow$ SDRT
  - DIMLex, LDM-PT $\rightarrow$ PDTB 3.0
  - DPDE $\rightarrow$ lexicographic definition

- Different solutions to encode polyfunctionality:
  - DIMLex $\rightarrow$ list of senses in a POS entry
  - LEXCONN, LDM-PT $\rightarrow$ individual entries of form-meaning pairs
  - DPDE: distinguishes between distinct uses (homonyms) and « other uses » (contextual senses)
Our proposal

• First steps for the semantic structure of a lexicon of spoken DRDs
• Based on annotations in the DisFrEn dataset (English-French)

• Which semantic labels to use
• How to account for ambiguity and polysemy
Why turn to speech?

- Several DRDs and relations are shared across speech and writing
  - *and, so, but, because, actually, in fact, for example…*

- Some shared DRDs perform *additional functions*
  - *so ➔ exemplification, topic-resuming*

- Some shared relations are expressed by *additional markers*
  - restatement ➔ *well, I mean, you know*
The DisFrEn dataset

CORPUS DATA AND FUNCTIONAL TAXONOMY
English-French comparable dataset

- 80,000 words (abt 7.5 hours) in each language
- 8 spoken genres, such as conversation, interview, classroom lesson, news broadcast...
- Sampled from existing corpora, mainly *International Corpus of English* and VALIBEL

- Text-to-sound aligned, audio available during annotation
- Manually annotated under EXMARaLDA
Identification of DRDs (discourse markers)

- Bottom-up (no closed list) and manual identification

- Three main criteria:
  - syntactic optionality
  - formal fixedness
  - procedural meaning

- 100+ DRD types in each language

actually; after; after all; albeit; alright; although; and; and so on; and still; and that kind of stuff; and then; and things; anyway; as; as it were; as long as; as soon as; because; before; but; but then; by the way; considering; either; etcetera; even if; even though; finally; first; first of all; for; for example; for instance; having said that; however; I don't know; I mean; I suppose; if; if you like; in addition; in fact; in other words; indeed; insofar as; instead; kind of; like; listen; look; meanwhile; nevertheless; no; now; oh; ok; okay; on the other hand; once; only; or; or something; otherwise; plus; provided; right; say; second; secondly; see; since; so; so that; sort of; then; therefore; though; till; unless; until; well; when; whenever; where; whereas; while; whilst; yeah; yes; yet; you know; you see

(Crible 2017)
Sense disambiguation (1)

- New taxonomy designed to reconcile models of discourse functions (speech) with discourse annotation schemes (writing)

- Two inter-dependent semantic-pragmatic layers:
  - domains (generic level): for quantitative analysis and summarization of data
  - functions (specific level): for descriptive accuracy

- Generic level mainly inspired by Redeker (1990), González (2005)
- Relational functions and guidelines inspired by the PDTB 2.0
- Additional functions inspired by González (2005), Cuenca (2013)
Sense disambiguation (2)

- 4 domains, 30 functions

<table>
<thead>
<tr>
<th>Ideational</th>
<th>Rhetorical</th>
<th>Sequential</th>
<th>Interpersonal</th>
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<tbody>
<tr>
<td>cause</td>
<td>motivation</td>
<td>punctuation</td>
<td>monitoring</td>
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<td>consequence</td>
<td>conclusion</td>
<td>opening boundary</td>
<td>face-saving</td>
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<td>concession</td>
<td>opposition</td>
<td>closing boundary</td>
<td>disagreeing</td>
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<td>contrast</td>
<td>specification</td>
<td>topic-resuming</td>
<td>agreeing</td>
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<td>alternative</td>
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<td>topic-shifting</td>
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<td>approximation</td>
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**inter-annotator agreement** $\kappa = 0.406, 44.5\%$

**intra-annotator agreement** $\kappa = 0.74, 75.8\%$
An example

BB1: could you talk a little bit about the Wirral accent I I know that um (0.200) there’s obviously quite a um range of accents in that part of the country

BB4: yeah (0.520) uh well I (0.290) consider myself to have a Cheshire accent because when I was born (0.300) and I lived in (0.110) on the Wirral (0.287) uh (0.333) i- (0.460) it was a Cheshire accent which is (0.440) the accent I have now though (0.270) there are overtones of (0.230) the Liverpudlian accent (0.290) however over the years certainly it has changed (0.270) and now it’s very much (0.110) a Liverpool accent (0.340) and uh you know which (0.430) I’m not (0.300) I’m not saying I disapprove of it but I think it’s a lazy speech and you need to (0.440) actually um (0.530) think about what you’re saying I know my nephew sometimes’ll to speak to me in the Liverpool accent (0.350) and I’ll say please speak to me in English <laughing/> (0.160) but it’s things like “yeah” and “you what” and (0.230) whereas you know mine is “yes” “pardon” or whatever <noise/> I’m a bit old-fashioned in that way so I do find the accent (0.440) is a bit harsh and it’s interesting that actually that accent is spread out into the (0.270) uh (0.390) the parts of north Wales that are very near to the Wirral…

(EN-intf-03)
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From meaning to function

- Not only the encoded semantics but also contextually enriched interpretations
- Includes functions related to the management of speech turns, topics or relationships
- Allows double labels for simultaneous functions

➢ Not only what they mean but also what they do
From corpus to lexicon

- Number and types of semantic labels for each DRD can be very high
  - 19 different (combination of) labels for 429 occurrences of so: CONS, CCL, SPE, TS, REFOR...
  - only two labels (result, reason) in the PDTB 2.0

- Not only due to data type but also a difference in the coverage of the taxonomy

- Such rich information cannot be directly implemented in the lexicon
  - needs to be filtered or structured
  - needs to be reduced so that it can be useful for the lexicon user

- Distinguish between different types of polyfunctionality
Our semantic proposal

POLYFUNCTIONALITY AND FUTURE STEPS
Ambiguity is ambiguous

Different types of polyfunctionality concern different DRDs or the same DRD:

1. Polysemy
2. Multifunctionality
3. Underspecification
4. Multidimensionality

- Ambiguity corresponds to homonymy (Tuggy 1993, e.g. *banks*): not relevant for DMs

(Crible forthc.)
Polysemy

- Single lexeme with clearly distinct yet related meanings (Lyons 1977)
- A DRD encodes more than one meaning
  - but = contrast, concession
  - so = consequence, specification

- The lexicon should reflect all of these meanings
Multifunctionality

- Two or more simultaneous functions in a given context
  - e.g. temporal + consequence
- Annotation instructions often limit to one or two labels
- Multifunctionality can be easily extracted from DisFrEn (double labels)

- Double labels are not practical for lexicons
  - choose the more prominent sense, if any
Underspecification

- The DRD expresses a meaning that is richer, more specific than its basic meaning.
- Mostly applies to *and* (most frequent DRD in written and spoken English)
  - only encodes addition, not polysemous
  - can be used in contexts with enriched interpretations of consequence, concession, contrast...
  - only 57% of all *and* tokens express addition in *DisFrEn* (1140 total)
  - 91% of all *and* tokens express addition in the PDTB (3000 total) + list (7%), result (1%), juxtap. (0.4%)
- Underspecified labels of *and* can be easily extracted from *DisFrEn*

- Either do not include in the lexicon (semantic spectrum only, not pragmatic functions)
- Or do not lose the information but distinguish underspecified uses from core meaning
Multidimensionality

- Applies to types, not tokens in context
- Some senses of the DRD belong to different domains (or dimensions)
- In DisFrEn, some labels have equivalents in other domains
  - contrast – opposition (ideational – rhetorical)
  - cause – motivation (ideational – rhetorical)
  - condition – relevance (ideational – rhetorical)
  - alternative – reformulation (ideational – rhetorical)
  - temporal – enumeration (ideational – sequential)
- These pairs are not formally identified in the corpus, simply listed as different labels
Multidimensionality: independent layers

- Inspired by Crible & Degand’s (in press) revision of the taxonomy
- From 30 to 11 functions:
  - Ideational
  - Rhetorical
  - Sequential
  - Interpersonal
  - [addition] [alternative] [cause] [condition] [consequence] [contrast] [opening] [punctuation] [specification] [temporal] [topic]

- Assumption: any function in any domain
- One core meaning (or more if polysemous) expressed in several domains
- The lexicon only includes the core meaning(s) and specifies possible domains
Nous sommes animés par le désir de participer à notre échelle au progrès de la connaissance mais nos liens avec l’université sont aussi fragiles

[ideational contrast]

Parce que je vois encore de la poésie en cinquième ce qui peut paraître classique mais enfin c’est comme ça que je voulais subdiviser le le cours

[rhetorical contrast]

L2 euh j’aime les néologismes j’aime les régionalismes mais euh je mets le point d’exclamation dessus euh pour dire euh attention

L1 mais la norme qu’est-ce qu’est-elle pour vous

[sequential contrast]

Alors cet auditeur vigilant il va vous dire tiens euh encore Jean d’Ormesson mais on entend Jean d’Ormesson à chaque automne

[interpersonal contrast]
From annotations to lexicon entries

- Current annotations in *DisFrEn* do not allow to distinguish between polysemy, underspecification and multidimensionality

- We need to decide
  - whether other DRDs besides *and* can be underspecified (*actually ? I mean ?*)
  - whether we want to include the enriched interpretations of underspecified DRDs
  - which labels are multidimensional equivalents
  - whether everything else is polysemous

- Reduce the polyfunctionality of DRDs in the lexicon
- Maintain a large coverage of their functional spectrum in speech (and writing)
## Possible semantic structure

<table>
<thead>
<tr>
<th>Entry</th>
<th>Core meaning</th>
<th>Domains of use</th>
<th>Underspecified uses</th>
</tr>
</thead>
<tbody>
<tr>
<td>AND</td>
<td>addition</td>
<td>ideational, rhetorical, sequential</td>
<td>consequence, contrast, specification, topic...</td>
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<td>SO</td>
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<tr>
<td>BUT</td>
<td>contrast</td>
<td>ideational, rhetorical, sequential, interpersonal</td>
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</tr>
<tr>
<td>WHEREAS</td>
<td>contrast</td>
<td>ideational</td>
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</tr>
</tbody>
</table>

- Corpus annotations from *DisFrEn* not directly applicable
- Requires some top-down semantic decisions
Conclusions

- Semantic framework necessary to structure DRDs polyfunctionality
  - in particular, to formalize the entries in the lexicon
  - in general, to revisit classifications and semantic-pragmatic descriptions

- Building a corpus-based lexicon is complex
  - *DisFrEn* was not specifically designed for lexicographic applications
  - However it offers a broader and more flexible view of the functional spectrum of DRDs
    - Importance of the purpose and research question behind any annotation endeavor

- Work in progress!
Thank you for your attention

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