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 $\rightsquigarrow$ non-truth conditional (?)
  - content $\rightsquigarrow$ content-procedural $\rightsquigarrow$ procedural (?)
  - scope-within-proposition $\rightsquigarrow$ scope-over-proposition $\rightsquigarrow$ scope-over-discourse
  - nonsubjective $\rightsquigarrow$ subjective $\rightsquigarrow$ 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 significancy)
- QCIL : Approach in a systematic a 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:

lge	dur(m)	syll	tokens	PU	DU
fr	89	23631	20233	6057	2130
tw	205	54615	37637	8563	5673

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

Domains:

Description	**Tier Name**	**Tier Content**
Syllable	Syllable	STRING-UTF8
Token	Word	STRING-UTF8
Part-Of-Speech	POS	STRING-UTF8
Prosodic Units	PU	'PU'
Discourse Units	DU	{ 'DU', 'ADU'}

Creating prosodic units

French

- Both phonetic and phonological criteria have been used to segment
- 3 levels $\rightsquigarrow$ First evaluation $\rightsquigarrow$ Derive a less detailed but more reliable dataset
- Second Evaluation: κ-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 $\rightsquigarrow$ propositional content)
  - discourse criterion *(presence of discourse markers)*
  - pragmatic criterion *(recognition of specific speech acts)*
- Evaluation:
  - French: $0.74 < \kappa < 0.85$
  - 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

	dur (s)	# syll	#tokens	# PU
PU-fr	0.88	3.9	3.3	-
PU-tw	1.44	6.4	4.4	-
DU-fr	2.51	11.1	9.5	2.8
DU-tw	2.17	9.6	6.6	1.5

Table : Comparative size of the units produced

Association of prosodic and discourse units

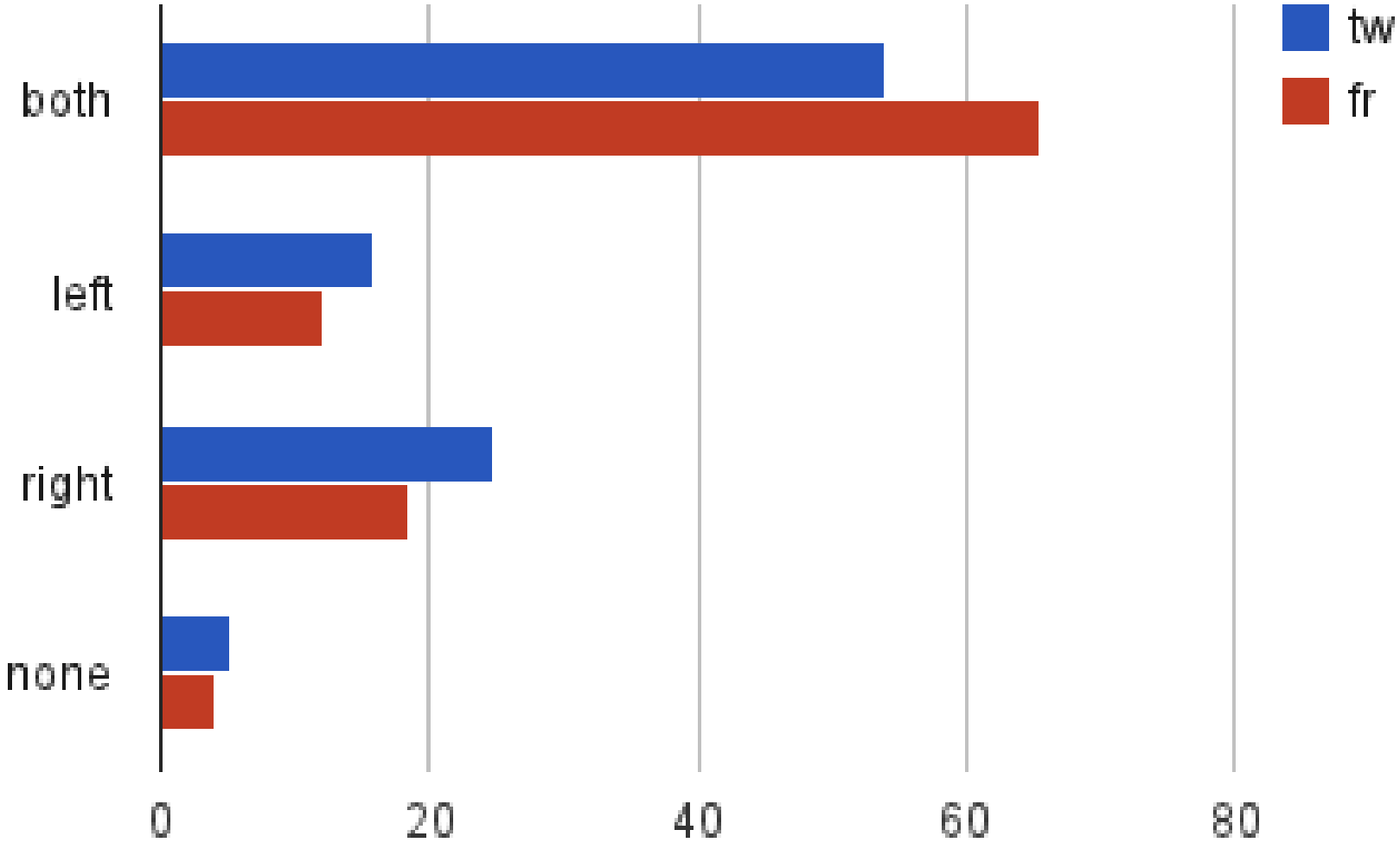


Figure : Distribution of PU/DU simplified association types

Syntactic categories at beginning boundaries

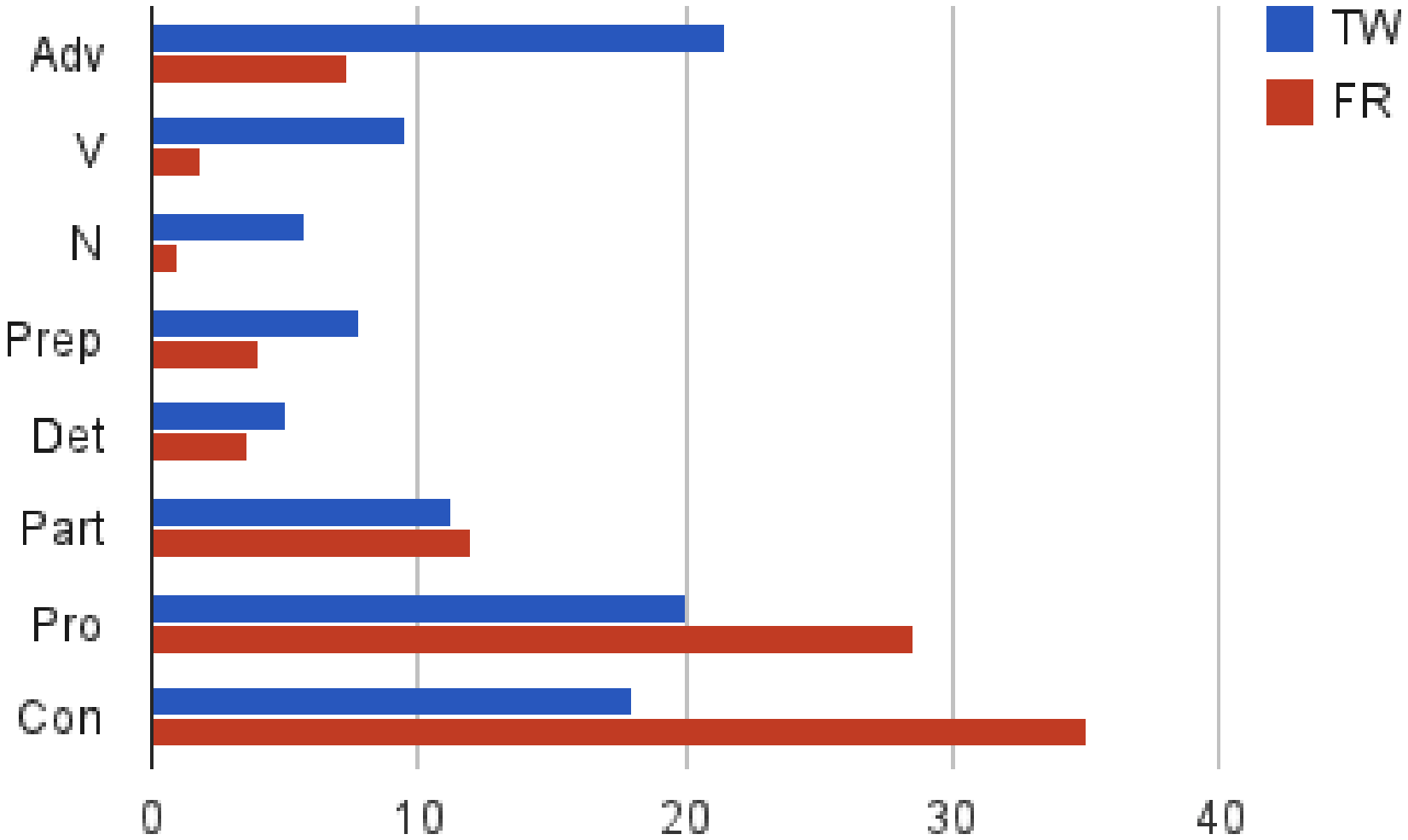


Figure : POS distribution at Initial matching boundaries

Syntactic categories at ending boundaries

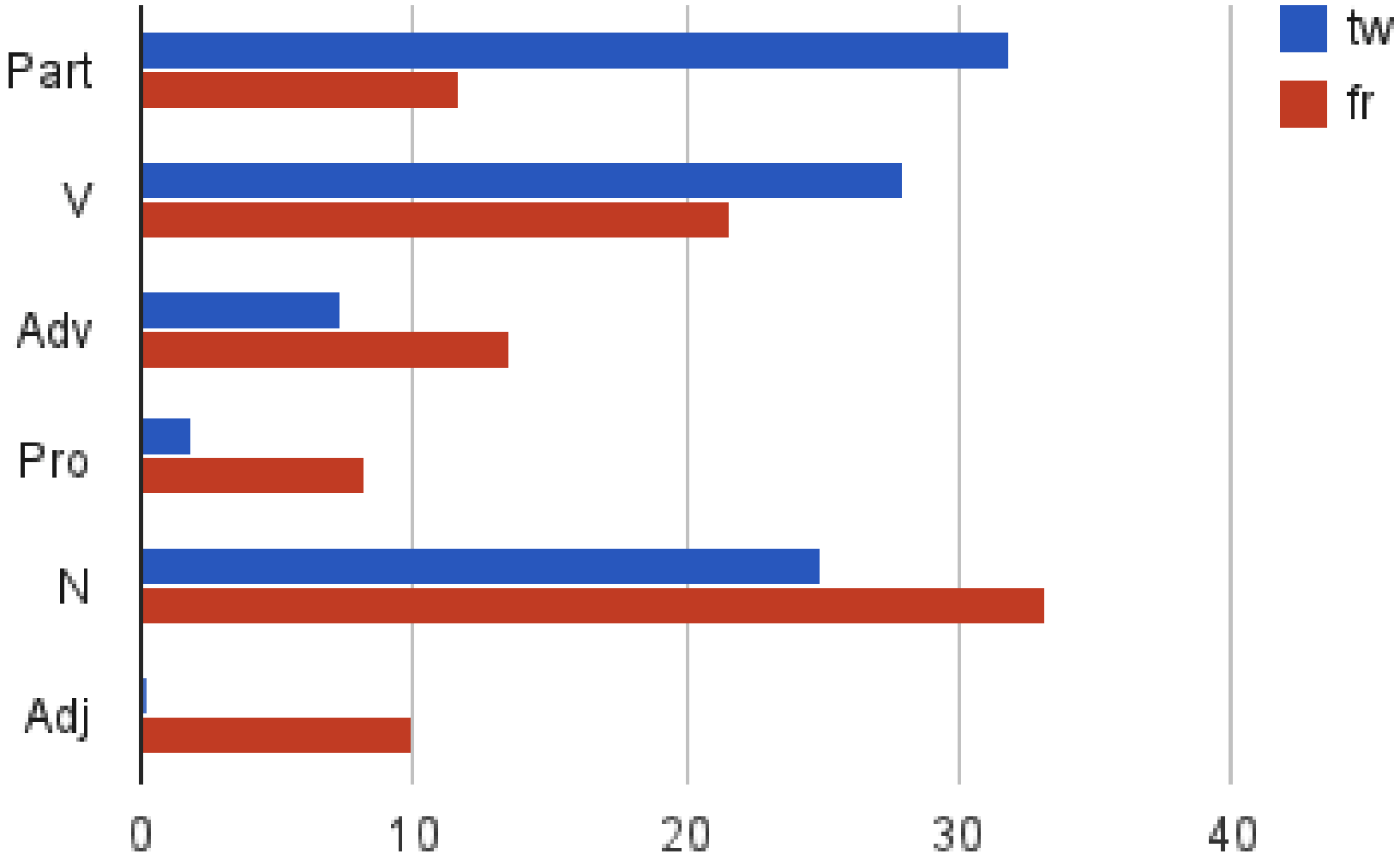


Figure : POS distribution at Final matching boundaries

Observations

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

- Mandarin
  - ∅-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 $\rightsquigarrow$ 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)

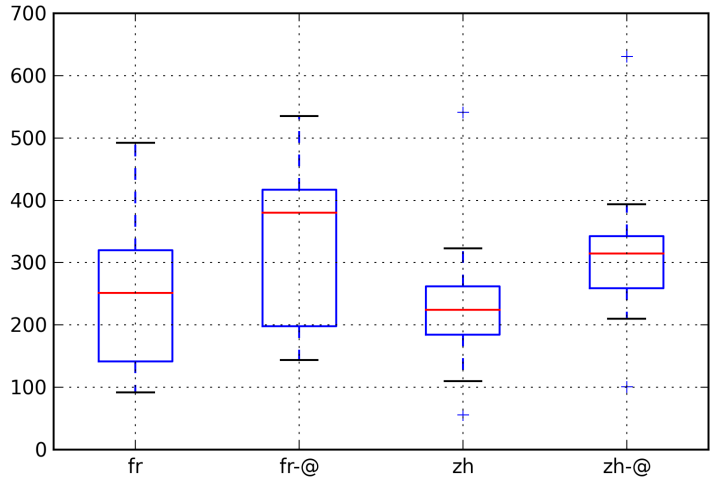
a. [edo∼k/DM o∼/Pro sU∼stAl/V U∼p@/R pARtu/R]
[o∼n/Pro o∼n/Pro AlymV/ le/Det tRyk/N]

(5) [edo∼k]$_{DC}$ [o∼ sU∼stAl]$_{VC}$ [U∼p@ pARtu]$_{RC}$ [o∼n o∼n Alym]$_{VC}$[le tRyk]$_{NC}$

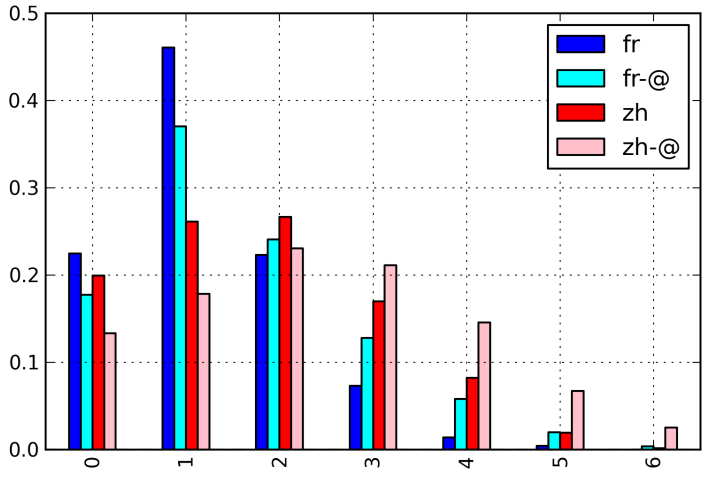
a. [edo∼k/*DC* VC RC] [VC NC]
b. [edo∼k/*DC* VC-action RC] [VC-action NC-generic]

The werewolf corpus

Comparative overview of a game

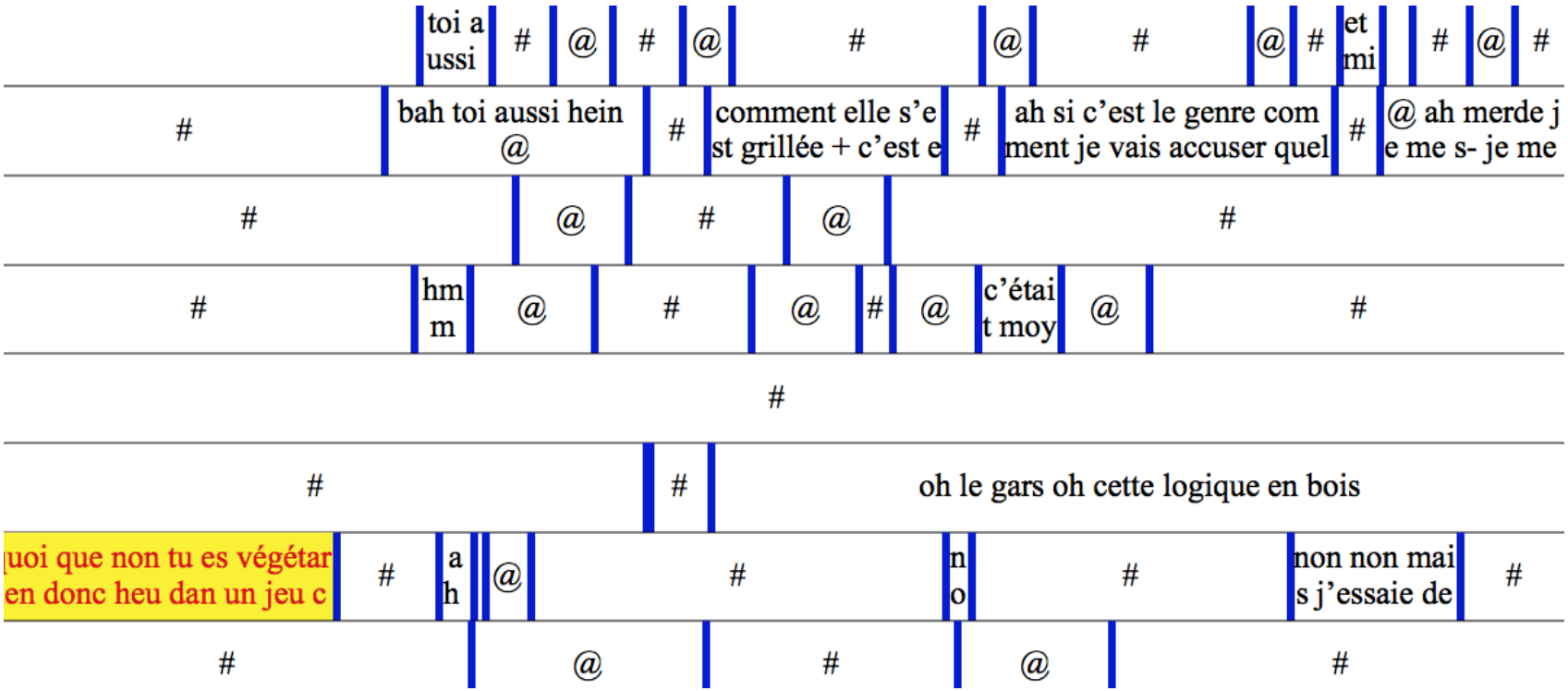


Actual Speaking Duration



# of simultaneous speakers

French illustration



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

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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