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Studying French mapping of syntax to prosody in natural speech

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Background
• Standard definition of the French Accenual Phrase: any lexical word and all dependent words at its left side [3, 5, 7].
• In general, a rising pitch movement (H*) marks its right edge [3, 5, 7].
• Factors contributing to the AP’s formation [6, 8, 2]:
  – # of syllables (3/4 on average)
  – Articulation rate
  – Rhythm (balance of APs in terms of # of syllables)

Goals
• Studying the syntax to prosody mapping to analyze the formation of APs in French by using large corpora & semi-automatic analysis
• Analyzing whether syntactic information is a good predictor of the AP’s formation
• Analyzing the contribution of:
  – Constituent length (# of syllables / phrase)
  – Constituent type
  – Temporal cues

Corpus
• Subset of French ETAPE corpus [4]
  ✓ 25 speakers
  ✓ 1.5 hours
  ✓ 16,377 words

Grammatical Annotations
• French Spoken Treebank [1]
  ✓ 25 POS labels
  ✓ 12 Constituent labels
  ✓ Several Function labels

Methods

Linguistic Information Extraction
• Focus on the most frequent constituents observed in the corpus:
  ✓ Noun Phrases (NP)
  ✓ Verbal Nuclei (VN)
  ✓ Adjectival Phrases (AdjP)
• Automatic alignment to the signal as Praats’ TextGrids

Prosodic Analysis
• Rising pitch: an AP was marked if its rightmost syllable carries a rising movement >2 st
• Normalization of constituent durations: duration of constituent /number of phones

Results, Analysis and Discussion

Successful predictions across the 3 constituent types

General observations
• Identification of 4,415 potential APs:
  ✓ 2,528 Noun Phrases
  ✓ 1,713 Verbal Nuclei
  ✓ 428 Adjectival Phrases
• 43% success rate: relatively weak match of syntactic and prosodic information
• The syntactic-prosodic predictions are less accurate with VN

Possible Explanations
• 40% -> monosyllabic constituents -> too small for an AP
• Prosodic patterns in VN constituents:
  ✓ Rising pitch movements are less frequent than in the rest of the categories
  ✓ Durations are shorter

Conclusion
✓ Best match for AdjP: Adj. tend to follow NP
✓ Worst match for VN: (i) Tend to precede NP & (ii) short durations
✓ Future: consider phrase merging (NP+AP, VP+AP….) & length conditions

References

Mapping
• Predictions: Any lexical word and its function word(s) at the left side (in non-final positions) calls for a final prosodic boundary (rising pitch)