Analysing automatic descriptions of intonation with ICARUS

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Introduction

Research on Intonation

- often based on manual annotation ⇒ very time consuming
- automatic descriptions often not directly and/or intuitively accessible to users
- often elaborate in terms of typical "speech tools" but separate from elaborate text-based tools (for e.g. parsing, taging, co-reference resolution)

Interactive Research Platform: ICARUS

- tool for searching/analysing large *text* corpora
- handles dependency-parses, POS tags, co-reference annotation
- offers elaborate search and analysis features

Gärtner et al. [2013], Thiele et al. [2014], Gärtner et al. [2014]

Research goals

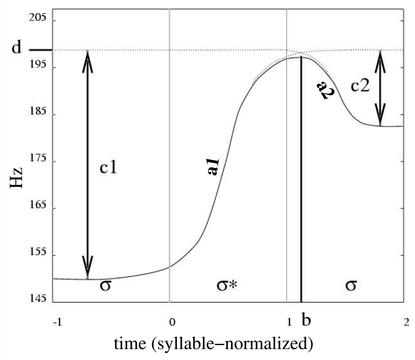
- bridge the gap between manual analysis of small datasets and large-scale analyses of automatically derived features
- analyse tonal parameters conjointly with other annotation levels

⇒ incorporate automatically derived tonal descriptions in ICARUS

Automatic analysis of intonation

The PaIntE model

Möhler [2001]



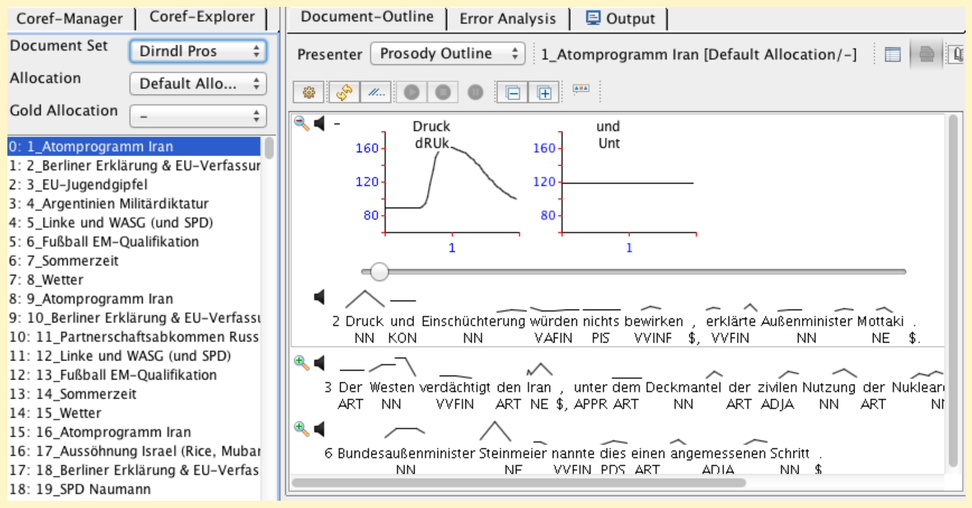
- approximation of a peak in the F_0-contour
- employs a model function with **6 parameters** on a 3-syllable window:
  - **a1/a2:** steepness of rise and fall
  - **b:** location of peak
  - **c1/c2:** amplitude of rise and fall
  - **d:** absolute height of peak

ICARUS for Intonation

Features

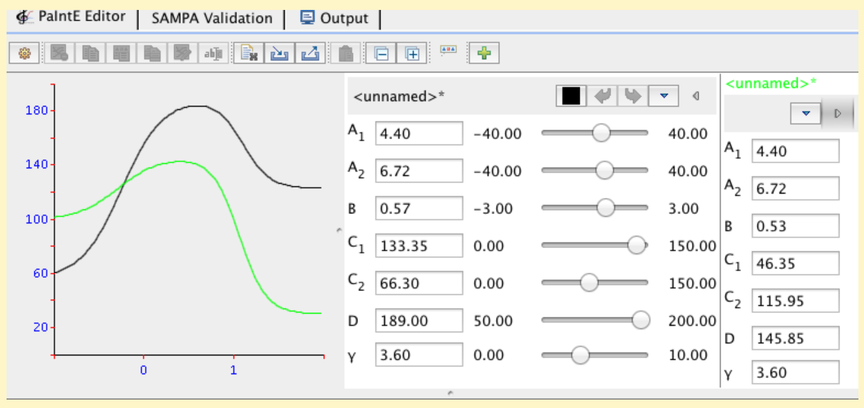
- reads in PaIntE parameters along with any other linguistic information available, e.g. in tabular format
- here: DIRNDL corpus as an example — Eckart et al. [2012] Björkelund et al. [2014]
- provides various ways of visualising and searching the data
- provides various ways of audio-playback
- provides various ways to export search results

Data exploration



PaIntE editor

- provides users with no or little knowledge about the PaIntE model with the possiblity to see the direct impact of changes in PaIntE parameters
- tonal contours can be saved and used in search (e.g. similarity search)



Sample applications

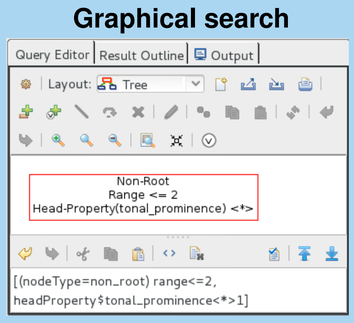
Co-reference resolution and intonation

- phonetic features up to now not taken into account in automatic co-reference resolution Rösiger and Riester [2015]
- ongoing work: do phonetic features improve co-reference resolution
- evidence that givenness and (lack of) pitch-accenting correlate Terken and Hirschberg [1994]
- task: investigate whether automatically derived tonal parameters good candidates to be used in automatic co-reference resolution

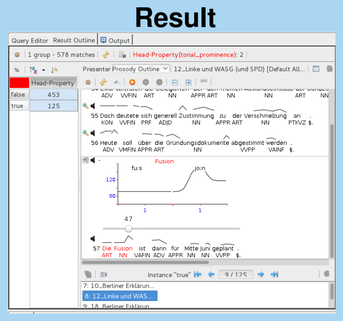
Investigation with ICARUS

- employ feature *tonal prominence*: find peaks that exceed a customisable Hertz value (default 50Hz)
- use *grouping operator* <⋆>: displays values of categorical features along with their frequency distribution in the corpus

Graphical search



Result



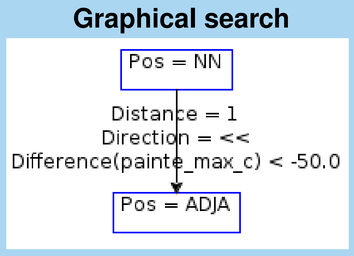
Intonation of adjective-noun sequences

- recent study investigated ADJ-NN sequences with respect to their prominence by means of manual labels — Riester and Piontek [2015]
- main interest: cases where ADJ is more prominent than noun

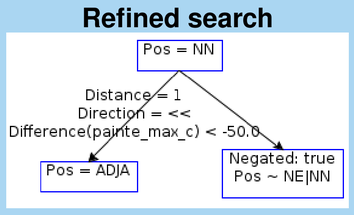
Investigation with Icarus

- find cases where the amplitude of the peak on ADJ is at least 50Hz higher than on NN
  → employ feature *Difference(painte_max_c)*: compares pitch excursions on two tokens
- use dependency syntax structure to define directly adjacent words
- result shows: nominal modifiers to the noun receive the nuclear pitch accent
- refine search by using POS tagging and synatax to exclude cases where the noun is modified by another noun

Graphical search



Refined search



Result

Summary

ICARUS for intonation

- provides easy access, visualisation and of automatically derived tonal parameters together with other annotation layers
- allows for various ways of audio-playback

⇒ allows for convenient data exploration of different linguistc levels conjointly

⇒ can foster interdisciplinary corpus-based research

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