EURAC research

Usability engineering for corpus query tools: Evaluating the use of visualizations

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Outline

- Research aim and motivation
- Setup of the study
- Starting points

User-centered evaluation of query tools

Motivation:

- Query tools are central to corpus analysis by humans
- Profiles of users and developers differ
- No systematic user studies
- No substantial innovation in functionalities

Requirements analysis I: Interviews

Setup of interviews

- Open interviews with 14 corpus linguists
- Based on recent corpus studies
- Description of working procedures
  - Analysis steps
  - Tasks
  - Tools (useful functionalities, required improvements)
  - Problems (and how they were resolved)

Requirements analysis I: Interviews

Common problems:

- Errors in primary or secondary corpus data
- Lack of annotations
- Lack of support for querying annotated corpora
- Time consuming manual processing
- Incompatibility of data formats

Common tasks:

- Comparison of documents / entire corpora
- Manual post-processing of search results
- Exploratory corpus analysis

Requirements analysis I: Interviews

Methodological observation:

- Diversity of goals in corpus studies
- Hard to detect general requirements
- Requirements concerning data / technical features

==> Restricted context for evaluation

- Focus on concrete tasks
- Evaluation of concrete functionalities

Visualizations for query tools

„**Depiction of information using** spatial or graphical representations, **to facilitate** comparison, pattern recognition, change detection **and other cognitive skills by making use of the visual system.**“ (Hearst, 2003)

Motivation:

- Capabilities of human visual system
- Cognitive aid to data analysis
- Information visualization is growing
- Little work done for linguistic data

Aims and scope of the study

How can visualizations support exploratory corpus analysis?

- Methods from usability engineering /testing
- Focus on corpus linguists only

Secondary aim: Provide a case study

- Document usability evaluation for corpus query tools
- Impact and feasibility of approach
- Indications on how to apply/adapt methods from usability

Corpus query tools: functionalities

Core functionalities:

- Concordances, word lists, n-gram lists
- Extraction of key words, collocations
- Filtering, sorting and counting
- Display: include/exclude annotations, change context window, show full text

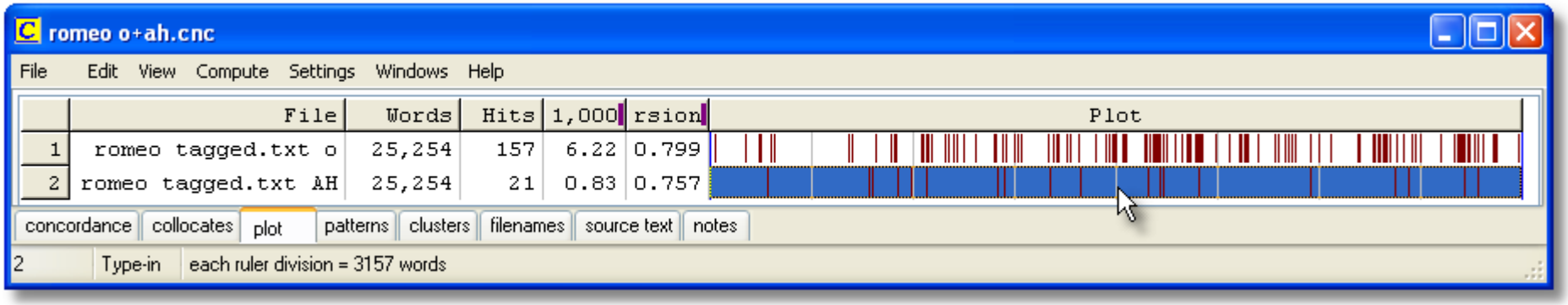
Improvements:

- Character encodings
- Corpus size
- Power of query languages
- Annotated corpora, parallel corpora

Corpus query tools: visualizations

Ex.1: Dispersion plots

- Visual display of distribution of words over text

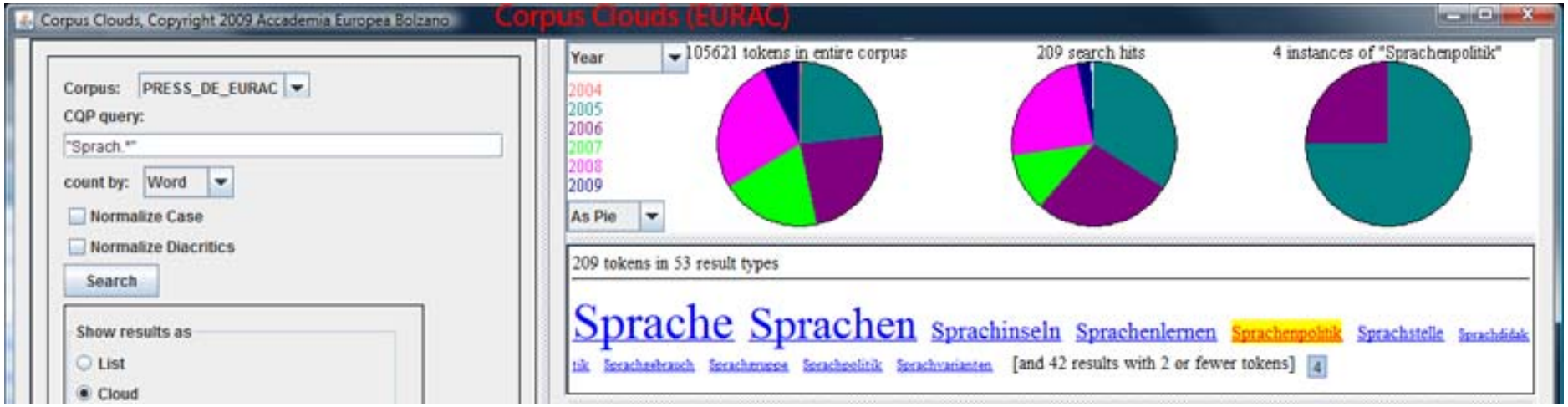


WordSmith Tools; screenshot taken from www.lexically.net

Corpus query tools: visualizations

Ex. 2: Charts for frequency distributions

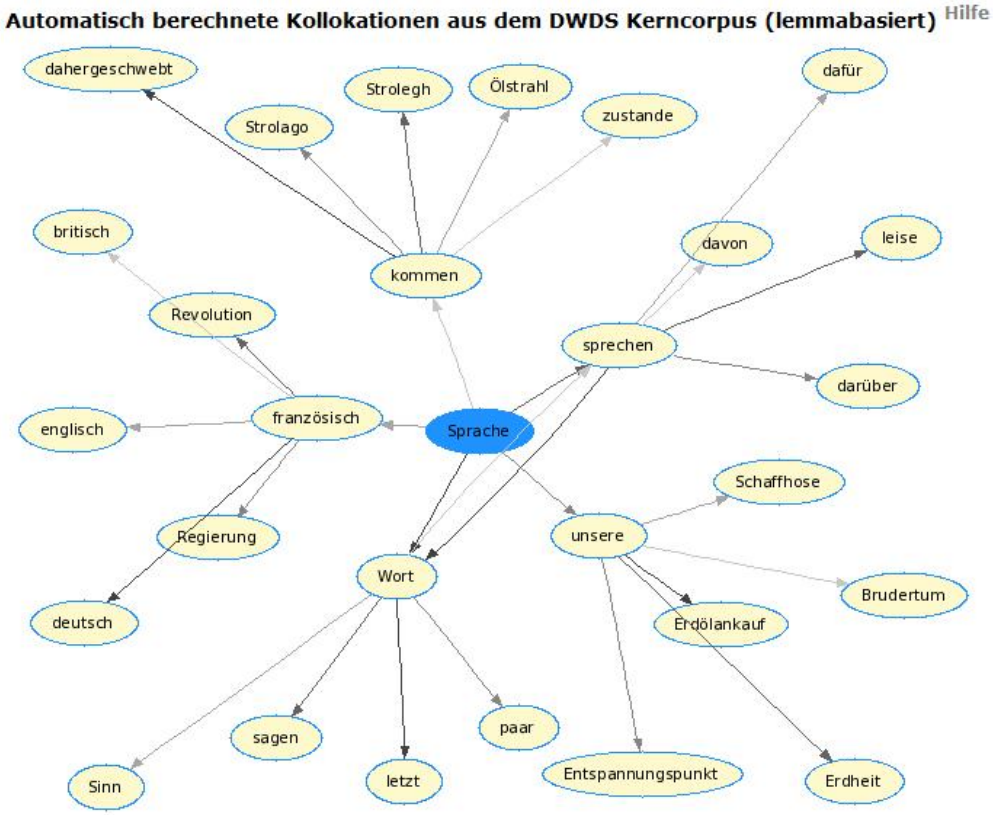
- Distribution of search results over years

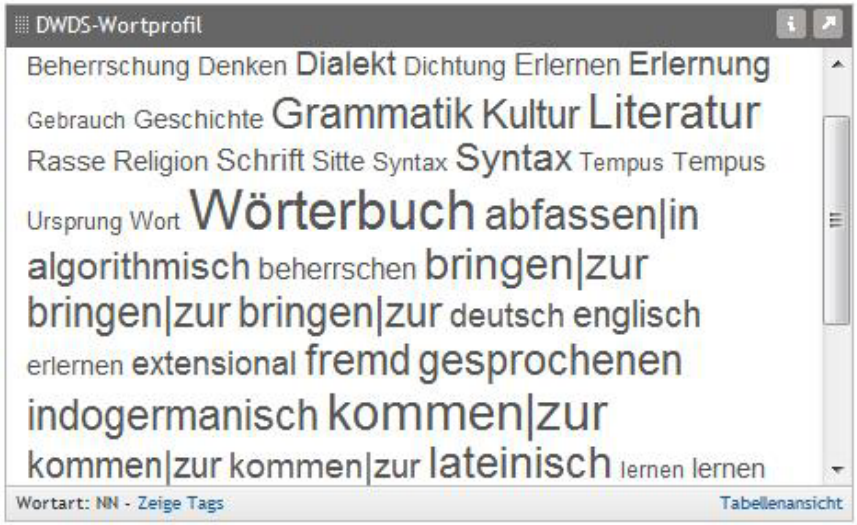


Corpus Clouds by EURAC; www.eurac.edu/linfovis

Corpus query tools: visualizations

Ex. 3: networks and clouds for co-occurrences





Collocations and word profile for „Sprache“, DWDS corpora

www.dwds.de

www.beta.dwds.de

Setup of the study

Following a standard setup for usability studies:
(cf. Hamborg and Gediga, 2006)

- Requirements analysis
- Specification of usability goals and prototypes
- Several cycles of development, testing and improvements

User-centered tests in 3 phases:

- Requirements analysis concerning visualizations
- Evaluation of fragmented aspects of visualizations
- In-depth evaluation of more elaborated visualizations

Setup of the study: phase 1

Requirements analysis II

Aims:

- Requirements concerning exploratory analysis
- Utility of visualizations in general
- Feedback on proposals

Method:

- Focus group discussions

Setup of the study: phase 2

Evaluation of fragmented visualization solutions

Aims:

- Evaluate different aspects of visualizations
- Determine preferences / most relevant functionalities

Methods:

- Low-fidelity prototypes: drawings/sketches, basic demos
- Online tests
- User ratings, analysis of log files

Setup of the study: phase 3

In-depth evaluation of more elaborated visualizations

Aims:

- Development of detailed specification for visualization functionalities

Methods:

- High-fidelity prototypes: lots of detail and functionality
- Contextual enquiry, video recordings, eye-tracking protocols, etc.
- Free use and test tasks
- Restricted test group

Evaluation

What to evaluate?

What data is relevant for analysis?

- Levels/characteristics of textual data
- Units: word, phrase, sentence, text, corpus, ...
- Aspects: position, categories, association, distribution, etc.
- Combinations of information

Evaluation

What to evaluate?

What visualizations are meaningful?

- Visual models
- Mappings of data and models
- Interaction
- Information amounts

Evaluation

How to evaluate?

What methods to use for evaluation?

- Prototype-based: free usage vs. test tasks
- Unobtrusive / obtrusive observation
- Observations of user behaviour

What measures to use?

- User estimations (ratings /quantitative feedback)
- Time
- Navigation paths
- Error rates

Conceptual starting points

Shneiderman's Information-Seeking Mantra served as central concept: **„Overview first, zoom and filter, then details on demand“** (Shneiderman, 1996)

Provide different perspectives on the data, support navigation, etc.

- Link examples and context
- Augment examples with information
- Condense examples

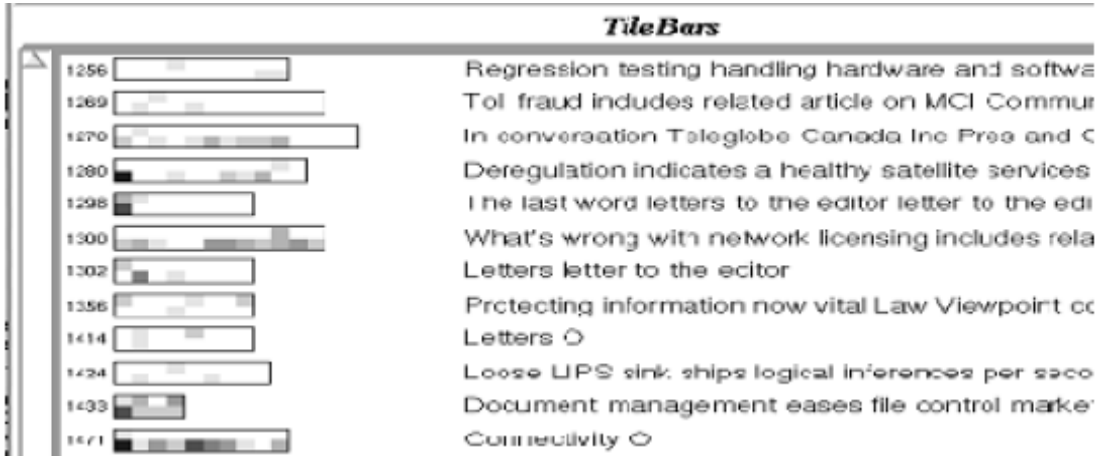
Conceptual starting points

Link textual examples to bigger picture

Aim: Place authentic text samples in context

Examples:

- Search word placed in sentence context (KWIC)
- Search word placed in text (e.g. dispersion plot, highlighting)
- Search word related to corpus (e.g. distribution over



Example:

TileBars (Hearst, 1995)

Conceptual starting points

Augment textual examples with multiple information

Aim: Integrate multiple information on units in authentic text

Examples:

- Include POS information in KWIC display
- Display associations among words in running text
- Integrate frequency information
- ...

Dem Festgottesdienst in <Bozen> war ein Friedensmarsch durch

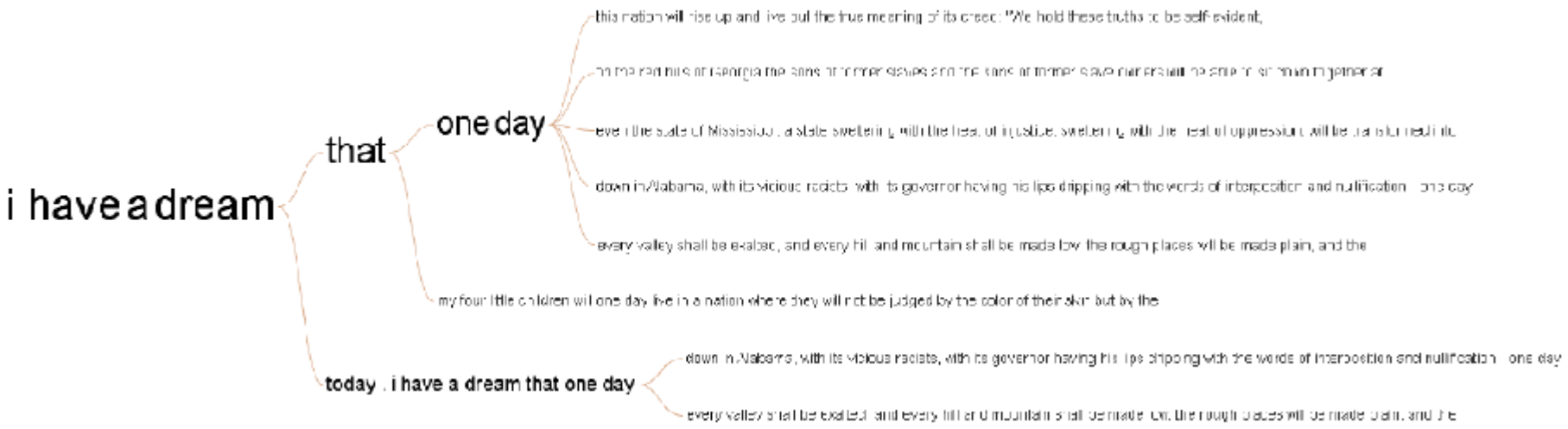
Conceptual starting points

Condense textual examples

Aim: Create compact representations by abstracting over data

Examples:

- WordTrees (Wattenberg and Viégas, 2008; manyeyes.alphaworks.ibm.com)
- Replace units by more general labels



Conclusion

- Setup of usability study for corpus query tools
- Methodological considerations
- Conceptualizations as starting points

Focus on:

- User-centered approach
- Applicability of usability methods?
- Question how to foster progress / innovation

Thank you for your attention!

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Screenshots:

Corpus Clouds, EURAC: www.eurac.edu/linfovis

DWDS Corpora: www.dwds.de; www.beta-dwds.de

WordSmith tools: www.lexically.net

WordTrees: Wattenberg and Viègas, 2008; see also http://manyeyes.alphaworks.ibm.com