Multi-Layer Resources in ANNIS

Historical Corpora and Information Structural Annotation

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Background in SFB 632

- ANNIS: **ANN**otation of **I**nformation **S**tructure
  (Dipper et al. 2004; Chiarcos et al. 2008; Zeldes et al. 2009)
  http://www.sfb632.uni-potsdam.de/d1/annis/
- Open-source web-based corpus search tool
- Developed in project D1 of SFB 632 on *Information Structure*

- Requirements:
  - Archive data from different projects in a unified format
  - Deal with heterogeneous annotations for IS & beyond
  - Search and visualization of complex data structures

Different Research Questions

- What is the role of Information Structure for the development of German word order?
  (Petrova 2006, Donhauser et al. 2006, Petrova & Solf, to appear)
- Which topic markings are possible in the Chadic languages and under what circumstances?
  (Hartmann 2006, Zimmermann, to appear)
- How do universal IS categories influence prosody, morphology and syntax?
  (Féry 2006, Fanselow 2007, Dipper et al. 2007)
- Can IS be inferred from morphosyntax, lexis and discourse structure?

Different Data Structures

- Token and span annotations
- syntax trees / DAGs (with / without non-terminal units)
- Labeled pointing relations
- Multimodal data, Metadata, Alignment…

Different Tools/Formats

- Automatic tools with proprietary formats (taggers, parsers, machine learning)
- Diverse dedicated manual tools (transcription, annotation, treebanking, discourse analysis)
- Asynchronously produced annotations from different sources and theories referring to the same data

Annotation Formats

- Token Annotations (e.g. TreeTagger)
  - POS Tagging
  - Lemmatization
  - Morphology
  - Phonology/Phonetics

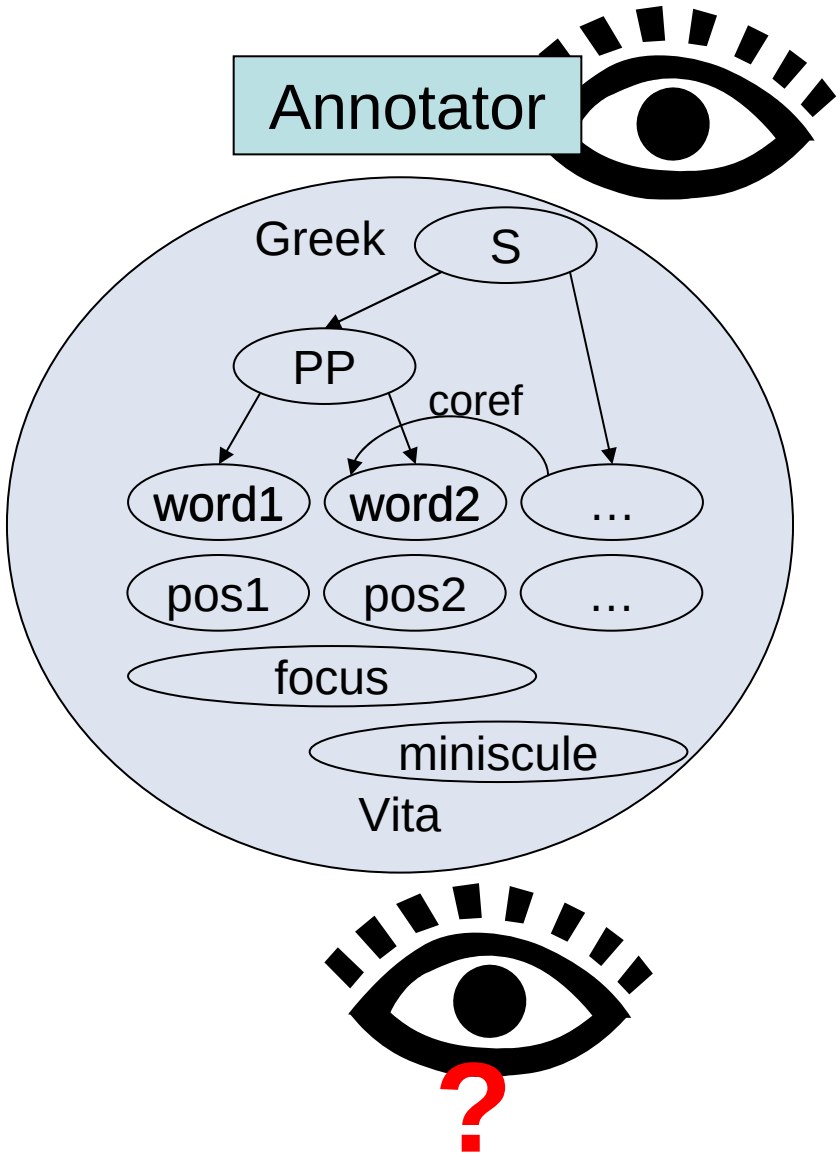
- Tree/Graph
  - Bracketing formats (e.g. Penn, Bies et al. 1995)
  - Generic Inline XML
  - Tiger XML / Negra (Synpathy, Tiger, annotate, Brants & Plaehn, 2000)
  - RST tool (rhetorical sentence trees, O'Donnel 2000)

- Grids
  - EXMARaLDA (Schmidt 2004)
  - ELAN (Wittenburg et al. 2006)
  - Toolbox (Stuart et al. 2007)

- Pointing Relations
  - MMAX2 (Müller & Strube 2006)
  - PALinkA (Orasan 2003)
  - Serengeti (TODO)

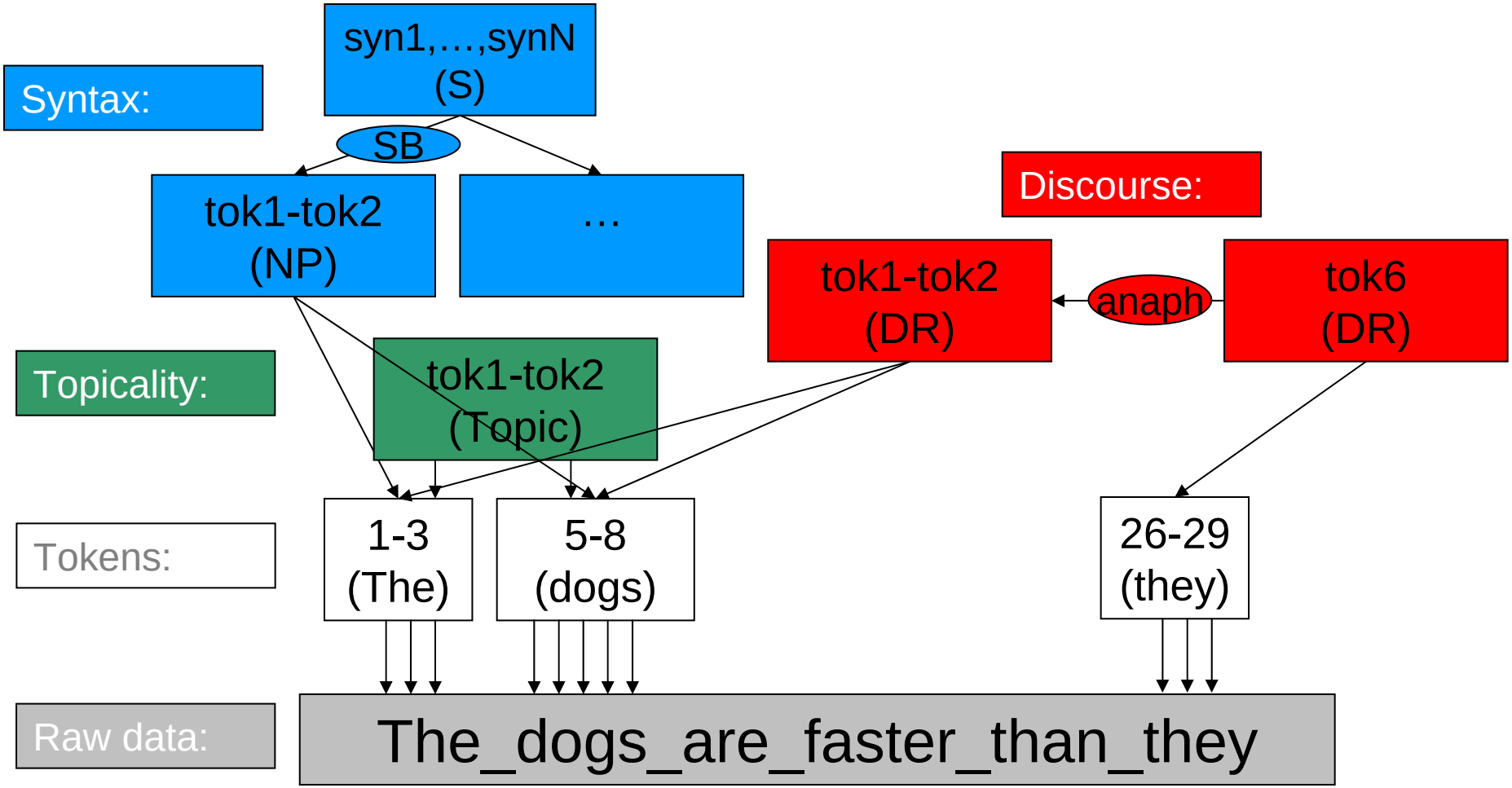
Modeling Multilevel Data

- Reduction to typed and labeled nodes and edges
- Independent layers (stand-off)
  - Retroactively insert / update / replace layers
  - Alternative interpretations (multiple pos-tags, parses, even tokenizations)



PAULA stand-off XML (simplified)

(Dipper, 2005, Dipper & Götze, 2005)

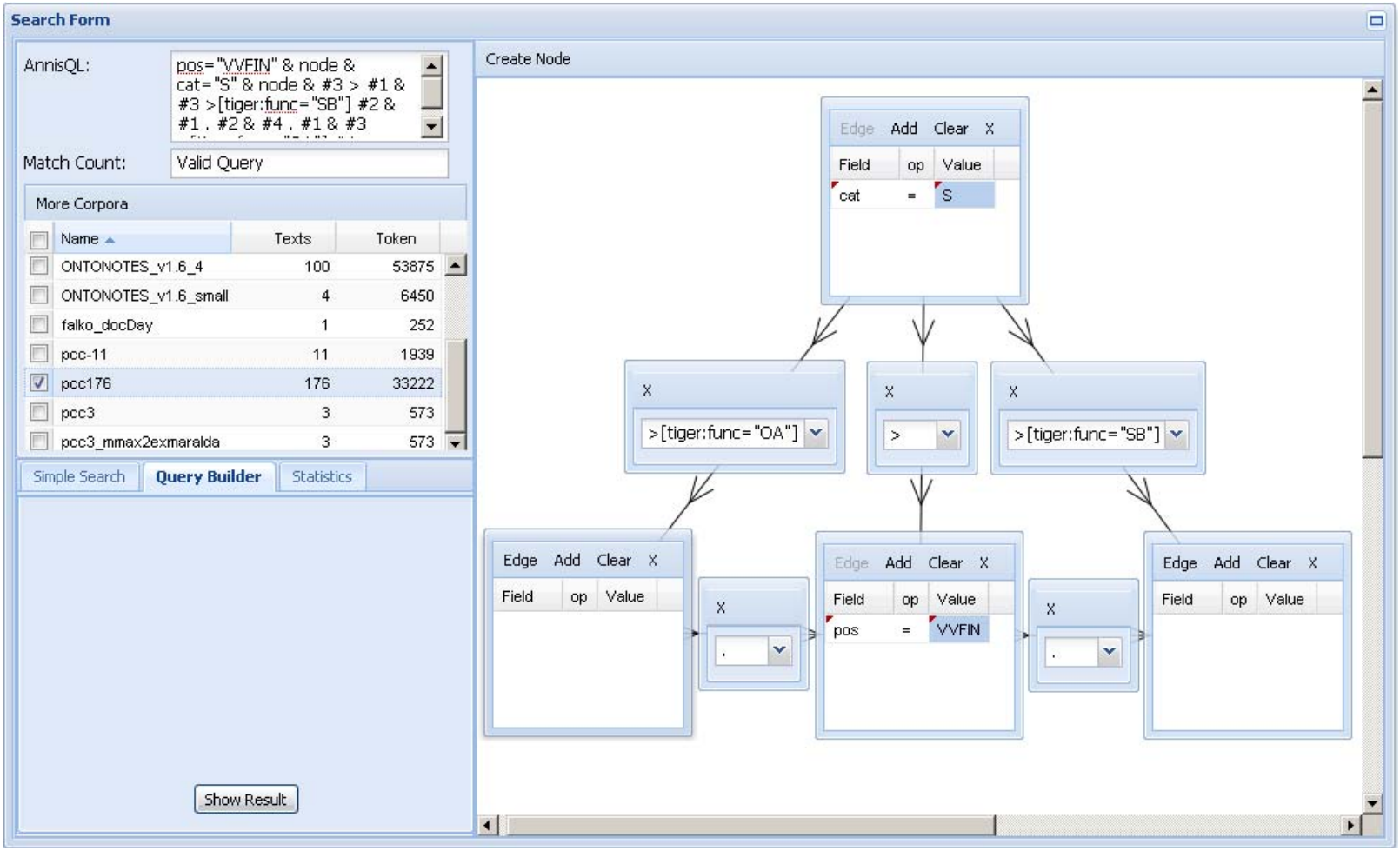


Human Readable AQL

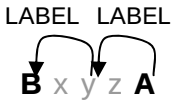
- SQL queries too complex for users
- Simple query language based on nodes and relations: (cf. *NiteQL* Carletta et al. 2003, *TIGERSearch* Lezius 2002)

```
cat="S" & node & cat="S" & pos="PRP" &
#1 >[func="sb"] #2 &
#3 >[func="sb"] #4 &
#4 ->[coref="anaphor-antecedent"] #2 &
meta::language="en"
```

Query Builder

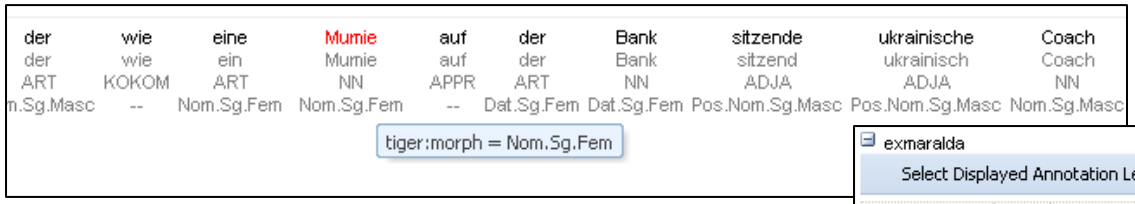


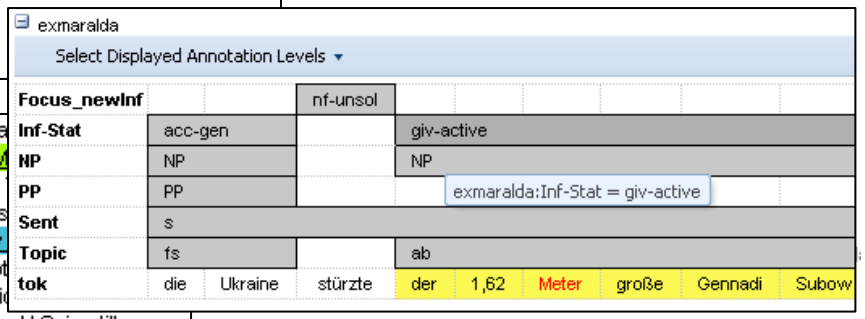
List of AQL Operators

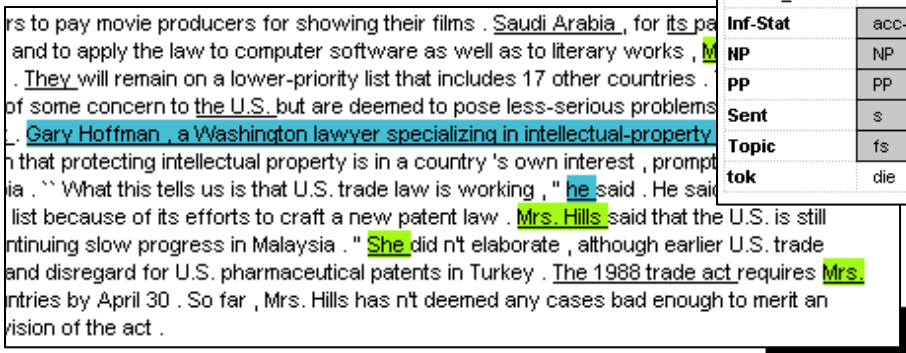
	Name	Illustration	Options
.	direct precedence	**A B**	
.*	indirect precedence	**A** x y z **B**	.n,m
>	direct dominance	**A** | **B**	>secedge >[func="OA"]
>*	indirect dominance	**A** | ... | **B**	>n,m
->LABEL	Labeled pointing relation		
->LABEL*	Labeled pointing path		
_=_	identical coverage	**AAA** **BBB**	
_o_	overlap	**AAA** **BBB**	_ol_ _or_
_i_	inclusion	**AAA** **B**	

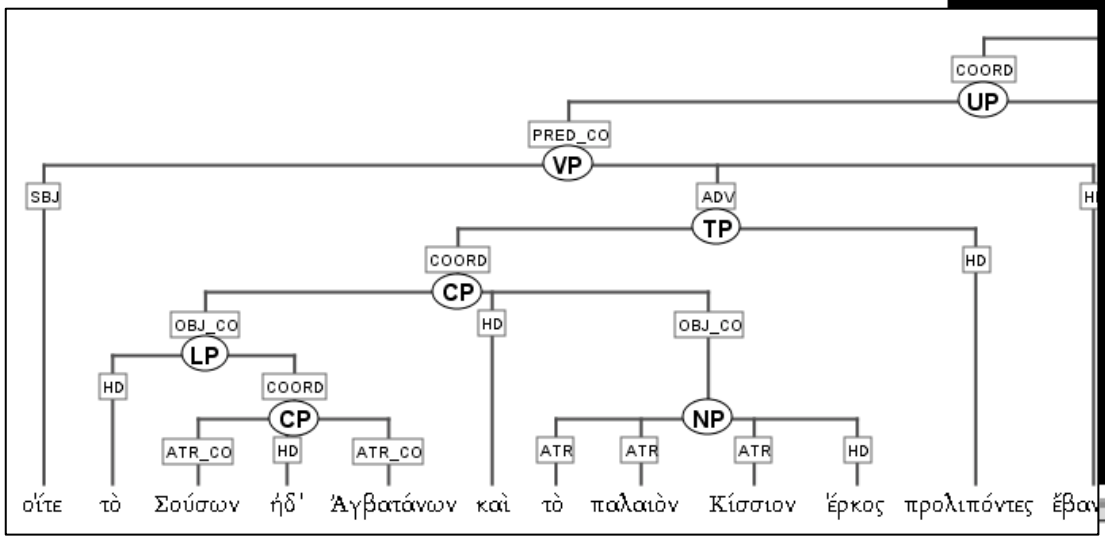
	Name	Illustration
_l_	left aligned	**AAA** **BB**
_r_	right aligned	**AA** **BBB**
>@l	left-most child	**A** / | \ **B** x y
>@r	right-most child	**A** / | \ x y **B**
$	Common parent node	x / \ **A B**
$*	Common ancestor node	x ... / \ **A B**
#x:arity=n	Arity	x / | \ **1 ... n**
#x:length=n	Length	x ... / \ **1 ... n**

Visualization





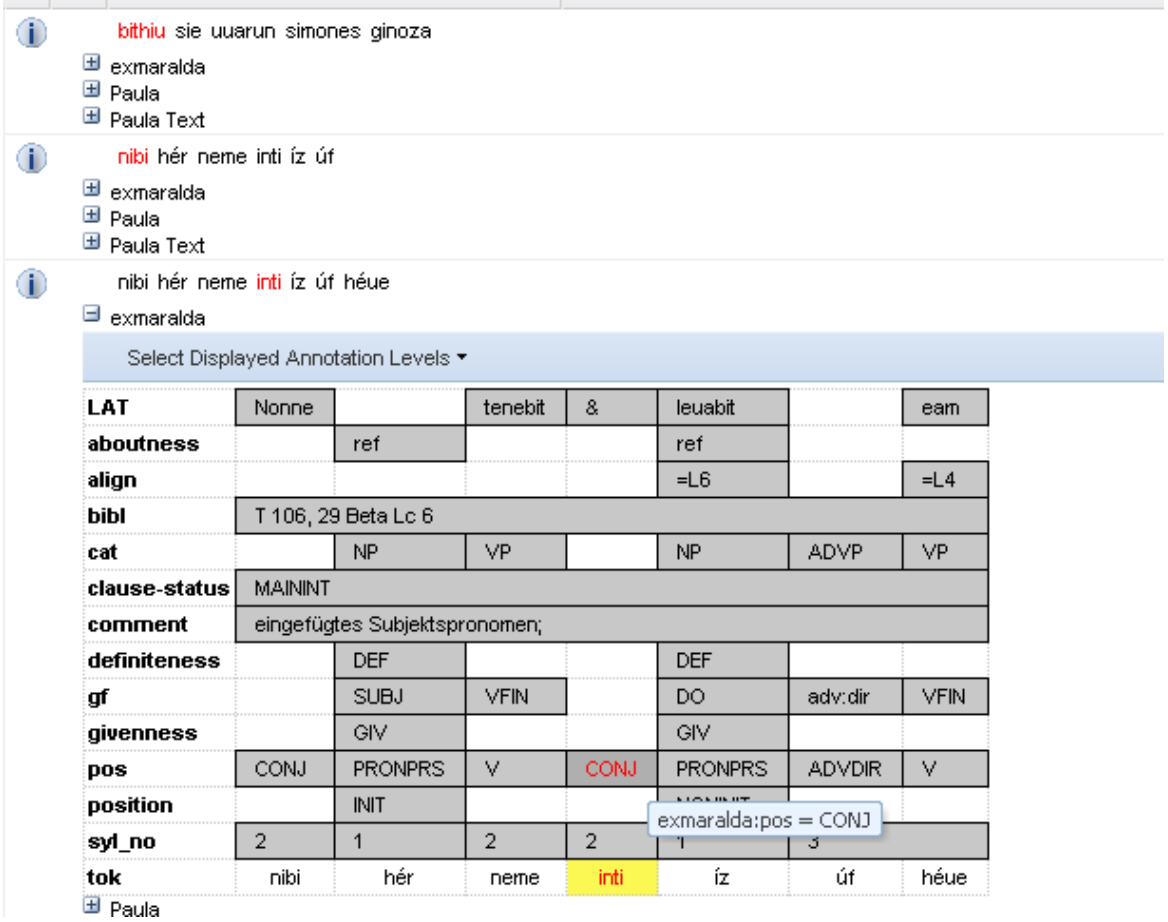




B4: T-Codex (, Muspilli, Heliand…)

(Petrova et al. 2009)

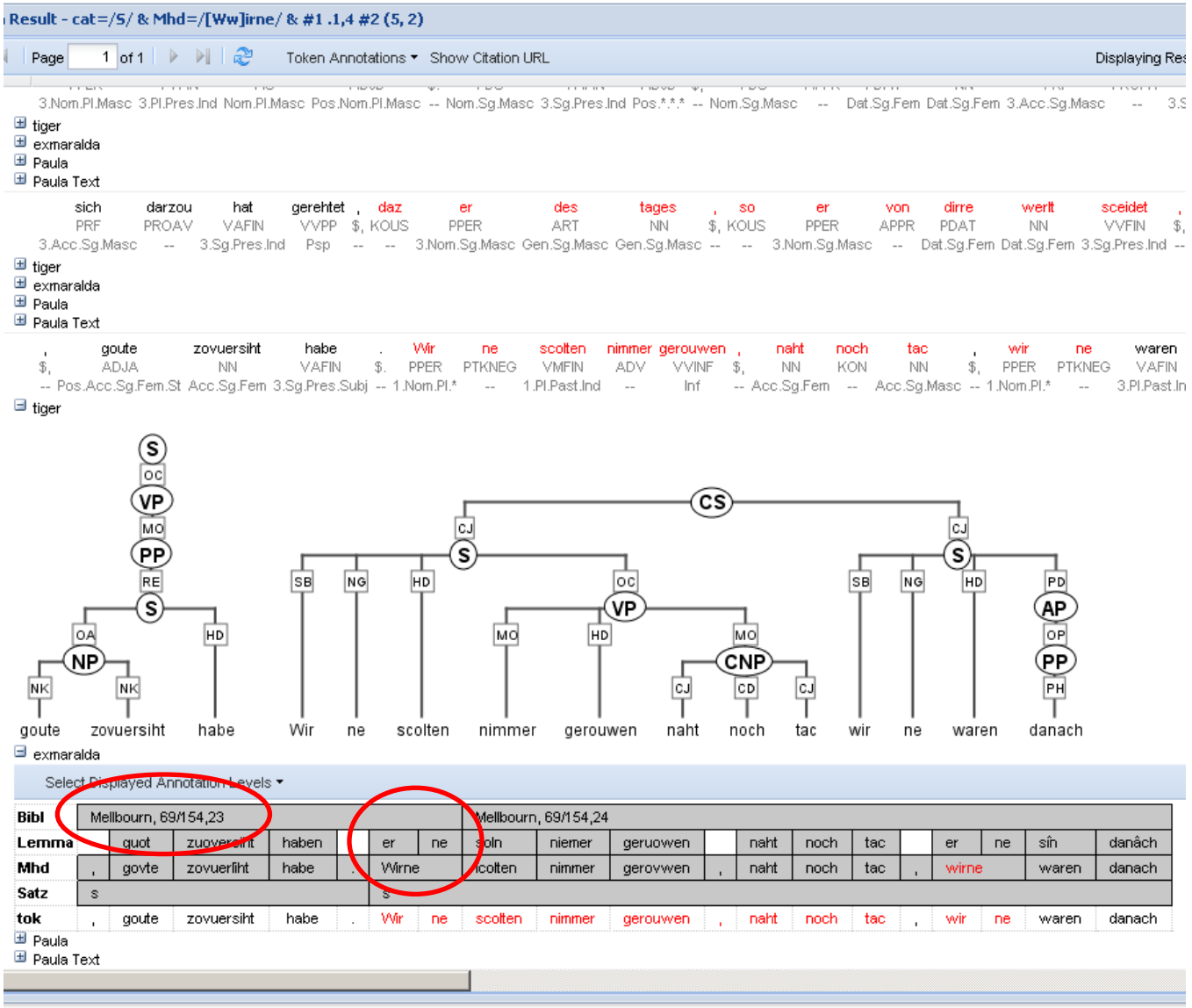
- IS (SFB guidelines)
- Morpho-syntactic annotation
- “Interlinear” Latin



MHG Speculum Ecclesiae

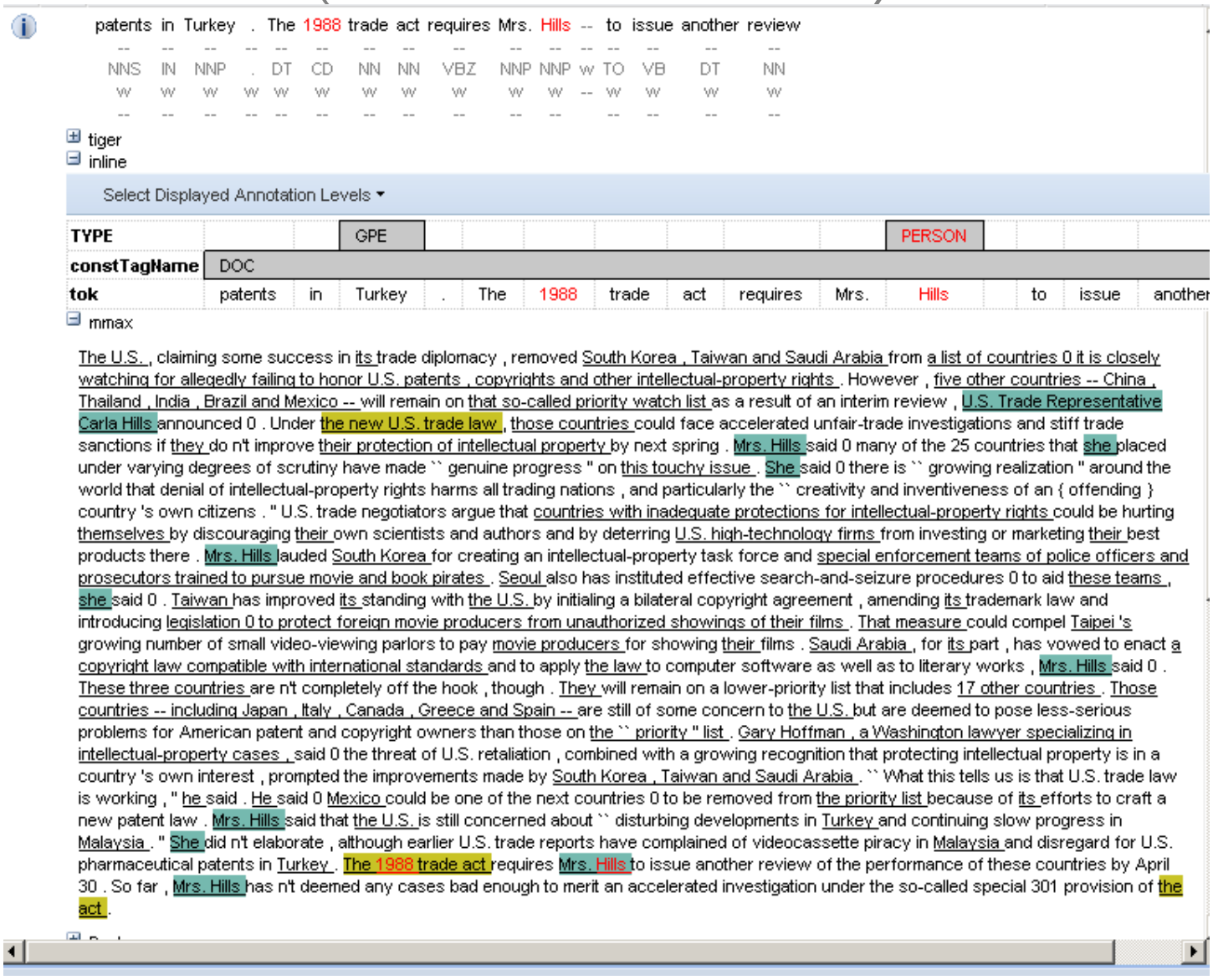
(WIP, Hagen Hirschmann/Sonja Linde et al.)

- Syntactically annotated corpus
- Normalization over multiple tokens
- Spans for edition references
- Similarly Monsee Fragments

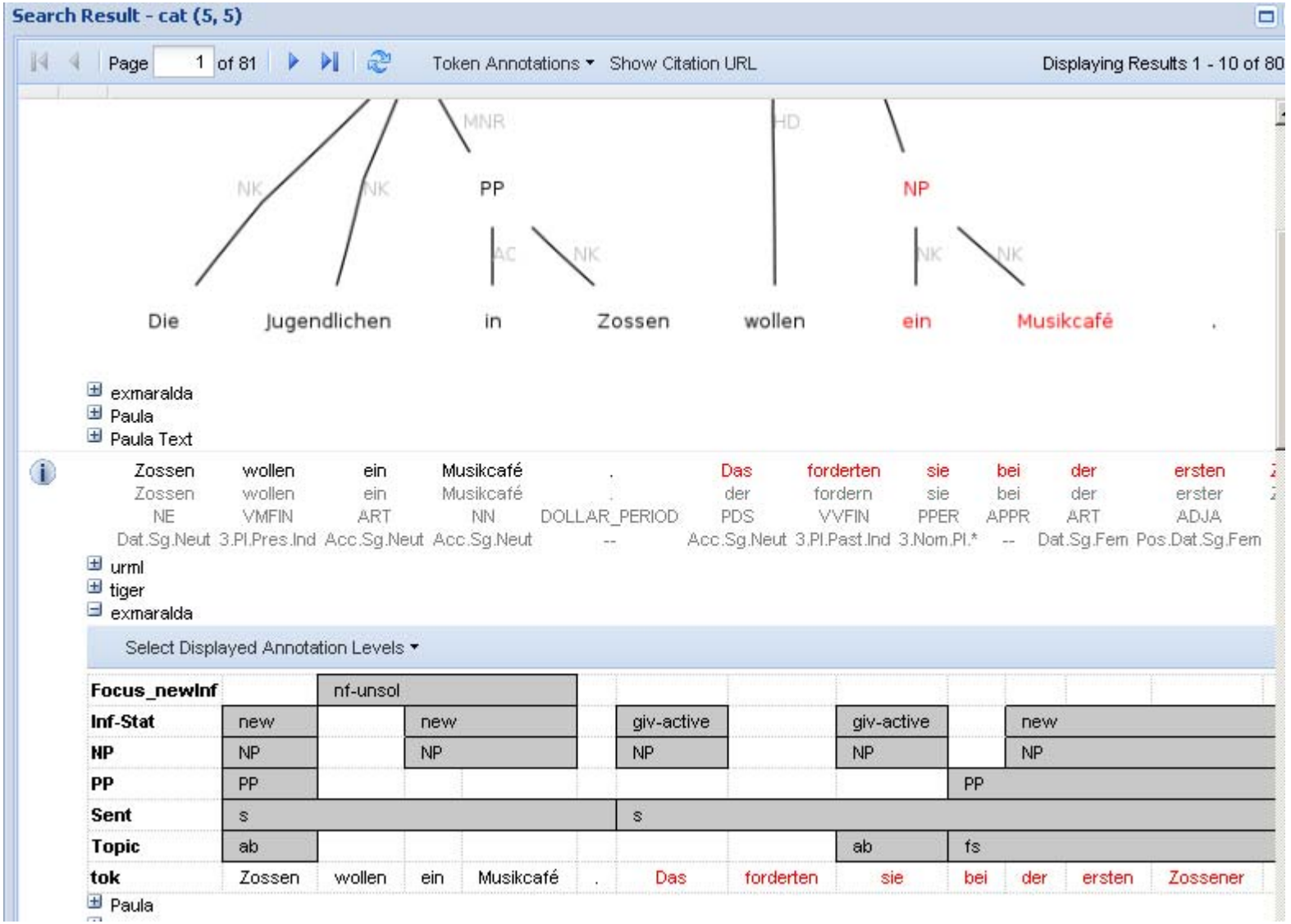


OntoNotes: Coreference/Syntax/NER

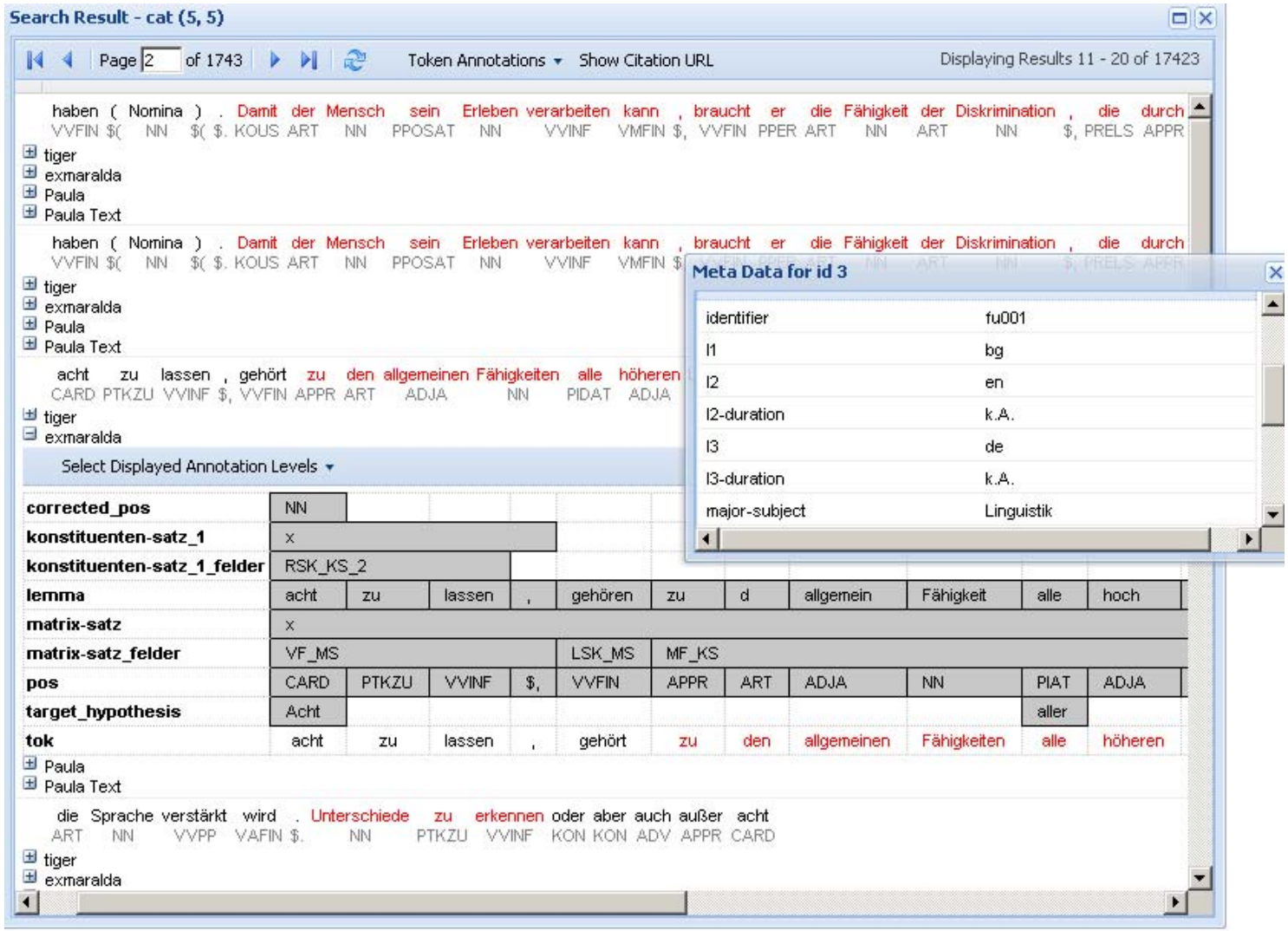
(Weischedel et al. 2008)



PCC: RST, IS (Stede 2004)



Falko: Topological Fields, Errors

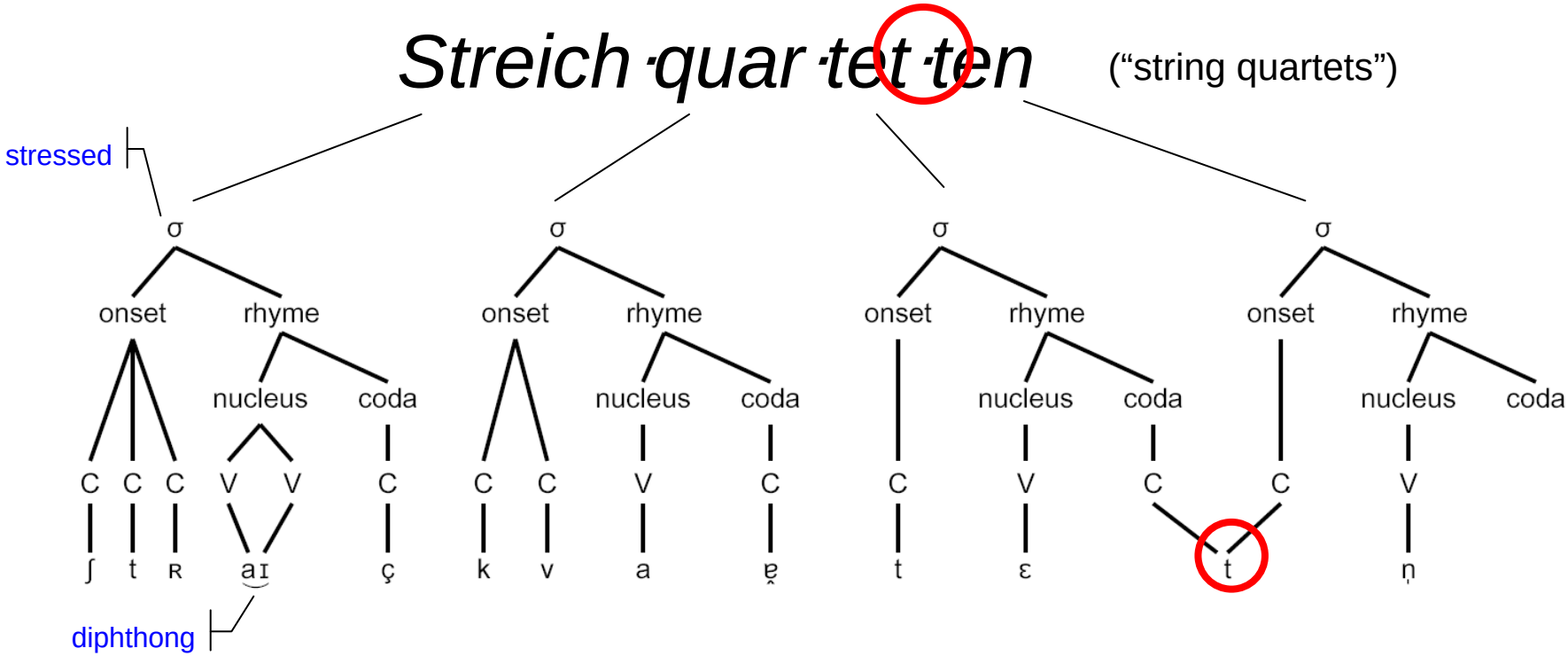


Future Directions / Open Issues

- Subtokenization (cf. MAF, Clément & de la Clergerie 2005)
  - Structural challenge to token based concept:
    - "Physical" tokens (atoms) = smallest units
    - "Reference" tokens (e.g. word forms) = unit of reference for search operators (*“within 5 tokens”*) and context visualization (*“10 tokens left and right, sort by second token to the right”*)
  - Users unaware if desired results are subtokenized!

Future Directions / Open Issues

- Subtoken DAGs, features → operators?
- Ambiguous subtoken-token alignment



Parallel Corpora

- Representation of aligned document sets
- Edges to align multiple levels paragraph/ sentence/word… (TEI, Romary & Bonhomme 2000)
- Handling of mismatching / circular / incomplete alignment
- Search and visualization

Summary

- ANNIS is an open-source search and visualization architecture for multi-layer corpora
- Merge annotations from multiple tools
- Annotate IS, syntax, morphology, discourse structure…
- Modular visualizations can be written for further types of data – we’re always looking for partners!

Thanks!

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http://www.sfb632.uni-potsdam.de/~d1/annis/

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RelAnnis (simplified)

(WIP, Viktor Rosenfeld & Florian Zipser, cf. Grust et al. 2004)