Automatic extraction of Tree Wrapping Grammars from Discontinuous Constituent Treebanks

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Tree Wrapping Grammar (TWG)

- Finite set of elementary trees, combined via:
  - → (simple) substitution,
  - → sister adjunction,
  - → wrapping substitution (Kallmeyer et al., 2013; Osswald and Kallmeyer, 2018).

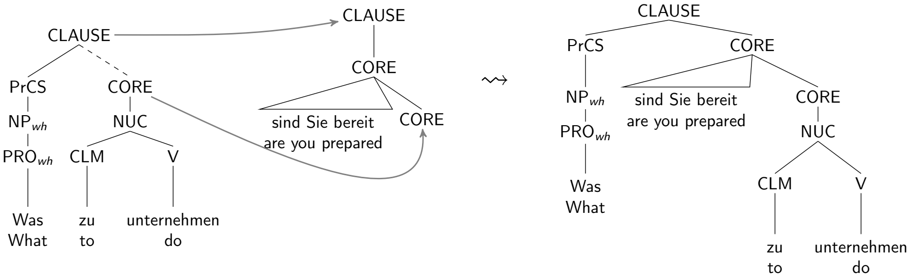


Figure 1: Wrapping substitution and a long distance dependency (LDD).

TWG: Extraposed Relative Clauses (ERCs)

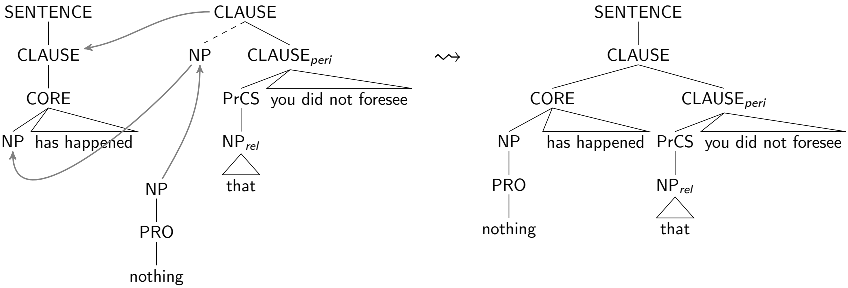
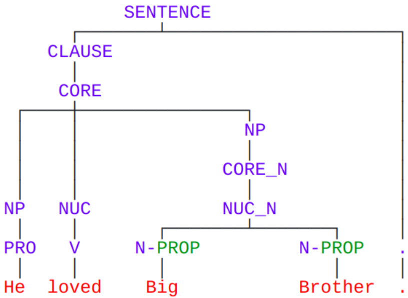


Figure 2: Extraposed Relative Clause (ERC) in TWG.

RRGparbank

- Multilingual corpus of RRG annotated sentences (RRG = Role and Reference Grammar, Van Valin and LaPolla 1997; Van Valin 2005)
- George Orwell's '1984' (≈ 6700 sentences) and translations into German, French, Russian, Farsi, Hungarian, Croatian
- Coverage of annotation so far: 81% English, 47% German, 12% French, 54% Russian, 15% Farsi
- rrgparbank.phil.hhu.de



TWG Extraction: initial and auxiliary trees

- TWG extraction algorithm based on Xia (1999) for TAG.
- Percolation tables for head and modifier distinction.

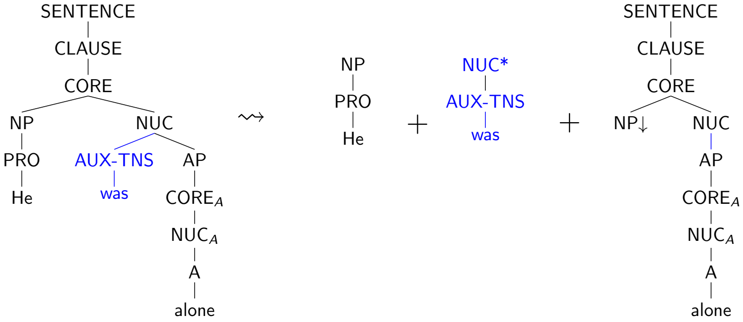


Figure 3: Extraction of initial and sister-adjoining trees.

TWG Extraction: d-edge trees for LDDs

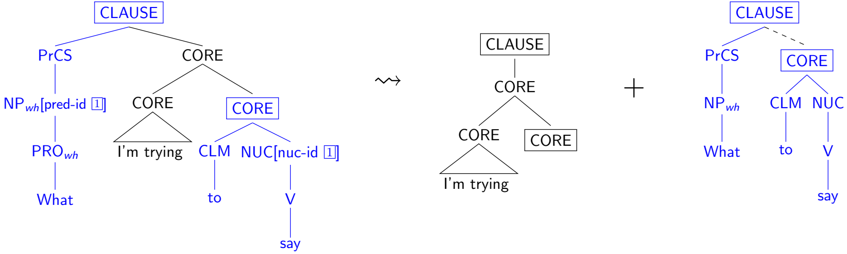


Figure 4: Extraction of a target tree and an elementary tree with a long distance dependency (LDD).

Extracted TWG Grammars

Parameters	English TWG	German TWG	French TWG	Russian TWG
# supertags	**3340**	**2591**	**947**	**2272**
# supertags occuring once	**1994**	**1689**	**584**	**1503**
# initial trees	1727	1490	483	1350
# sister-adjoining trees	1571	1031	431	898
# d-edge trees	**42**	**70**	**33**	**22**
Avg. sentence length	14.12	13.5	12.4	10.03
# sentences	5445	3062	851	3586
# Long-dist. dependenc. (LDDs)	**58**	**13**	**36**	**27**
# Extraposed rel. clauses (ERCs)	**8**	**110**	**4**	**0**

Table 1: Statistics on subcorpora and extracted grammars.

Similarity of extracted TWGs

Common supertags	**English TWG**	**German TWG**	**French TWG**	**Russian TWG**
English TWG	–	24.97 (834)	15.45 (516)	21.8 (728)
German TWG	32.19 (834)	–	15.51 (402)	24.9 (645)
French TWG	**54.49 (516)**	42.45 (402)	–	37.80 (358)
Russian TWG	32.04 (728)	28.4 (645)	15.76 (358)	–
Common supertags acr. languages	263			

Table 2: Ratio of common supertags across language pairs in percents and in numbers (in brackets).

Symbolic parsing with extracted grammars

	English TWG	German TWG	French TWG	Russian TWG
% exactly matching parses	81	79.07	78.86	80.68
# not parsed sentences	13	8	5	10

Table 3: Validation of extracted TWGs on symbolic parsing with TWG parser ParTAGe (Waszczuk, 2017; Bladier et al., 2020).

Problematic cases for TWG parsing

- Free-order placement of predicate arguments.

  Ja vot čto xoču skazat'.
  I here what want to.say
  'What I'm trying to say is this.'

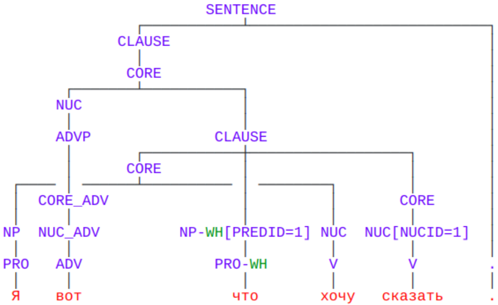


Figure 5: RRGparbank: interface example

Perspectives

Linguistic resources

- Corpus-based RRG grammars for different languages
- Dynamic treebanking for creating large RRG-annotated corpora
- Cross-linguistically valid “core” RRG grammar
- Cross-lingual proof of concept for TWG, in particular wrt. non-local dependencies

Parsing

- Wide-coverage probabilistic parsing with TWGs
- Multilingual TWG parsing

THANK YOU VERY MUCH
FOR YOUR ATTENTION!

References I

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