

DEPFIx: A System for Automatic Correction of Czech MT Outputs

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WMT 12 EN-to-CS winner

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Goal: Improve Czech grammar

- Phrase-based MT often breaks morphological agreement
- Some of the dependencies still recovered in parses of MT output
⇒ We can check and fix the agreements.

Depfix

- Rule-based grammar correction of English-to-Czech MT
- Applicable on top of any MT system
- WMT12: cu-depfix = onlineB + Depfix

Input: *source* (English sentences), *target* (Czech MT output)

1. Tag *source* and *target* (morphological tags and lemmas)
 2. Align *source* with *target*, using lemmas (GIZA++)
 3. Parse *source* (MST Parser)
 4. Parse *target* (RUR Parser)
 5. Apply Depfix rules
- Output: corrected *target*

RUR Parser

- Non-projective two-stage dependency parser
- A modification of the MST parser (McDonald, 2005)
- Adapted for parsing of SMT outputs:
 - Features projected from source sentence analysis (tag, dependency relation, dependency label)
- “Worsening” the training treebank (changing correct flection of some words to incorrect based on a tag error model estimated on Moses output)
- Labeling done in a second stage (MIRA-based labeler, adapted in a similar way as the parser)

Rules

Preposition “by”

- “by + noun” is translated by putting the noun into:
 - the instrumental case, if modifying a verb
 - the genitive case, if modifying a noun

Subject case

- Subject must be in the nominative case

Subject–Past Participle agreement

- Subject and past participle must agree in number and gender

Passive–Auxiliary “be” agreement

- Aux. verb “to be” must agree with passive in gender and number

Preposition–Noun agreement

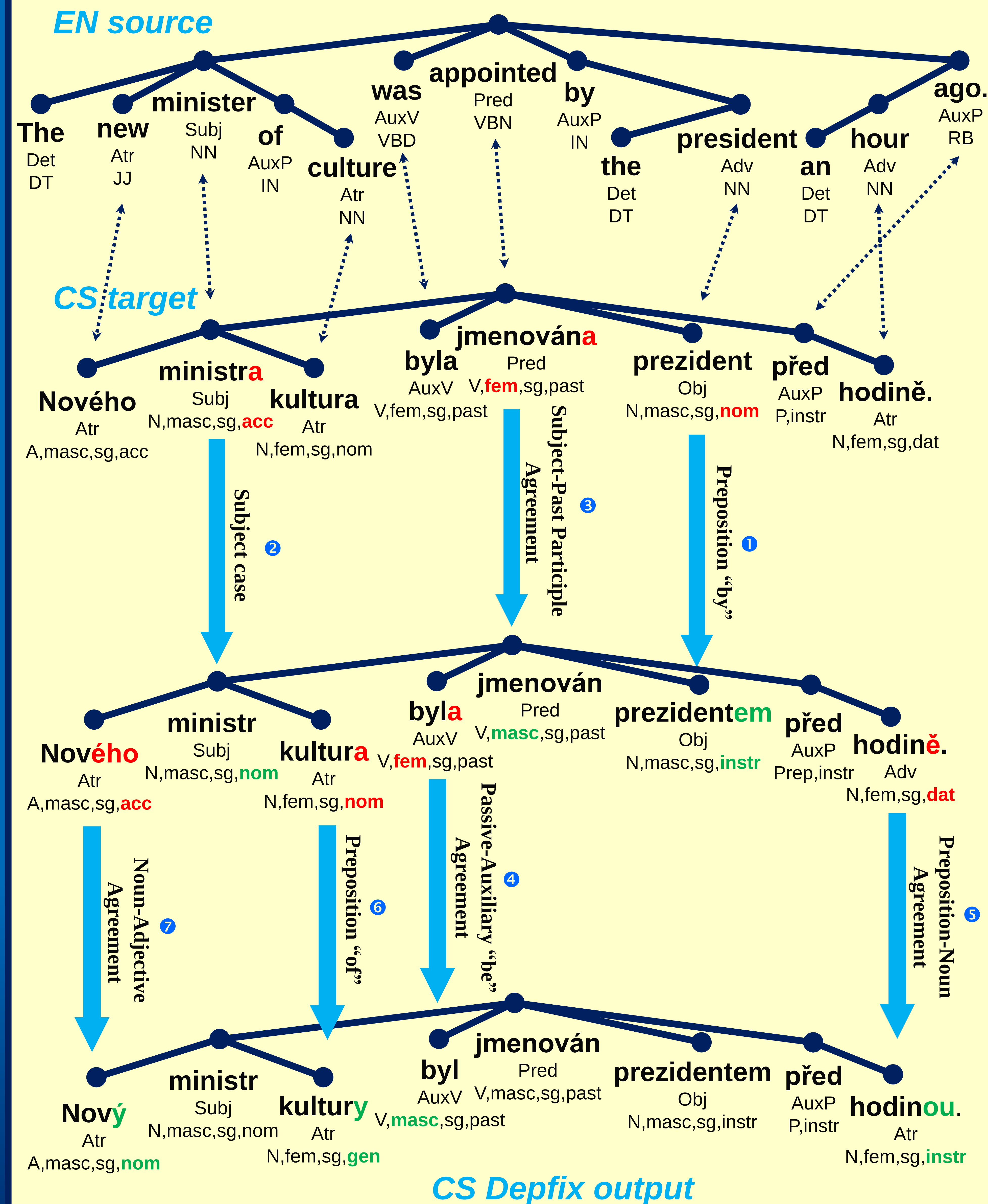
- Nouns must agree with prepositions in morphological case

Preposition “of”

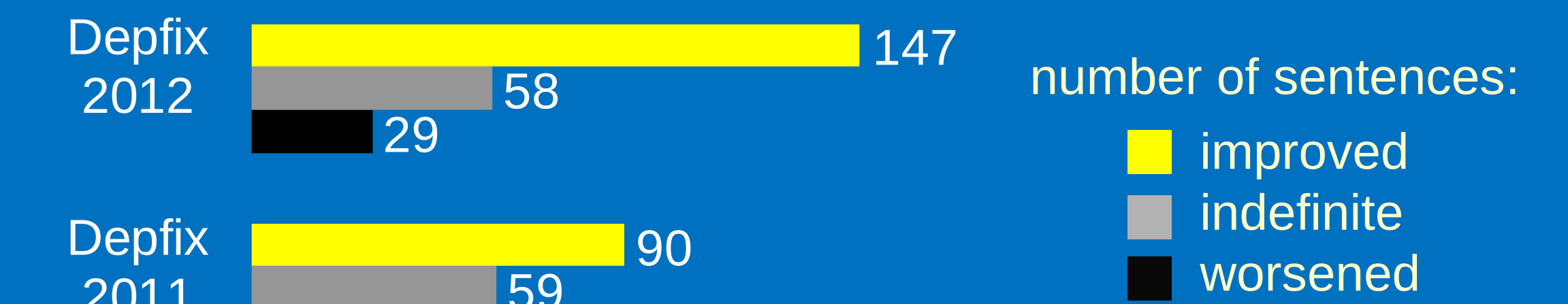
- “of + noun” is translated by putting the noun into the genitive case

Noun–Adjective agreement

- Adjectives must agree with nouns in number, gender, and case



Manual evaluation (on 500 sentences)



(applying Depfix on onlineB output, WMT11 data)

Inter-annotator agreement

A/B	Impr.	Wors.	Indef.
Improved	55%	1%	11%
Worsened	1%	8%	4%
Indefinite	3%	2%	15%

(applying Depfix 2012 on onlineB output, WMT11 data)

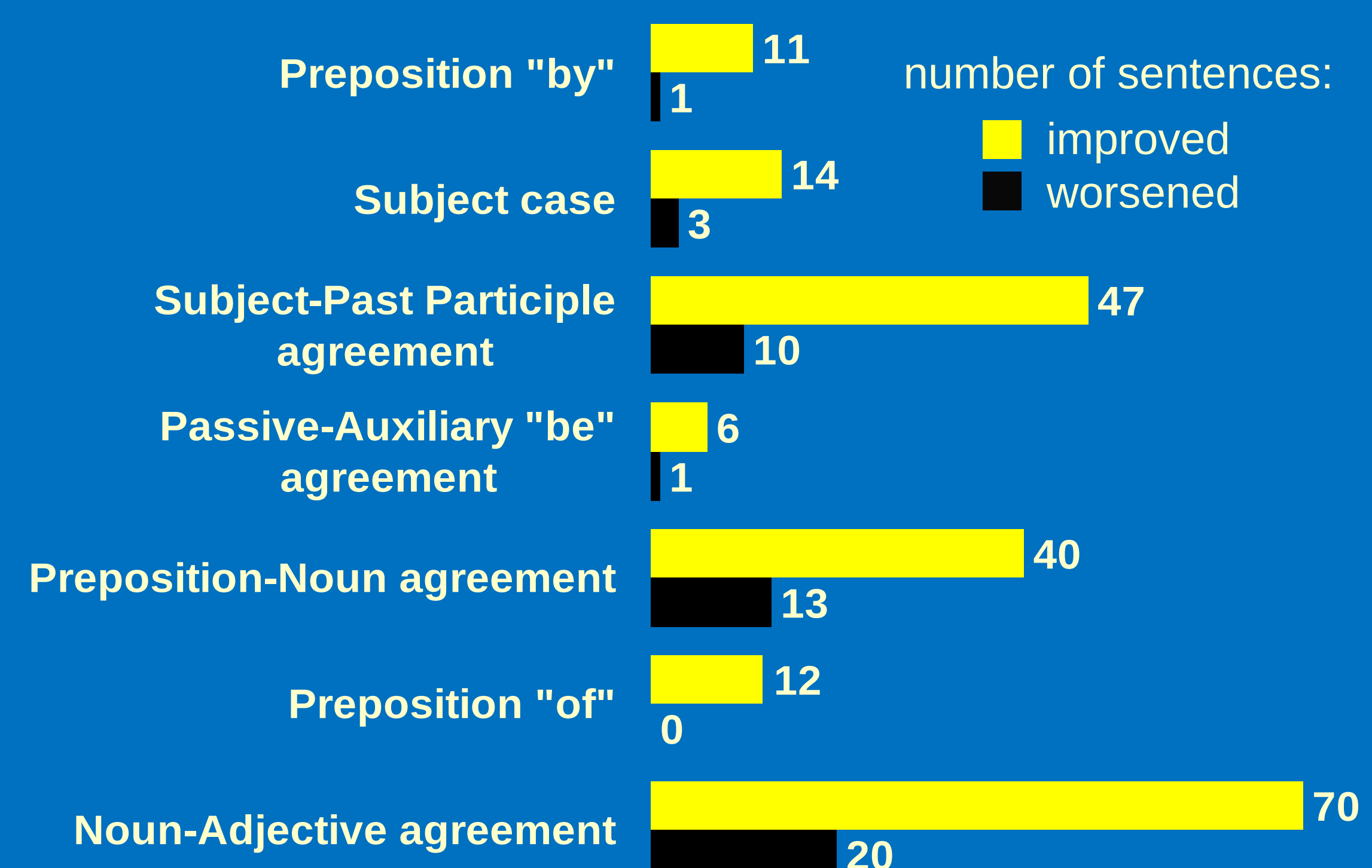
Manual evaluation, WMT12 competition

System	> others
onlineB + Depfix	0.66
onlineB	0.63
uedin	0.56
cu-tamchboj	0.56
cu-bojar	0.54

$score = \frac{wins}{wins + losses}$

(adapted from Chris Callison-Burch et al.: Findings of the 2012 Workshop on SMT)

Impact of rules (on 500 sentences)



(applying Depfix 2012 on onlineB output, WMT11 data, average for two annotators)

Depfix improvements in BLEU score

System	Before	After	Improvement
onlineB	16.25	16.31	0.06
uedin	15.54	15.75	0.21
cu-bojar	15.41	15.45	0.04
cu-tamch-boj	15.35	15.39	0.04

(applying Depfix on various SMT systems outputs, WMT12 data)