Incorporation of a Valency Lexicon into a TectoMT Pipeline

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October 21, 2016

Overview

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   - Valency in Slavic Languages
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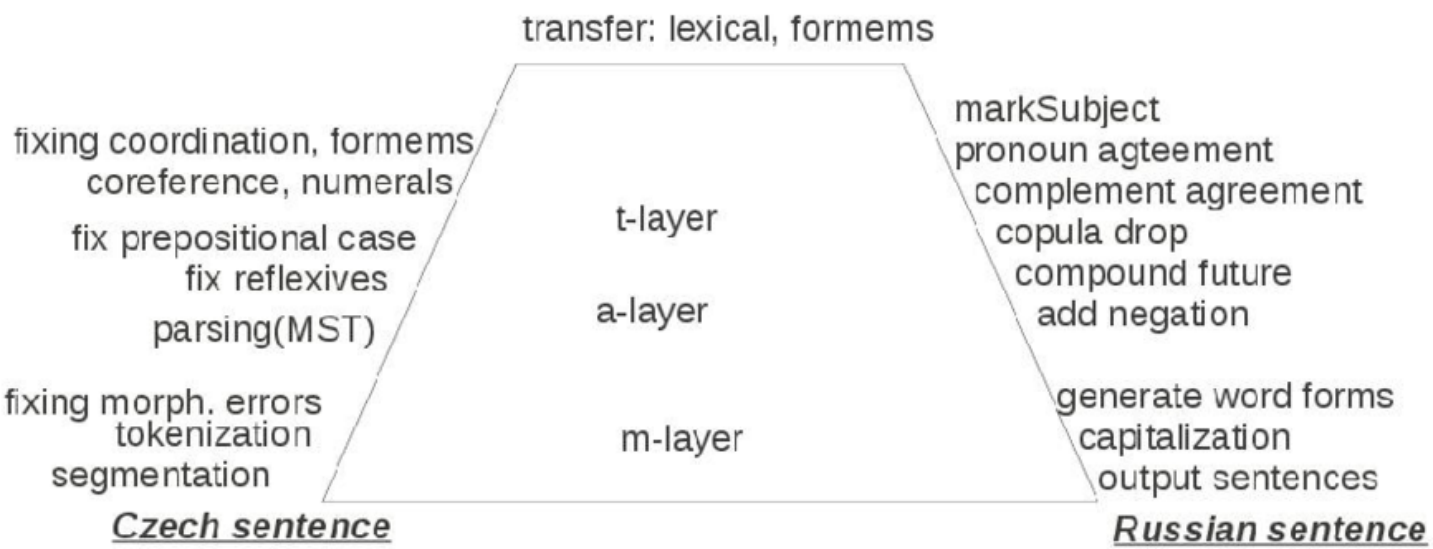
TectoMT scenario for Czech-Russian

- Czech analysis module
- Czech-Russian transfer: Czech-Russian dictionary; formemes (+ surface valency frames)
- Russian synthesis: specific blocks for Russian like copula drop



System improvement

- Fixing verbal aspect.
- Enlarging the dictionary.
- The list of formemes with prepositional complements:
- Some blocks to fix certain linguistic phenomena were added/improved: copula drop, modal verbs, fixing year construction in Russian etc.
- Surface valency frames added as formemes

System improvement

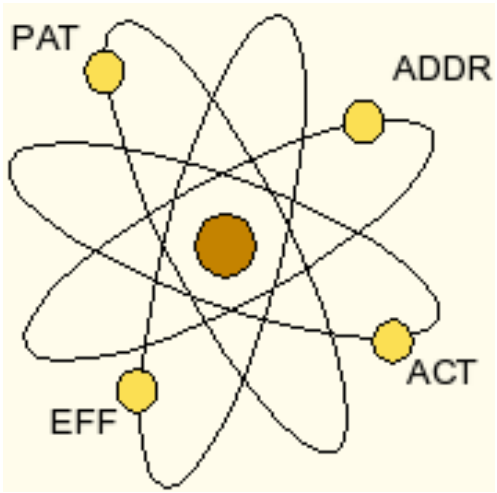
Experiment and improvements	BLEU score
Baseline	4.44%
Fixing verb tenses and aspect	5.09%
Adding preposition formemes	6.62%
Larger dictionary	7.04%
Fixes in Czech analysis (punctuation)	9.04%
Fixes in rules	9.40%
Fixes in valency	9.37[1]%

Table: Baseline and improvements

[1] Trust BLEU score under 20?

Valency

- Valency : Capability of a word to bind arguments
- Deep valency vs. surface valency
- Surface valency frame - formeme
- noun, verbal valency



The verbs that can cause mistranslations:

CZ: účastnit se konference (lit. to participate conference.Gen)
RU: участвовать в конференции (to participate in conference.Loc)

Ruslan dictionary - format transfer

VYSTAC3==R(5,PRP,?(N(D),S(I,G)),39,CHVATIT6):

- VYSTAC3 presents a stem of the verb vystačit – 'be enough',
- R denotes a root of a tree,
- 5 is a symbol for a verb and PRP is a conjugation pattern of the Czech verb,
- N(D),S(I,G)) is a valency frame that we will further describe in detail,
- 39 is a Russian declination pattern,
- CHVATIT6 is the Russian translation of a lexeme, coded in Latin

Transformed into vystačit s + Ins - chvatit' + Gen

Discrepancies in valency frames

- The same simple valency frame: Nom vyzývat + Acc -> Nom вызвать + Acc – to call + Acc
- The same prepositional complements: působit na + Acc -> воздействовать на + Acc to influence on + Acc
- different simple frame: (cz)vyhýbat se + Dat -> (ru) избегать + Gen – to avoid)
- different prepositional frame: (cz)doufat v + Acc -> (ru)надеяться на + Acc – to believe in)

Discrepancies in cases

		Czech				
		Nom	Gen	Dat	Acc	Ins
Russian	Nom	3070	8	10	6	3
	Gen	0	25	0	4	0
	Dat	0	3	178	7	0
	Acc	3	19	12	1388	7
	Inst	5	0	0	3	1355

Different surface frames:	90 (1.47%)
Total number of surface frames:	6160 (100%)
Number of verbs with different frames:	68 (3.66%)
Total number of analyzed verbs:	1856 (100%)

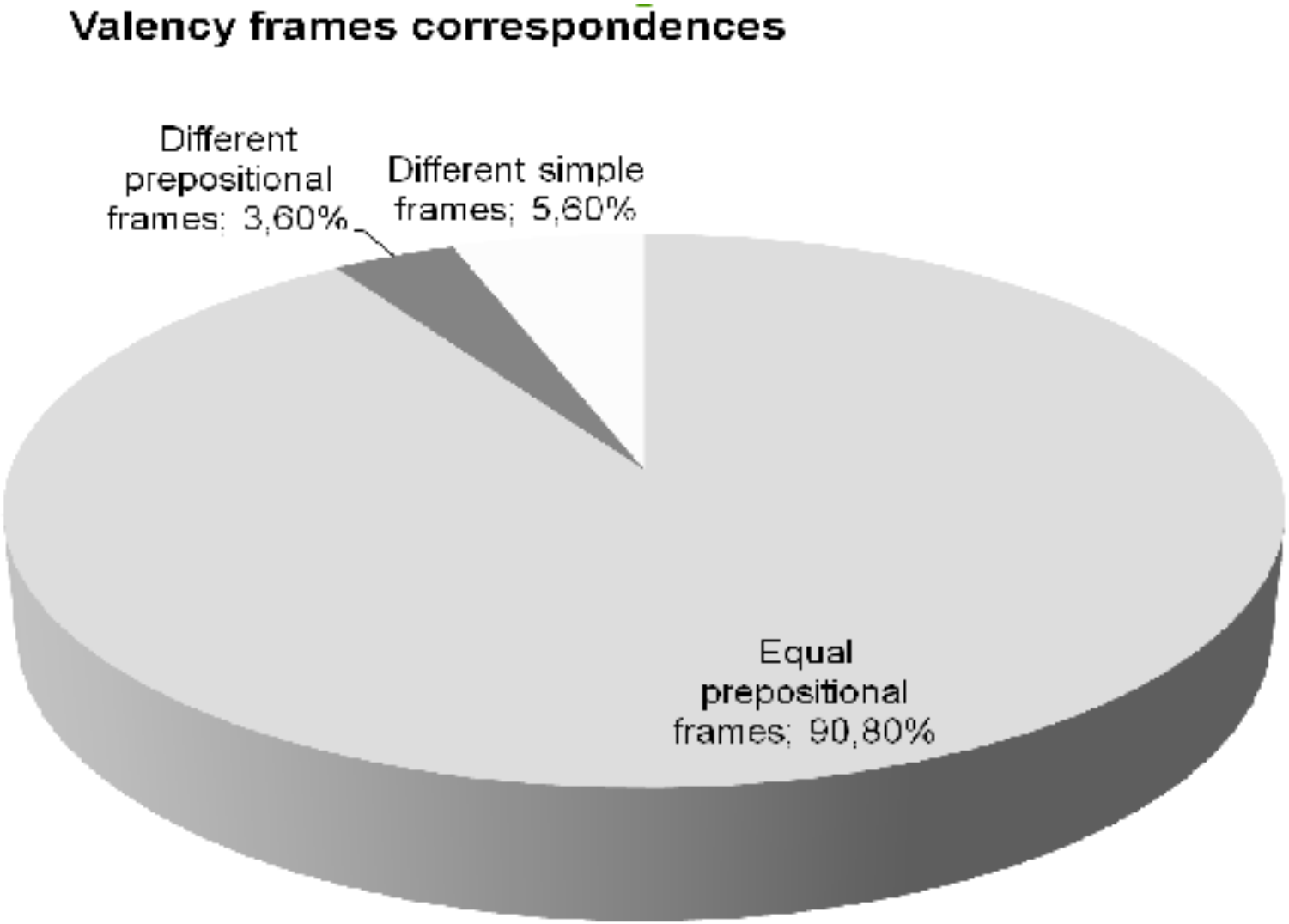
Table: Co-occurrence of the same cases in Czech and Russian based on Ruslan dictionary

Discrepancies in prepositional phrases

Czech frame	Russian frame	freq
na+Acc	na+Acc	82
do+Gen	v+Acc	80
z+Gen	iz+Gen	76
k+Dat	k+Dat	58
s+Ins	s+Ins	57
od+Gen	ot+Gen	29
v+Loc	v+Loc	26
o+Loc	o+Loc	22
do+Gen	do+Gen	19
k+Dat	dlja+Gen	16
na+Acc	o+Loc	15
na+Acc	k+Dat	14
před+Ins	ot+Gen	12
o+Acc	na+Acc	10

Table: Prepositional case correspondence – Ruslan dictionary

Discrepancies: overall statistics



Ruslan frames transformed into formemes

"vztahovat n:k+3" => "относить n:к+3",
"vystačit n:s+7" => "хватить n:2",
"vztáhnout n:4" => "отнести n:4",
"vznášet n:4" => "задавать n:4",
"vžit se n:do+2" => "вжиться n:в+4",
"vzdálit se n:od+2" => "удалиться n:от+2",
"vyzývat n:4" => "вызывать n:4",
"vyzvat n:4" => "вызвать n:4",
"vyznačovat n:4" => "обозначать n:4",

Any improvement?

- BLEU: 9.40% - > 9.38%
- manual evaluation of 100 sentences:

Effect	number of differences	Percentage
improved	28	58.3 %
worsened	3	6.2%
no effect	17	35.4%
Total	48	100%

Table: Manual evaluation of changes after adding FixValency.pm

Conclusion

- exploiting old language resources
- challenges for morphologically rich languages
- valency lexicon: no impact in BLEU, but the manual evaluation showed some improvement

Thank You!