Consistency and completeness of multiword expressions during translation

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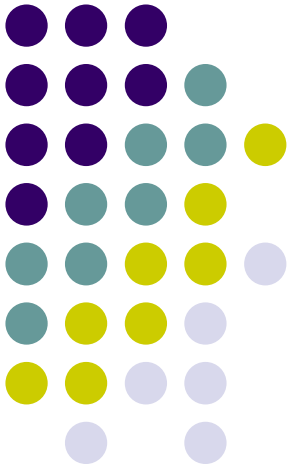
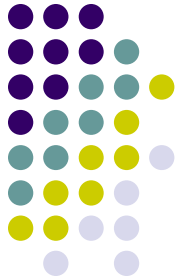


Overview

- System for extraction of MWEs and their translations
- Evaluation of the system
- Main drawbacks
- Consistency of the system
- Completeness of the system
- Conclusion and further work

System for extraction of MWEs and their translations



- Extraction
- Syntactical filtering
- Translation and cross evaluation
- Evaluation of the results

MWEs extraction

- 3500 candidate MWEs, including some useless:
  - тоа би ја / *toa bi ja*, instead of тоа би ја усреќило / *toa bi ja usrekjilo* = that will make her happy
  - рече тој со / *reche toj so*, instead of рече тој со недоверба / *reche toj so nedoverba* = he said with mistrust;

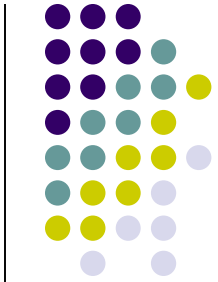
Syntactical filtering of MWEs

- Less than 500 phrases, sometimes inflections of the same phrase:
  - атомската бомба */ atomskata bomb* = the atomic bomb*,* атомски бомби */ atomski bombi* = atomic bombs
  - обичен човек */ obichen chovek* = an ordinary man, обичните луѓе */ obichnite lugje* = the ordinary men or the ordinary people,
  - шаховска табла */ shahovska tabla* = a chess board, шаховската табла */ shahovskata tabla* = the chess board

Translation and cross evaluation of MWEs

- Translation and cross evaluation
- This process extracted 968 English candidate MWEs
- They were translated using the system to:
  - Macedonian
  - Slovene
- and evaluated together

The learning corpus



- Multilingual corpus of Orwell's 1984 (created within Multext-East)
  - English
    - 6701 sentences
    - 104302 words
  - Macedonian
    - 6712 sentences
    - 98846 words
  - Slovene
    - 6684 Sentences
    - 90760 words

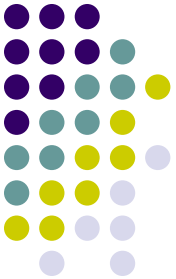
The crucial problems

- Manual translator of Orwell's 1984 was either inconsistent or had "an artistic freedom"
- Inflectional paradigms, which are richer in the Slavic languages can influence the translation
- The context in which the same target MWE appeared can also influence its translation

Incompleteness due to lexical inconsistency

Language	English	Macedonian	Slovene
Multiword expression	**the seconds were ticking by**	секундите минуваа (отчукувајќи)	sekunde so tiktakale mimo
Mac 1: секундите минуваа отчукувајќи ...			
Mac 2: секундите минуваа бескрајно долги ...			
Multiword expression	**almost on a level with**	речиси на исто (со)	no translation
Mac 1: ... речиси на исто ниво со ...			
Mac 2: ... речиси на исто рамниште со ...			
Slov 1: ... skoraj na ravni z ...			
Slov 2: ... skoraj v isti višini z ...			
Multiword expression	the first thing	(прва работа што мора) да ја сфатиш е	**prva stvar ki jo moraš ...**
Eng 1: the first thing for you to understand ...			
Eng 2: the first thing you must realize ...			

Incompleteness due to inflections



Language	English	Macedonian	Slovene
Multiword expression	**smell of her hair**	(мирисот) на нејзината коса	vonj njenih las
Mac 1: ... (пријатниот) мирис на нејзината коса			
Mac 2: мирисот на нејзината коса			
Multiword expression	**ideologically neutral**	идеолошки неутрален	ideološko nevtralen/na
Slov 1: ... (nobena beseda ... ni bila) ideološko nevtralna			
Slov 2: ... (predmet govora ni bil) ideološko nevtralen			
Multiword expression	**against us**	против нас	po robu (proti nam)
Slov 1: ... (nikdar ne) postavi po robu			
Slov 2: ... (in se nam) postavila po robu			

Incompleteness due to the context

Language	English	Macedonian	Slovene
Multiword expression	**for more than half an hour**	(за) повеќе од половина час	za več kot pol ure
Eng 1: ... and never for more than half an hour at a time Mac 1: ... и никогаш повеќе од половина час			
Eng 2: ... to turn off the telescreen for more than half an hour Mac 2: ... да го држат исклучен телекранот повеќе од половина час			
Multiword expression	**definitive edition**	дефинитивното издание	no translation (dokončna izdaja)
Eng 1: ... (the eleventh edition is the) definitive edition ... Slov 1: ... (enajsta izdaja je) dokončna			
Eng 2: ... (we were producing a) definitive edition ... Slov 2: ... (pripravljali smo) končno izdajo			
Mac 2: ... никогаш не работев во одделот за препишување Slov 2: ... (nikdar nisem bila v) prepisovalni ekipi Eng 2: (i was never in) the rewrite squad			

Consistency of the system

- Consistency measured with Herfindahl-Hirschman Index (*HHI*) measure (Itagaki, 2007)

$$HHI = \sum_{i=1}^{n} S_i^2$$

- *HHI* is applicable to multiword expressions, replacing the single words to lexical units
- Relative consistency:

$$RC = \frac{HHI}{|MWE|}$$

Completeness of the system

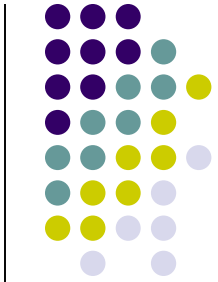
- We propose an index of completeness as its upgrading, to express the degree of correct translation of a complete MWE
- *DG* -> degree of generated MWE

$$DG = \frac{length(generated\ MWE)}{length(complete\ MWE)}$$

- *CC* -> combined completeness of the MWE

$$CC = \frac{1}{m}\sum_{j=1}^{m} S_j^2 DG_j^2$$

Consistency and completeness of our system

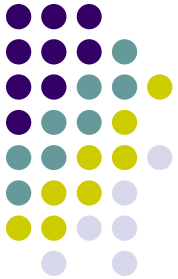


	Macedonian	Slovene
No translation	48	162
Partial inconsistency	127	91
HHI	836.75	778.25
RC	86.44%	80.40%
CC	83.42%	74.97%

Overview of our research

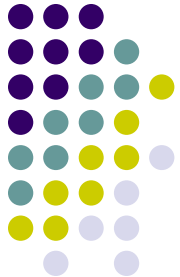
- We tried to define a framework for effective treatment of lexical units across languages
- We measured the consistency and the completeness of generated translations of MWEs existing in the small parallel Multext-East corpus

Extensions (1)



- Implement the same approach to bigger corpora
  - Example: the raw material obtained when Moses SMT toolkit, which was implemented over SETimes corpus (Slovene is not a part of this corpus)
- Incorporation of lexical entries +
- Extension with semi-fixed and flexible MWEs.
  - Decrease of inconsistency and incompleteness due to inflections

Extensions (2)



- Lexical cohesion
  - Extend the document-level translation to a larger collection
- Integration of the model into a hierarchical phrase-based SMT system
- Extraction of the common knowledge about multiword expressions out of a continuous context
  - Incorporation of acquired knowledge into a translation system capable to competently deal with MWEs

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Thank you for your attention

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