Using Wikipedia for Named-Entity Translation

Izaskun Fernandez, Iñaki Alegria, Nerea Ezeiza

Tekniker-IK4 and IXA NLP Group

Index

1. Introduction and Motivation
2. Related Works and Previous Works
3. System Development
4. Results
5. Conclusion and future work

Index

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Introduction and Motivation I

- Named Entities: person, location, organization
- Named Entities (NE) Recognition: common task
- Main Goal: Construct a multilingual NE database
  - translation systems
  - multilingual information extraction (QA)
- NE translations

Introduction and Motivation II

Exploit Wikipedia for NE translation

- Free on-line multilingual encyclopedia
- Each entry uniquely represented by its title
- Wikipedia Interlingual Links (WIL) to relate same titles in different languages:
    - Basque: *Euskal Herria*
    - English: *Basque Country*

Index

1. Introduction and Motivation
2. Related Works and Previous Works
3. System Development
4. Results
5. Conclusion and future work

Related Works I

NE translation:

- English-French translation system based on parallel corpora using statistical methods: *Learning Translations of Named-Entity Phrases from Parallel Corpora (Moore R., EACL 2003)*
- Arabic-English translation system based on comparable corpora using simple transformation rules and dictionaries: *Machine Transliteration of Names in Arabic Text (Al-Onaizan Y. et al., ACL 2002)*

Related Works II

Wikipedia and NE:

- Classification based approach for German-English WILs enrichment: *Enriching the Crosslingual Link Structure of Wikipedia (Sorg P., and Cimiano T. AAAI2008)*
- Multilingual NER based on Wikipedia, exploiting English data for bootstrap NER process in other languages: *Mining Wiki Resources for Multilingual Named Entity Recognition (Richman A. E., Schone P. ACL2008)*

Previous Work I

Basque-Spanish language dependent system

- Basque-Spanish comparable corpora
- Linguistic knowledge based transliteration module (phonetic/phonological information)
- Linguistic knowledge based re-arrangement module (morphosyntactic information)

Previous Work II

Language semi-independent translation tool

- Basque-Spanish
- Spanish-English

Using:

- Comparable corpora for each language pair
- Bilingual dictionary for each language pair
- Edit distance based transliteration module
- Re-arrangement module: all with all

Index

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Resources

Resources for constructing translation tool:

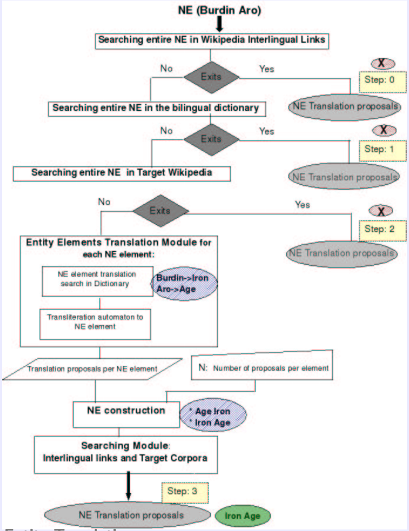
- MediaWiki API (`http://www.mediawiki.org/wiki/API`): WIL and redirection pages
- Yahoo! semantically annotated Wikipedia version: target lexicon using only NEs (`http://www.yr-bcnn.es/semanticWikipedia`)
- Basque-English bilingual dictionary

System Description

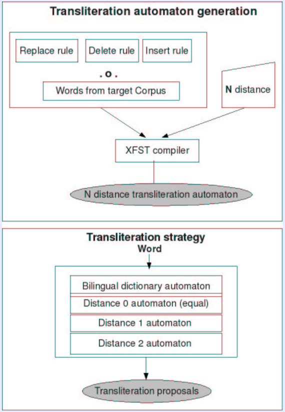
Three main modules:

- Searching module:
    - wikipedia interlingual links
    - bilingual dictionary
    - target NEs from Wikipedia
- Entity element translation module:
    - transliteration grammar
    - bilingual dictionary
- Element arranging module
    - all with all combinations

System Architecture


NE (Burdin Aro)
Searching entire NE in Wikipedia Interlingual Links
No
Exits
Yes
X
Step: 0
NE Translation proposals
Searching entire NE in the bilingual dictionary
No
Exits
Yes
X
Step: 1
NE Translation proposals
Searching entire NE in Target Wikipedia
No
Exits
Yes
X
Step: 2
NE Translation proposals
Entity Elements Translation Module for each NE element:
NE element translation search in Dictionary
Burdin->Iron
Aro->Age
Transliteration automaton to NE element
Translation proposals per NE element
N: Number of proposals per element
NE construction
* Age Iron
* Iron Age
Searching Module: Interlingual links and Target Corpora
Step: 3
NE Translation proposals
Iron Age

Entity Elements Translation Strategy


Transliteration automaton generation
Replace rule
Delete rule
Insert rule
. o .
Words from target Corpus
N distance
XFST compiler
N distance transliteration automaton
Transliteration strategy
Word
Bilingual dictionary automaton
Distance 0 automaton (equal)
Distance 1 automaton
Distance 2 automaton
Transliteration proposals

Index

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Experimental Settings

- Two evaluation corpus:
  - Most frequent NEs at *Egunkaria 2002* data-set with Basque-English WILs
    - 142,464 NEs in data-set
    - 575 NE filtered for evaluation
    - WILs for tranlation (Step0) not used for this evaluation
  - ResPubliQA CLEF2009 test set
    - 500 questions: Bulgarian, Basque, English, etc.
    - 72 Basque-English NE pairs
    - 9 of them without entry in the target Wikipedia

Measures

Three measures:

- $Precision = \frac{correctly\_translated\_NEs}{Translated\_NEs}$
- $Recall = \frac{correctly\_translated\_NEs}{All\_NEs}$
- $F - score = \frac{2*Precision*Recall}{Precision+Recall}$

Baseline:

- correct translation when Basque and English forms are identical

Evaluation with Wikipedia based test set I

Translation distribution:

Steps	Total	Correct
Bilingual dictionary	17	11
Target Wikipedia	391	375
Element by element	59	48
No Translation	108	0

Results:

	Pr	R	fs
Baseline	59.82%	59.82%	59.82%
Our system	93.36%	75.82%	83.68%

Evaluation with Wikipedia based test set II

Encouraging results: 83.68% f-score

Analysing errors: WILs not always link equivalent forms

- WIL: *Dorre bikiak - World Trade Center*
- Correct link: *Dorre bikiak - Twin Towers*
- New WIL suggestion

Evaluation with CLEF2009 based test set I

9 of the 72 pairs without entry in the target Wikipedia

Topline recall 87.5%

Evalution in two different ways:

- silence-mode: when no proposal found, no translation is returned
- talkative-mode: when no proposal found, the original Basque form is proposed

Results:

	Pr	**R**	**fs**
Baseline	23.69%	23.69%	23.69%
Silence-mode	92.68%	52.77%	67.25%
Talkative-mode	55.5%	55.5%	55.5%

Evaluation with CLEF2009 based test set II

CLEF2009 set not belong to Wikipedia

- WILs explotation for NE translation (Step0)
- 26 NE translation proposal

System improvement respect to the baseline

System Improvement I

Not very suitable bilingual dictionary

- *Nazio Batuak - United Nations*
- Using the dictionary: Union and Nation

Automatic dictionary lexical enrichment:

- WILs of 84 wrong translated NE pairs in the Wikipedia-based test set
- For each NE pair: try to match each element Basque form with their English form:
  - mantaining the original Basque form
  - using the existing bilingual dictionary
  - when every Basque element except one parsed, and only one English element has no Basque element assigned, enrich dictionary with the new pair
- Iterate until no new word pair is found

System Improvement II

Example:*Europako Parlamentua - European Parliament*

- Try *Europako*. No equivalence found
- Try *Parlamentua*. Bilingual dictionary: *Parliament*
- Without matching *Europako* and *European*. Add new pair to dictionary

Results:

	Pr	**R**	**fs**
Silence-mode	92.68%	52.77%	67.25%
Talkative-mode	55.5%	55.5%	55.5%
Enriched-Silence-mode	**93%**	**55.5%**	**69.51%**
Enriched-Talkative-mode	**58.33%**	**58.33%**	**58.33%**

Index

1. Introduction and Motivation
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Conclusions and Future Works

- Exploiting Wikipedia for NE translation might benefit in two directions:
  - Building a good-quality NE translation system
  - Suggesting new WILs
- Promising results but deeper evaluation and error analysis is needed
- Future works:
  - NE disambiguation, specially for minority languages
  - Using the presented NE translation system for that purpose

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