Subsegmental language detection in Celtic language text



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Introduction

We aim to perform language identification on sub segmental basis:

- Typical case is to detect the language of documents and sentences.
- We are focussing on cases where A single sentence may have different **code switching** points

Dataset

- Simplifying the task by taking into account Celtic languages and a corresponding majority language.
- Manual annotation of about 40-50 tweets for each of the three language pairs.

Pair	Language	Statistics (%)		
1 an	Language	Tokens	Segments	
Irish—English	Irish	332	40	
	English	379	42	
Welsh—English	Welsh	419	64	
	English	378	66	
Breton—French	Breton	388	54	
	French	379	53	

Methodology

- Alphabet n-gram approach
- Character Language model
- Using IRSTLM we build a language model for the five languages
- For English and French Europarl
- Breton, Welsh and Irish Corpora of text crawled from the web
- Size of the corpus from which this language model was built - 1.5 million tokens
- Example the word 'sláinte!' would be broken down into a sequence of {'_ s', 's l', 'l á', 'á i', 'i n', 'n t', 't e', 'e!', '! _'}.

- Generate word lists for the languages using aspell which is widely used on Unix systems.
- Word are labeled according to their presence in the particular word list.
- In case of a confusion the word is added to the previous segment
- .. Word-based prediction with character backoff..
- Same as Word-based prediction, but in case of confusion this falls back to the Alphabet bi-gram approach.

..... Baseline

• Using *langid.py* labeled all the lines in a particular dataset according to the majority classification

......Langid character trigram prediction.....

- Trigram probabilities from *langid* were taken into account.
- All other heuristics and chunking algorithm are same

as for other methods

Examples of code-switching segmentation

[en You're a] [ga Meiriceánach, cén fáth] [en are you] [ga foghlaim Gaeilge?!] @afaltomkins [cy gorfod cael bach o tan] [en though init] en omg[cy mar cwn bach yn] [en black and tan] [cy a popeth,] [en even cuter!!]

Example

Code switching: You're a [Meiriceánach, cén fáth] are you [foghlaim Gaeilge?!] The anthem starts with the words ['Mae hen wlad fy nhadau...'] **Quotations:** [Dr Jekyll] ha [Mr Hyde] embannet gant [Éditions Aber] Named entities:

Hey, that's great, [diolch yn fawr!] **Interjections:**

Bloavezh mat d'an holl! [Bonne anné à tous!] **Translations:**

Chunking algorithm

Algorithm 1 *

```
Require: s: sentence to chunk
```

```
1: buffer = [] /*Undecided expanding window of chunk*/
```

2: chunks = [] /*Decided labelled segment*/

3: buffer_language \leftarrow Language of first word */

4: $flag \leftarrow 0$

10:

11:

15:

16:

17:

18:

5: for all $w \in s$ do

if Language then $\operatorname{Language} \operatorname{then}$

if flag = 1 then

buffer \leftarrow buffer + [word_buffer,w]

 $flag \leftarrow 0$

else

buffer \leftarrow buffer + [w]

if Language then \neq buffer_language then

if flag= 0 then

13: $flag \leftarrow 1$

word_buffer $\leftarrow w$

continue

else

 $chunks \leftarrow chunks + [(buffer,buffer_language)]$

 $buffer \leftarrow [word_buffer, w]$

buffer_language \leftarrow LANGPREDICT(w)

 $flag \leftarrow 0$ 21:

22: if length(buffer) $\neq 0$ then

 $chunks \leftarrow chunks + [(buffer,buffer_language)]$

Results

System		Irish—English		Welsh—English		Breton—French	
		Irish	English	Welsh	English	Breton	French
baseline	\overline{p}	2.50	0.0	0.0	0.0	0.0	0.0
	\tilde{r}	2.56	$\mid 0.0 \mid$	0.0	0.0	0.0	0.0
langid-3character	\overline{p}	5.00	14.29	0.0	21.21	1.85	20.75
	\dot{r}	5.41	8.45	0.0	14.58	1.92	12.36
wordlist	\overline{p}	32.50	28.57	26.69	40.91	57.41	33.96
	\tilde{r}	23.64	26.09	26.03	33.75	47.69	33.33
character bigram	\overline{p}	32.50	35.71	23.44	19.70	57.41	52.83
	\dot{r}	22.41	26.79	15.31	16.67	41.33	37.84
wordlist+character bigram	\overline{p}	52.50	50.00	32.81	31.82	70.37	67.92
	\dot{r}	38.18	43.75	24.14	25.61	57.58	57.14

System	Accuracy (%)				
	Irish—English	Welsh—English	Breton—French		
baseline	42.76	42.16	44.07		
<i>langid-</i> 3character	57.24	45.92	43.16		
wordlist	79.75	74.28	83.96		
character bigram	81.29	65.62	76.79		
wordlist+character bigram	85.79	72.40	88.79		

Evaluation

- We followed the footsteps of **CoNLL 2000** shared task on language independent named entity recognition.
- Divide the text into non-overlapping segments.
- **Precision** percentage of correctly detected phrases.
- **Recall** number of phrases in the data that were found by the chunker.

Conclusions

- A very preliminary investigation into subsegment language identification in Celtic language texts.
- We would like to include supervised methods and features talked about by King and Abney (2013)
- We would also like to check our methods with higher order n-grams and more options in backoff.
- Explore a lattice technique where each word is a lattice node and the inclusions of the words are done using probability.