

Phonetic tools: Current Developments and Perspectives

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Summary

- 1 A tree-based phonetization algorithm
 - Overview
 - Examples
- 2 Syllabification
 - A language-independent algorithm
 - Proposed rules for French
 - Evaluation
 - The LPL-Syllabeur tool
- 3 SPPAS : a new tool
 - Overview
 - Demonstration

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A Tree-based phonetization approach

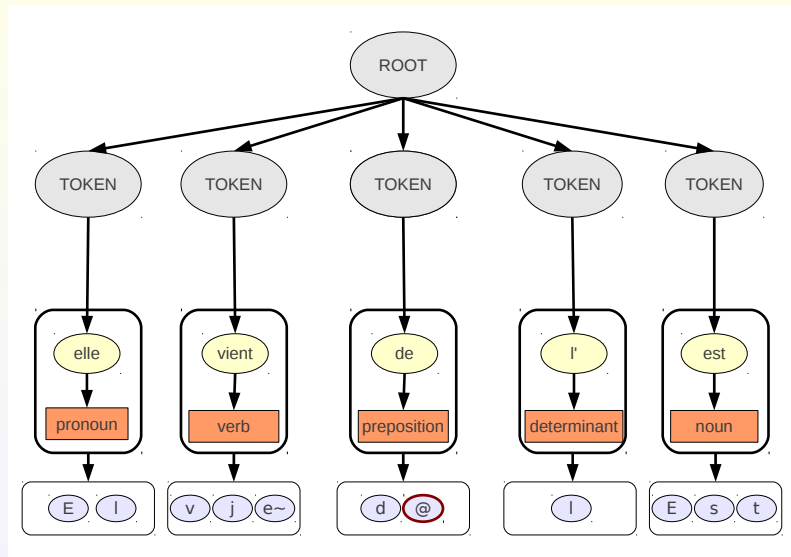
- Send a standard orthographic transcription to the tagger
- Send the phonetic-oriented transcription and the tags to the phonetizer
- The node's list :
 - root
 - token
 - laught
 - special pronunciation
 - elision
 - liaison
 - truncated words
 - short pause
 - header

- To the tagger :
 - token
 - special pronunciation : the standard transcription
 - elision : the standard transcription
- To the phonetizer :
 - token
 - special pronunciation : the transcription
 - elision : the modified transcription
- To a LTS :
 - liaison
 - truncated words

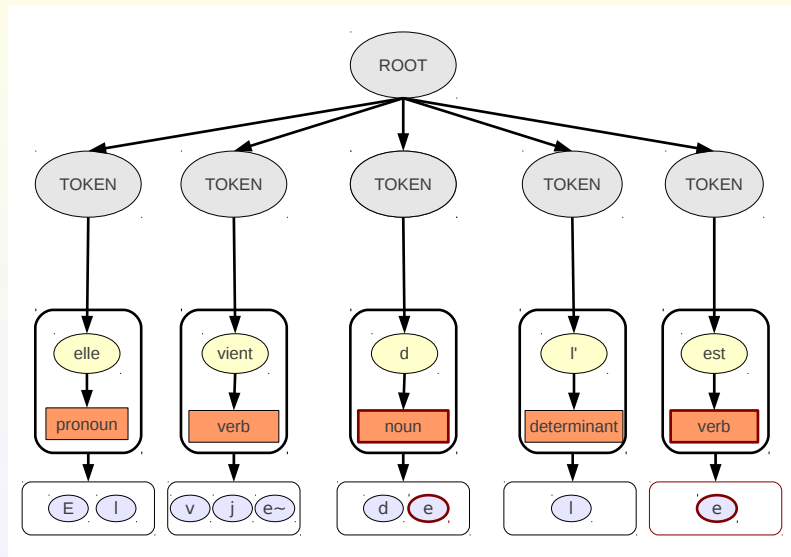
Example 1 : elision

- To deal with homograph disambiguation as for example :
 - est, verb : e
 - est, noun : ε s t
- Example :
 - The TOE sentence : elle vient d(e) l'est
 - The result we want : εl vjẽ d l εst
- Result with the LIA_PHON phonetizer :
 - with standard Transcription : elle vient de l'est : εl vjẽ də l εst
 - with modified Transcription : elle vient d l'est : εl vjẽ de l e

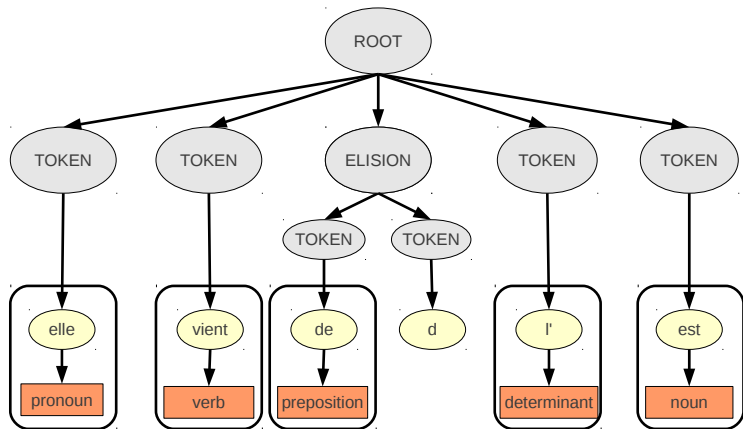
Standard Transcription tree representation



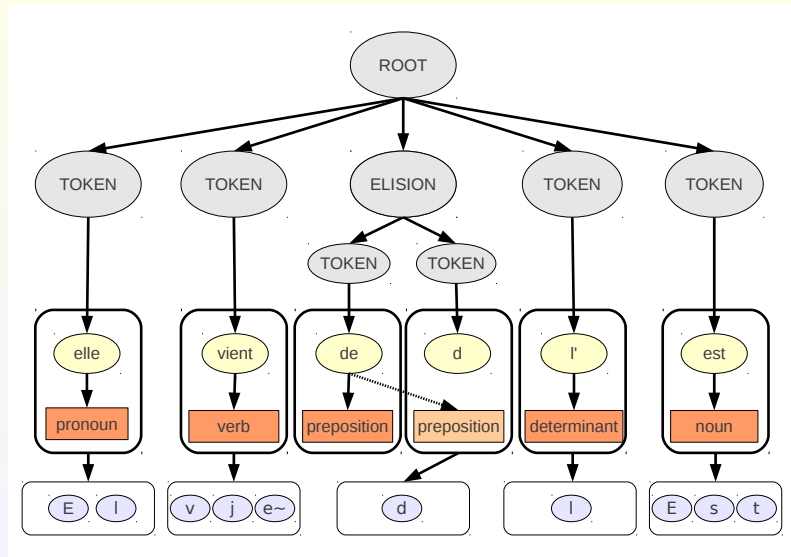
TOE Transcription tree representation



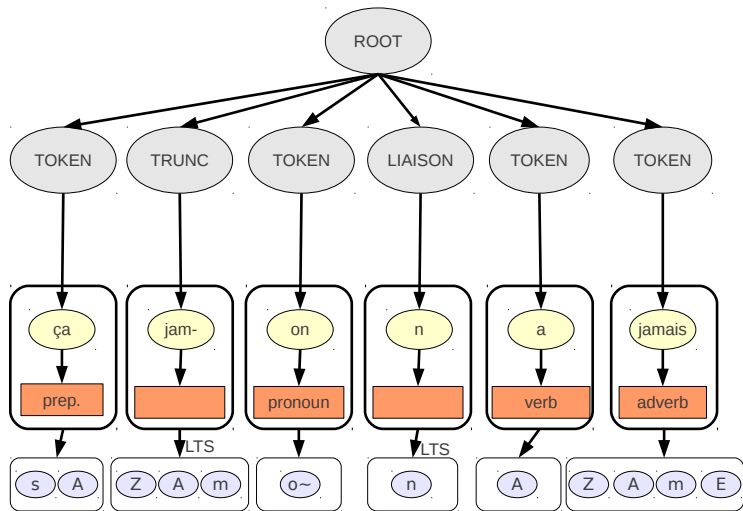
TOE-tree based representation (1)



TOE-tree based representation (2)



Example2 : truncated word



- The algorithm is language-independent
- Only external tools are language-dependent :
 - the tagger
 - the phonetizer
- The algorithm implementation call external scripts as interface.
- These scripts call external these tools and make the data input/output format.

See [6] for details.

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Main goal

- Automatic detection of syllable boundaries
- Development of a Rule-Based System (RBS) :
 - for automatic syllabification of phonemes' strings
 - of the size greater than a graphic word
 - Example :

Phonemes i l e k s p l i k e p a v r e m ã s k i i a v e d ã

Main RBS Principles

- The syllabification process is based on 2 main principles :
 - ① a syllable contains a vowel, and only one.
 - ② a pause is a syllable boundary.
- These two principles bring the problem to find the boundaries between two vowels

Phonemes i l e k s p l i k e p **A** v r e m **Ä** s k i j **A** v e d **Ä**

Group phonemes into 6 classes

V - Vowels : i e ε a ɑ ɔ o u y ø œ ə ĩ ã õ õe

G - Glides : j ɥ w

L - Liquids : l ʀ

O - Occlusives : p t k b d g

F - Fricatives : s z ʃ ʒ f v

N - Nasals : m n ŋ ɲ

- Unlike other systems, we divide consonants into 3 classes : O, F, N.

Phonemes	i l e k s p l i k e p a v r e m ã s k i j a v e d ã
Classes	V G V O F O L V O V O V F L V N V F O V G V F V O V

The letter X to mention one of G, L, O, N or F.

	Observed sequence	Segmentation rule	Examples (French)
1	VV	V.V	poète : po.ɛt, il y a un : i.a.œ
2	VXV	V.XV	limité : li.mi.te, et donc on : e.dõ.kõ
3	VXXV	VX.XV	jardin : ʒaʀ.dẽ, comme ça : kom.sa
4	VXXXV	VX.XXV	avec moi : a.vek.mwa
5	VXXXXV	VX.XXXV	il se présentait : il.spre.zã.te
6	VXXXXXV	VXX.XXXV	alors je crois : a.lorʒ.krwa

Exception rules

	Observed sequence	Segmentation rule	Examples
1	VXGV	V.XGV	baignoire : be.nwaʀ, spéciaux : spe.sjo
2	VFLV	V.FLV	découvre : de.ku.vʀə,
3	VOLV	V.OLV	il trouve : i.tʀuv, mais de la : me.dla
4	VFLGV	V.FLGV	effroyable : ef.ʀwa.jabl
5	VOLGV	V.OLGV	incroyable : ẽ.krwa.jabl
6	VOLOV	VOL.OV	connaître tu : ko.netʀ.ty

CID Syllabification Evaluation

- The test corpus is 1.6% of the CID
 - about 7 minutes of a dialogue
 - 2068 syllables
- The test corpus was manually segmented by two experts
 - a syllable agreement rate of 97.77% (23 boundary mismatches)
- Number of boundary mismatches and syllable difference rate :

	<i>syllabation.awk</i> (1)	<i>graphon+</i> (2)	<i>syllabify2.praat</i> (3)	LPL-Syllabeur
Expert 1	74 7.16%	80 7.74%	67 6.48%	43 4.16%
Expert 2	84 8.12%	85 8.22%	75 7.25%	53 5.13%

Discussion (1)

The rules we propose follow usual phonological statements for most of the corpus. Our aim is not to propose a true set of syllabification rules for French, but to provide an acceptable syllabification for the most part of spontaneous speech corpus.

See [5] for details.

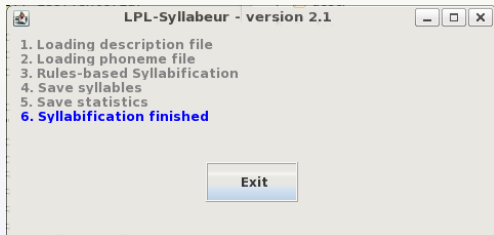
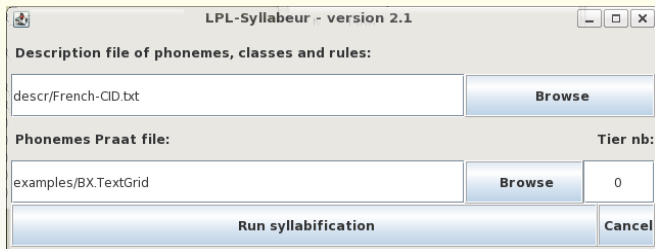
Discussion (2)

Transcription	il expliquait pas vraiment ce qu'il y avait dedans
Phonemes	i l e k s p l i k e p a v r e m ã s k i j a v e d ã
Classes	V G V O F O L V O V O V F L V N V F O V V V F V O V
Syllables Auto	i . lek . spli . ke . pa . vre . mã . ski . ja . ve . dã
Syllables Expert1	i . lek . spli . ke . pa . vre . mã . ski . ja . ve . dã
Syllables Expert2	i . leks . pli . ke . pa . vre . mã . ski . ja . ve . dã

The LPL-Syllabeur Tool

- A rule-based phoneme to syllable segmentation system
- Implemented in java 1.6 and tested under linux and windows®
- GPL
- Input and Output in a TextGrid Praat file
- **A configuration file** that the user can change as needed to specify
 - phonemes and classes :
PHONCLASS e V
PHONCLASS p 0
 - general and exception rules :
GENRULE VXXV 1
EXCRULE VFLV 0
 - some phoneme sequences and a boundary shift to apply :
OTHRULE ANY p s k -2

The LPL-Syllabeur : French or English GUI



- To adapt LPL-Syllabeur to a specific corpus by adding or modifying rules, phoneme encoding or phoneme classes :
 - Change the configuration file only
- In the same way, it is possible to adapt phonemes and rules to other languages
- Current development : English syllabification
 - Define a set of phone classes : usual phonological statements?
 - Define a set of segmentation rules : automatically train them from a segmented corpus?

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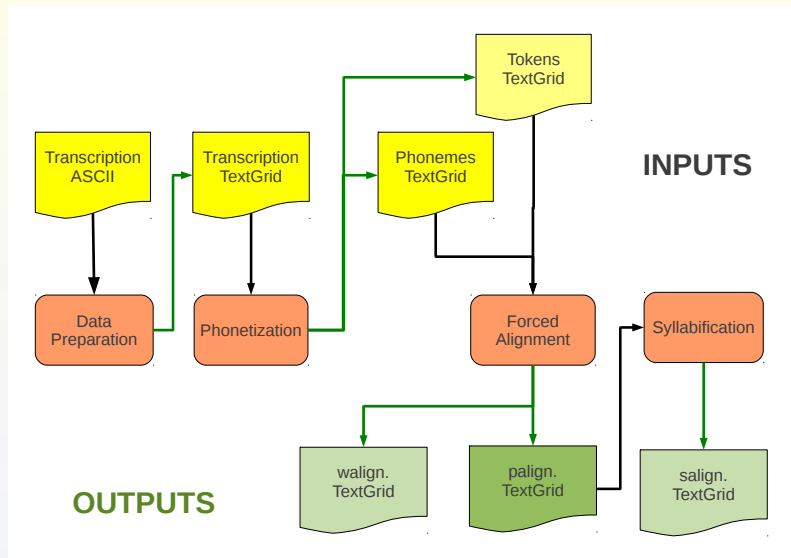
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- 1 Data manipulation : 
 - Find silences,
 - Put a text transcription into a textgrid...
- 2 Phonetization :
 - A tree-based phonetizer, currently only for French
 - A grapheme-to-phonemes converter for any other language
- 3 Alignment :
- 4 Syllabification :
 - A rule-based system with
 - A French configuration file (validated)
 - An English configuration file (to be validated)

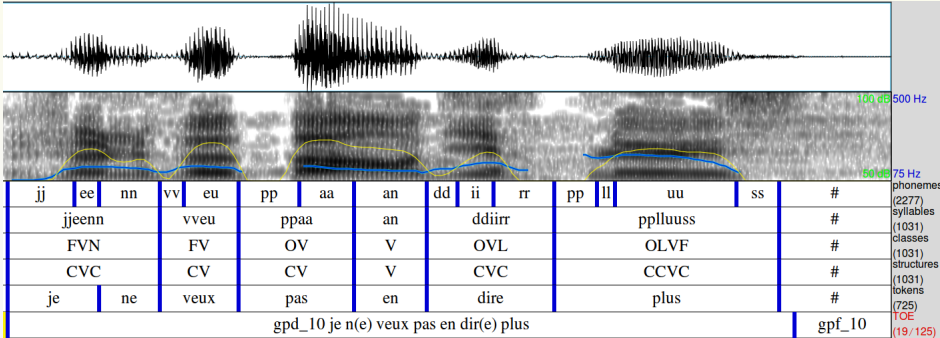
The SPPAS tool workflow



Current and Future developments

- TOE support for English
- French acoustic models trained from the CID corpus
- Chinese language Support
- Other languages support (any suggestions?); needed :
 - a phonetized dictionary
 - enough wav and transcription files
- For languages with the dictionary-based grapheme-to-phoneme conversion : I will add my tokenizer which currently can deal with FR/EN/SP/VN/KH [1]

French



SPPAS...

I will show you a demo of the SPPAS 1.0 tool...

See [3, 2, 4]

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