

Praatalign: an interactive Praat plug-in for performing phonetic forced alignment

A detailed manual for version 1.0

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Chapter 1

Introduction

1.1 Introduction

Praatalign is a plug-in for Praat that can be used to do forced phonetic alignment on speech signals and in particular free speech. Praatalign combines the powerful HTK toolkit with the interactivity and modularity of Praat to create an interactive, intuitive and extendable application. Text in `monospace` means that the word is a command, variable or value.

1.2 Example workflow

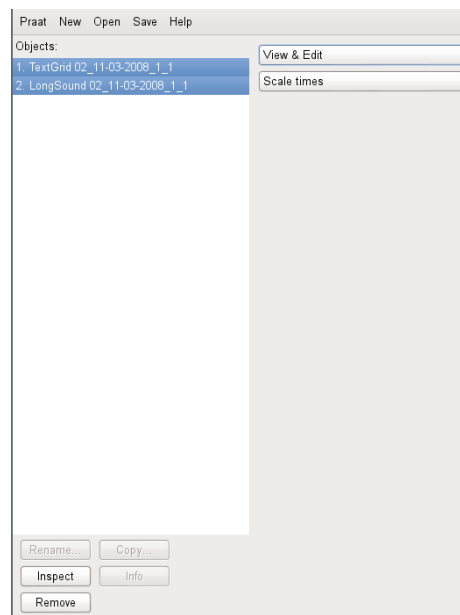
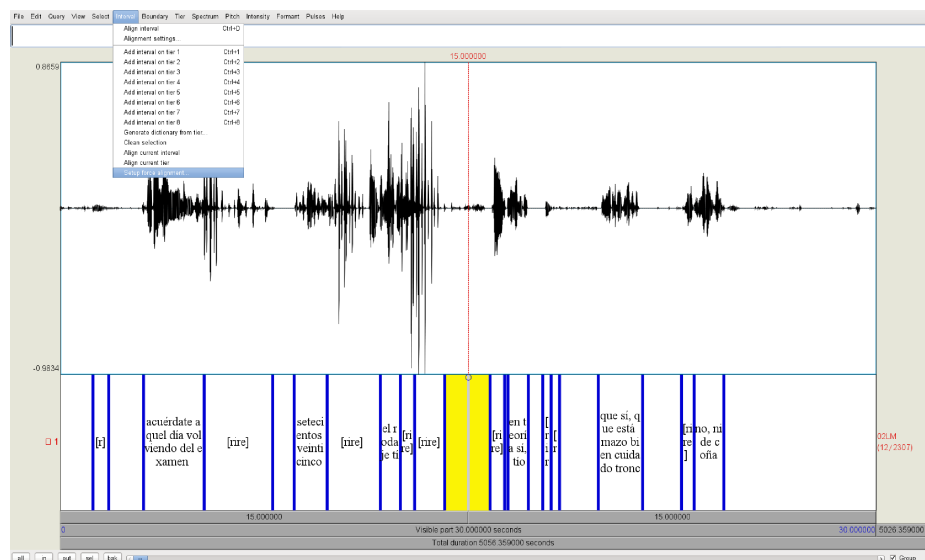
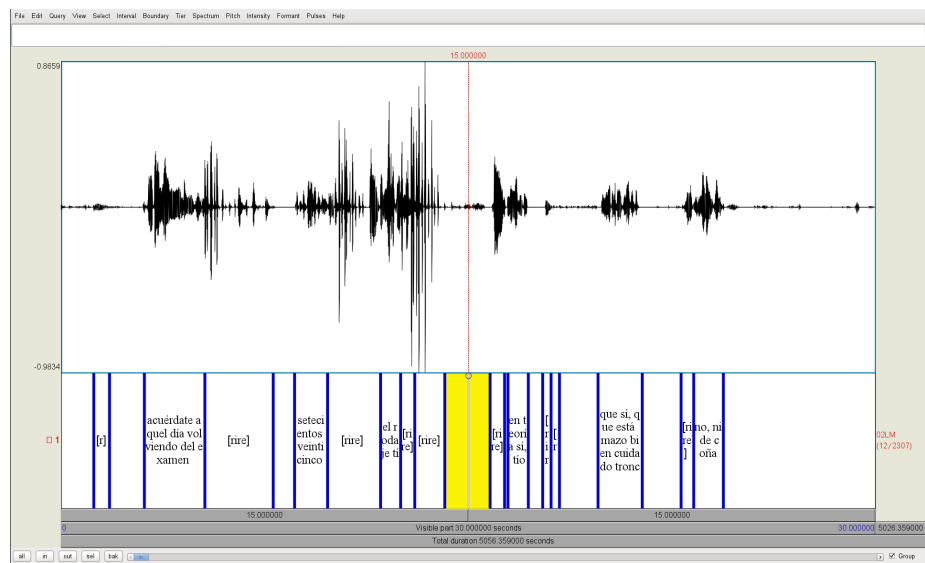
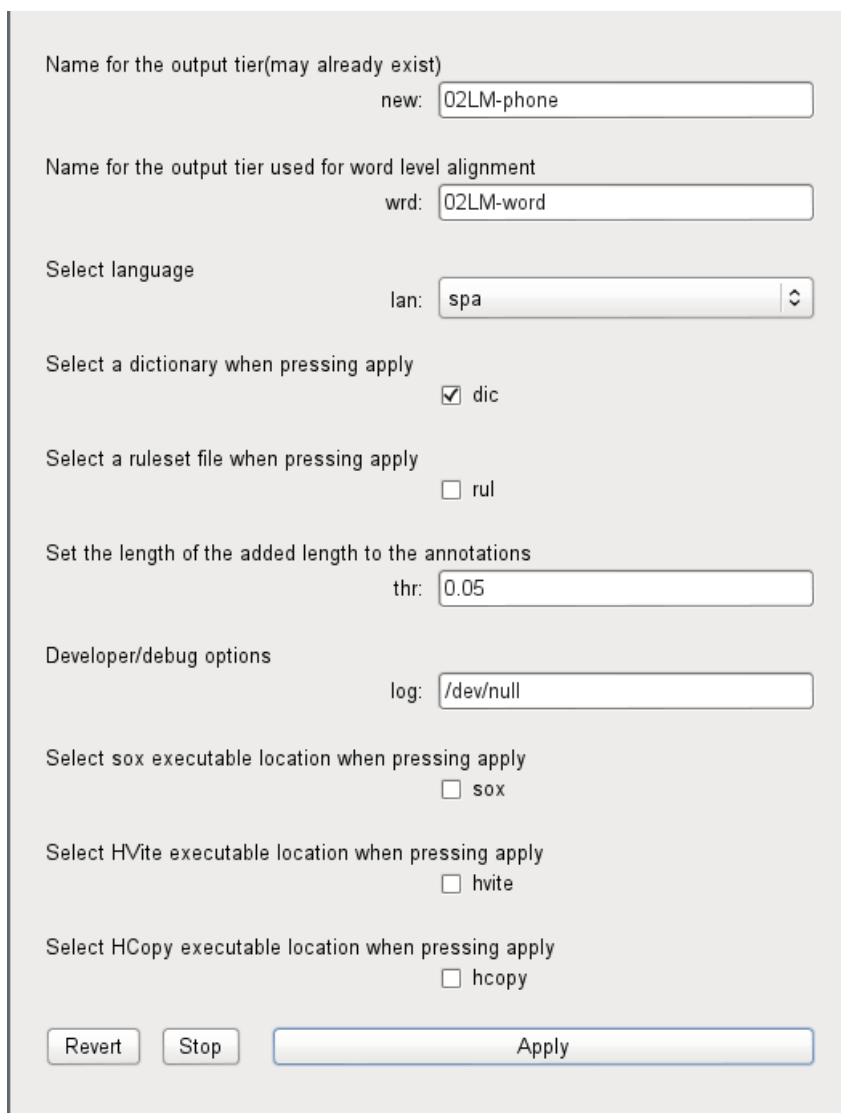


Figure 1.1: Opening and selecting a LongSound and a TextGrid





Name for the output tier(may already exist)
new:

Name for the output tier used for word level alignment
wrđ:

Select language
lan:

Select a dictionary when pressing apply
☒ dic

Select a ruleset file when pressing apply
☐ rul

Set the length of the added length to the annotations
thr:

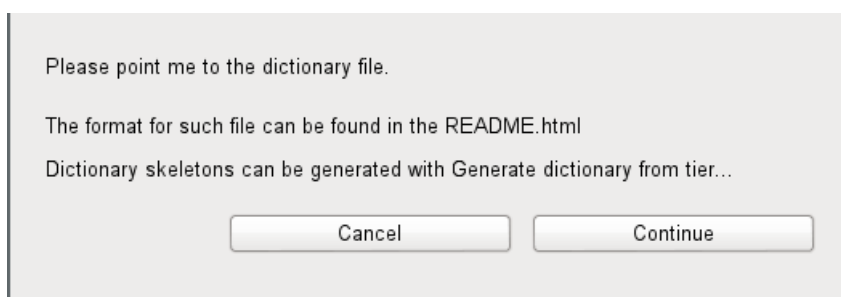
Developer/debug options
log:

Select sox executable location when pressing apply
☐ sox

Select HVite executable location when pressing apply
☐ hvite

Select HCopy executable location when pressing apply
☐ hcopy

Figure 1.4: Edit the settings to your liking



Please point me to the dictionary file.

The format for such file can be found in the README.html

Dictionary skeletons can be generated with Generate dictionary from tier...

Figure 1.5: Because of the dictionary flag a dialog spawns

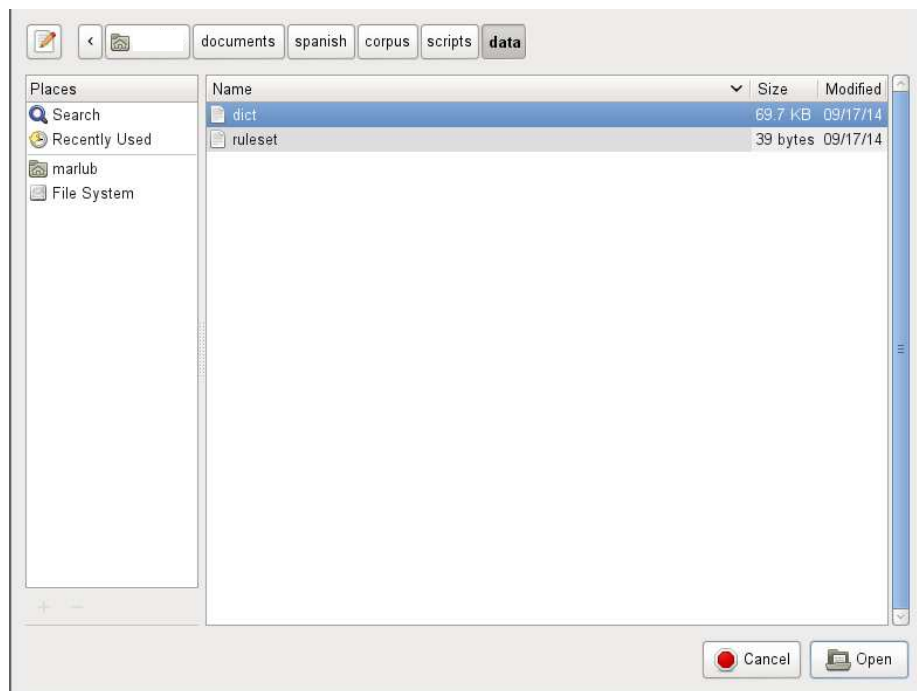
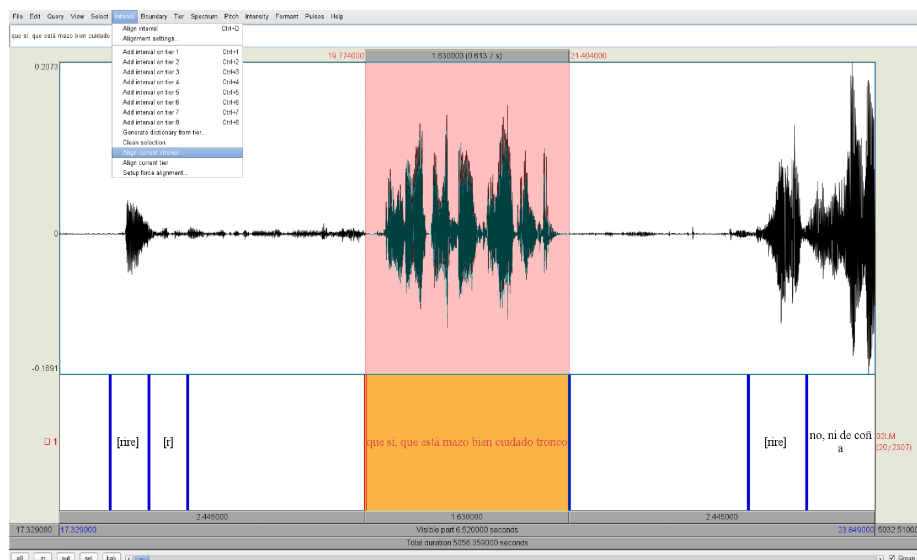


Figure 1.6: Select the dictionary

Figure 1.7: Select an interval, zoom in and press **Align** the current interval

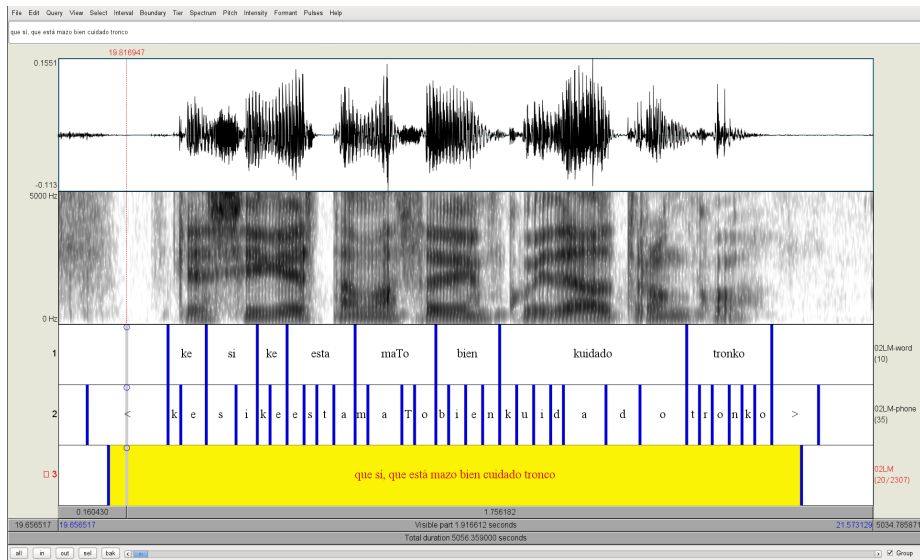


Figure 1.8: Wait a couple of seconds and see the alignment. Note that there is an error because of a reduction from *cuidado* to *cuida*.

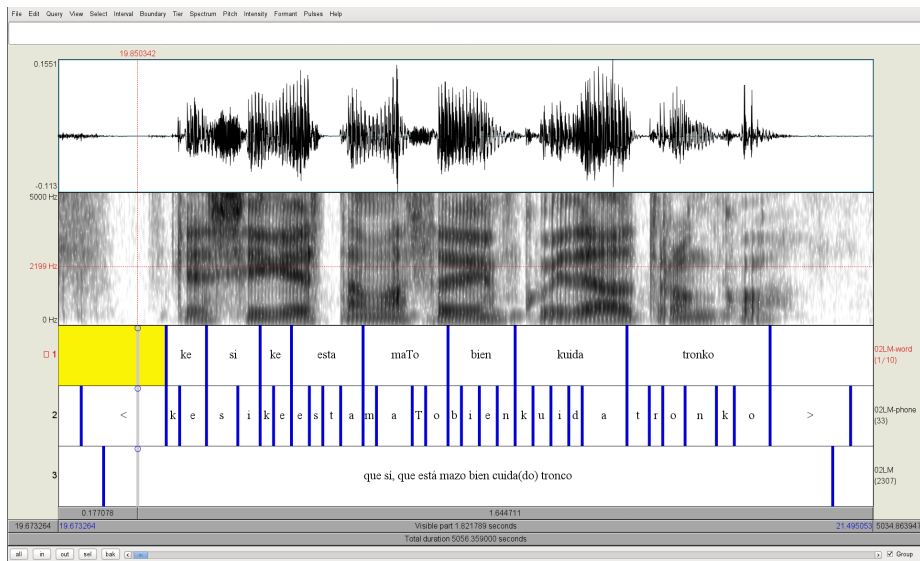


Figure 1.9: We fix the annotation error with the reduction to *cuida(do)*, using truncation specified in the Spanish phonetizer. Then we run the alignment again and the results are much better. If this is a common truncation we could add a pronunciation variant or if it is really general we could create a ruleset file

Chapter 2

Installation

2.1 Preparation

Some programs are not included in the package due to licencing and compatibility restrictions but they need to be pre-installed in order for the plug-in to work properly. The following list of programs need to be installed.

- **Praat**

Praat is a program that allows you to do phonetic analysis and annotations with a computer and praatalign uses Praat to provide an interactive user interface to the annotated sound files. Praat can be downloaded here¹.

- **Python**

Python is used to interpret the scripts that run the core of the aligner. Python, in this case Python 2, can be downloaded here². Be sure to download the Python 2 version as the Python 3 version is not supported.

- **SoX**

For processing the sound files in a very detailed and controlled way we use SoX. Although Praat also has sound processing capabilities SoX works better, this is because Praat does not allow you to specify certain options like sampling rate for all formats. Sox can be downloaded here³.

- **Hcopy & HVite**

HCopy and HVite are programs from the HTK toolkit and due to licencing issues we can not provide the binaries in a direct way. The program is for free but you are not allowed to distribute it. For Windows there is a compiled binary package, for Linux and Mac you have to compile the package yourself. For windows we tested the version that is available after registering here⁴. For Linux and Mac the latest compiled sources that work can be found here⁵. Installing HTK is probably the hardest part of using the program, if it does not work you can always contact us.

¹<http://www.fon.hum.uva.nl/praat>

²<https://www.python.org/download/>

³<http://sox.sourceforge.net/>

⁴<http://htk.eng.cam.ac.uk/ftp/software/htk-3.3-windows-binary.zip>

⁵<http://htk.eng.cam.ac.uk/ftp/software/HTK-3.4.tar.gz>

2.2 Installation

The installation of the plug-in is very easy but for all operating systems a bit different. For every main operating system there is an installation script that automates the installation.

Automated installation

Run the installation script:

- **Linux**
./install_lin
- **Mac**
./install_mac
- **Windows**
install_win.bat

Manual installation

Copy the contents of the root directory to:

- **Linux**
\${HOME}/.praat-dir/plugin_pralign.
- **Windows**
%USERPROFILE%\Praat\plugin_pralign
- **Mac**
\${HOME}/Library/Preferences/Praat Prefs/plugin_pralign.

Chapter 3

Documentation

3.1 General information

Presets for Spanish, Tzeltal, English and Dutch are included. Presets for Australian English, Estonian, German, Hungarian, Italian, New Zealand English Polish and Portuguese will be added in the future. When you want a language from the above list implemented with priority you can always contact us. If you want other languages you can still contact us and it might be possible using the SAMPA model.

Dictionary, ruleset and all other files are, and should be, encoded in UTF-8. To enforce this the plug-in changes the default behaviour of Praat every time Praat loads to make sure Praats reading and writing preferences are set to UTF-8. When the plug-in is successfully installed several menu items are added in the **TextGrid** editor under the **Interval** menu. The options for alignment only work when you are editing a **TextGrid** and a **LongSound**. It does not work with a normal **Sound**, this is because **Sound** objects are loaded in memory and thus detached from the real sound file on disk. Currently it is also only tested on **WAVE** files.

3.2 Menu items

- **Generate dictionary from tier**

This functions allows the user to generate a dictionary containing all the missing or unphonetizable words within a file. The program will prompt for a file location where the dictionary file will be stored. Only the missing words from the current selected tier are written to the file. When this process is done the user can fill the dictionary with pronunciations.

For this function to work **Setup forced alignment...** has to run at least once.

- **Clean selection**

This function is a helper function to clean up old or wrong alignment. When the function runs all annotation data within the selection within the selected tier will be removed. Note that this is not necessary to do before

an alignment because this function runs by default before the alignment of an interval.

- **Align current interval**

This function aligns the current selected interval on the current selected tier. When selecting a small interval it should not take much time at all. Be careful that you do not try to align an output tier from a previous alignment (word or phone level). When this happens you will be prompted to make sure you mean to align an output tier.

For this function to work **Setup forced alignment...** has to run at least once.

- **Align current tier**

This function aligns the entire selected tier. Note that this can take quite a long time for long data. When you do not have a lot of pronunciation variants it still can take about 30 minutes for an hour long conversation. This function will clear the tier entirely before aligning.

For this function to work **Setup forced alignment...** has to run at least once.

- **Setup forced alignment...**

When you run this function a big option menu is spawned that will generate the necessary settings files that are needed for the alignment. For almost all functions this function has to run at least once before they can run. When you close the form a settings file is written to disk.

All options start with a long description and then a letter code describing the internal variable, the following options identified by their letter code can be specified in the settings menu:

- **new**

Name of the tier where the phone level alignment is stored, this can be either an existing tier or a non existing tier. If the tier does not exist it will be created upon doing the first alignment. If the tier does exist the annotations that overlap with the alignment will be removed.

- **wrd**

Name of the tier that stores the word level alignment, this can be again either an existing tier or a non existing tier with the same consequences as for the **new** value. In theory this tier can be the same tier as the **new** tier, however this can and will result in unexpected behaviour and will generate a warning every time you align something.

- **lan**

Language used for the forced alignment, all properly added languages will appear in this drop down list. Currently only Spanish, Tzeltal, Dutch and English are supported.

- **dic**

Flag for setting a dictionary file, when you tick this box you will be prompted to locate the dictionary file. When a dictionary was previously set an extra variable is shown named **dictionary** containing

the path to the current dictionary. When you want to change the dictionary you can either tick the **dic** box or change the path in the **dictionary** field. To unset a dictionary you can just clear out the **dictionary** field and leave the **dic** box unticked.

– **rul**

Flag for setting a ruleset file, when you tick this box you will be prompted to locate the ruleset file. When a ruleset file was previously set an extra variable is shown named **ruleset** containing the path to the current ruleset file. When you want to change the ruleset file you can either tick the **rul** box or change the path in the **ruleset** field. To unset a ruleset file you can just clear out the **ruleset** field and leave the **rul** box unticked.

– **thr**

Extra margin used for every annotation, when the annotations are placed to close to the real sound the initial pause can clobber up the beginning of speech and that can reduce the aligners performance. Setting the **thr** value to 0.1 will for example increase all boundaries from annotations with 100ms. Note that this does not change the original annotation and it will only increase the widen the annotation when there is room to do so, meaning that it will not create overlap with other annotations.

– **log**

Location of the log output, when an annotation is aligned a log is produced that contains detailed output of all the subcommands and can be used for debugging purposes. You can either put a file path in here that will become the log file or if you want to discard the log you can put **/dev/null** there on Linux or Mac and **nul** on Windows.

– **sox**

Flag for setting a custom SoX executable location, when you tick this box you will be prompted to locate a SoX executable. When a SoX executable is already present in one of the location in **\$PATH** on Linux or mac or **%PATH%** on Windows you do not have to set a custom location. When a custom location has been previously set an extra variable named **soxex** is shown that contains the current custom SoX location. When you want to change this you can either tick the **sox** box or change the path in the **soxex** field. When you want to unset a custom SoX location you can just clear out the **soxex** field and leave the **sox** box unticked.

– **hvite**

Flag for setting a custom HVite executable location, when you tick this box you will be prompted to locate a HVite executable. When a HVite executable is already present in one of the location in **\$PATH** on Linux or mac or **%PATH%** on Windows you do not have to set a custom location. When a custom location has been previously set an extra variable named **hviteex** is shown that contains the current custom HVite location. When you want to change this you can either tick the **sox** box or change the path in the **hviteex** field. When you want to unset a custom HVite location you can just clear out the **hviteex** field and leave the **hvite** box unticked.

- **hcopy**

Flag for setting a custom HCopy executable location, when you tick this box you will be prompted to locate a HCopy executable. When a HCopy executable is already present in one of the location in `$PATH` on Linux or mac or `%PATH%` on Windows you do not have to set a custom location. When a custom location has been previously set an extra variable named `hcopyex` is shown that contains the current custom HCopy location. When you want to change this you can either tick the `sox` box or change the path in the `hcopyex` field. When you want to unset a custom HCopy location you can just clear out the `hcopyex` field and leave the `hcopy` box unticked.

3.3 Dictionary

To phonetize words praatalign either uses the provided phonetizer or a dictionary. Dictionaries are plain text files that contain words and one or more pronunciations. A dictionary file is a UTF-8 encoded file containing non-empty lines separated by a newline character¹. Lines starting with a `#` will be ignored and can thus be used as comments. The format of a dictionary entry is a word followed by a tab followed by tab separated pronunciations. An example dictionary can be found in Listing 1

```
# This is comment
# This is a word with two possible pronunciations
ado      a d o      a o
# These are words with one possible pronunciation
empatar   e m p a t a r
empataran e m p a t a r a n
```

Listing 1: Example dictionary

3.4 Ruleset

Besides generating pronunciation by using the dictionary and phonetization you can also use rulesets to define pronunciation variants. Ruleset make you able to define general rules applied over all words(phonetized words and dictionary words). In this way you can easily define for example deletion rules. Internally the pronunciation variants are visualized as a graph. With rulesets you can define shortcuts within that graph. For example the word `ado` and rule: `(?P<fr>a)d(?P<to>o)` make the graph in Figure 3.4. A Ruleset file is a UTF-8 encoded file containing non-empty lines separated by a newline character. Lines starting with a `#` will be ignored and can thus be used as comments. The format of a ruleset entry is just the regular expression describing the rule. The regular expression uses two named groups to tie certain character groups to each other.

¹On Linux and Mac this is default, on Windows this can cause problems. When using praatalign on windows please refrain to a text editor that has newline capabilities like Notepad++

The group **fr** marks the start node and the group **to** marks the destination node. Several escape sequences besides the standard escape sequences exist, namely:

- `\v` for vowels([**aoeiu**])
- `\c` for consonants([**^aoeiu**])
- `#` for a inter word silence



Figure 3.1: Example result of **ado**->**ao** deletion

3.5 Supported languages information

Different languages have different possibilities within the possibilities of phonetizing and dictionaries. Some languages are impossible to phonetize and thus need a complete dictionaries. Some languages can be fully phonetized and only need a dictionary for foreign words.

3.5.1 Dutch

A detailed description of the Dutch phones can be found in Section 5.2. Further specification:

Table 3.1: Dutch language properties

Phonetizer support	None
Ruleset support	Full
Dictionary support	Full

3.5.2 English

A detailed description of the English phones can be found in Section 5.3

Table 3.2: Dutch language properties

Phonetizer support	None
Ruleset support	Full
Dictionary support	Full

There is conversion script for the English CMU dictionary² located in `./par.eng/cmu2praatalign.py` that converts the CMU dictionary to praatalign format. The scripts is a Python script and should download the dictionary if you haven't done it yourself and will write it to a `dict.eng` file by default. The usage is: `python cmu2praatalign.py [inputfile [outputfile]]`.

²<http://www.speech.cs.cmu.edu/cgi-bin/cmudict>

3.5.3 Tzeltal

Tzeltal uses the general SAMPA models and information about the phones can be your in Section 5.4. Further specification:

Table 3.3: Tzeltal language properties

Phonetizer support	Full
Ruleset support	Full
Dictionary support	Full

3.5.4 Spanish

A detailed description of the Spanish phones can be found in Section 5.5. Further specification:

Table 3.4: Spanish language properties

Phonetizer support	Full
Ruleset support	Full
Dictionary support	Full

The phonetizer for spanish automatically reduces truncated words that are marked with brackets. For example: `cuida(do)` is phonetized as `cuida`. The spanish phonetizer also clears up some non speech annotations. Such as `[b]` etc.

3.6 Scriptability and batch processing

Although the `praatalign` script is inherently interactive it is still possible to batch process corpora using simple praat scripts. To facilitate this function a file called `$DIR/settings_ni.praat` can be run where `$DIR` is the location of the plugin files. The location of the plugin files for your operating system can be found in Section 2.2 in the manual installation section. The `settings_ni.praat` is a stripped down version of the settings dialog present in the aligner. Since it is using a praat form to ask for the user input, in contrary to the pause dialog in the normal settings script, it can be run non interactively by running the script from a praat script.

For example if you want to setup the aligner to align a tzeltal file with all custom values on linux under the user frobnicator you can put this in your script to setup the aligner:

```
runScript: "/home/frobnicator/.praat-dir/plugin_pralign/settings_ni.praat",
... "custom_phone_tier", "custom_word_tier", "/some/path/to/dict",
... "/some/path/to/ruleset", 0, "tze", "no", "/some/path/to/logfile",
... "/usr/bin/sox", "/usr/bin/HVite", "/usr/bin/HCopy"
```

When you then open a TextGrid and a LongSound file and do View & Edit to open the editor you can run the alignment from the script using the button text as function. For example the script could look like the script in Listing 2.

```
# We assume the LongSound and TextGrid are selected previously

# Spawn the editor
View & Edit

# Open the editor
editor: "TextGrid " + objectname$
# This bit of code is a small snippet to select a specific tier with the
# index: tiernum, tiernum is obtained by querying all tiers outside the
# editor and finding the tier that matches the name
currenttiernum = -1
while currenttiernum <> tiernum
  Select next tier
  inf$ = Editor info
  currenttiernum = extractNumber(inf$, "Selected tier: ")
endwhile

# Generate the settings file
runScript: "/home/frobnicator/.praat-dir/plugin_pralign/settings_ni.praat",
..."custom_phone_tier", "custom_word_tier", "/some/path/to/dict",
..."some/path/to/ruleset", 0, "tze", "no", "/some/path/to/logfile",
..."usr/bin/sox", "/usr/bin/HVite", "/usr/bin/HCopy"

# Do the actual alignment
Align current tier
# When this is done aligned data can be found in: custom_phone_tier and
# custom_word_tier.
endeditor
```

Listing 2: Example scriptability

Chapter 4

Extending praatalign

4.1 Introduction

Extending the aligner with new languages should be very easy for languages that can be mapped on the current SAMPA model or on any other existing model(maus model). Adding a language with a new model could be possible but no support will be given, however you can always try, you can even try getting help. Adding a language requires a couple of components that need to be written or adapted.

4.2 Phonetizer

Phonetization of your language is the most elegant solution of translating the graphemes to phonemes. Implementing a phonetizer is as easy as implementing one function called `phonetizeword`. A skeleton class can be found in `phonetizer.py`. The function in the skeleton class is accompanied by comments. A phonetized utterance is always of the following form:

`utt=[word1, word2, ..., wordn], word=[pron1, pron2, ..., pronn]` and `pron=[phone1, phone2, ..., phonen]` and every phone is a string. So if you want to use the skeleton class with the `phonetizeword` function you need to return a list of lists of strings where every string is a phone from the model. If you also want to do utterance based translation you need to return a list of lists of lists of strings.

4.3 Dictionary

If you do not want to use a phonetizer you can also suffice with only using a dictionary based translation. Dictionary based translation still needs to be loaded as a phonetizer though. All phonetizers include also a dictionary based lookup. In the `phonetizer.py` a dictionary phonetizer is already present called `PhonetizerDictionary`. There is also a loopback phonetizer that takes the literal annotation as transcription. This phonetizer is currently not used but could be used when an exact phonetic translation is already available.

4.4 Adding the language to the aligner

When you have the translation from grapheme to phoneme the only thing that needs to be done is adding it to the script files.

- **phonetizer.py**

On the bottom of this file there is a dictionary containing all the translations from language code to phonetizer and parameters directory. You need to add your language to that dictionary.

- **settings.praat**

In this file you need to add stuff on multiple locations, namely within the second **if** that relies in the first outer **if** block you need to add your language with its appropriate position. When you want your language on top you need to adapt the other numbers too.

Finally within the **pause** block you need to add your language code in the **optionMenu:** block on the same position as specified earlier.

When you have changed these files properly your language should be available in the menus and work out of the box.

Chapter 5

Appendices

5.1 How to cite

```
@misc{praatalign,  
  author={Lubbers, Mart and Torreira, Francisco},  
  title={Praatalign: an interactive Praat plug-in for performing phonetic forced alignment},  
  howpublished={\url{https://github.com/dopefishh/praatalign}},  
  year={2013-2014},  
  note={Version 1.0}  
}
```

Listing 3: Bibtex snippet

5.2 Dutch phone specification

Mapping with SAMPA alphabet¹

Consonants

Plosives

Praatalign	SAMPA	Word	Praatalign Transcription
p	p	pak	p A k
b	b	bak	b A k
t	t	tak	t A k
d	d	dak	d A k
k	k	kap	k A p
g	g	goal	g o: l

Fricatives

Praatalign	SAMPA	Word	Praatalign Transcription
f	f	fel	f E l
v	v	vel	v E l
s	s	sein	s E i n
z	z	zijn	z E i n
x	x	toch	t o x
G	G	goed	G u t
h	h	hand	h A n t
Z	Z	bagage	b A g a: Z @
S	S	show	S o: u

Sonorants

Praatalign	SAMPA	Word	Praatalign Transcription
m	m	met	m E t
n	n	net	n E t
N	N	bang	b A N
l	l	land	l A n t
r	r	rand	r A n t
w	w	wit	w I t
j	j	ja	j a:

Vowels

Checked

Praatalign	SAMPA	Word	Praatalign Transcription
I	I	pit	p I t
E	E	pet	p E t
A	A	pat	p A t
O	O	pot	p O t
Y	Y	put	p Y t
@	@	gemakkelijk	G @ m A k @ l @ k

¹<http://www.phon.ucl.ac.uk/home/sampa/dutch.htm>

Free

Praatalign	SAMPA	Word	Praatalign Transcription
i	i	vier	v i r
y	y	vuur	v y r
u	u	voer	v u r
a:	a:	naam	n a: m
e:	e:	veer	v e: r
P2:	2:	deur	d P2: r
o:	o:	voor	v o: r
EI	Ei	fijn	f EI n
P9y	9y	huis	h P9y s
Au	Au	goud	x Au t

Diphthongs

Praatalign	SAMPA	Word	Praatalign Transcription
a:i	a:i	draai	d r a: i
o:i	o:i	mooi	m o: i
ui	ui	roeiboot	r ui b o: t
iu	iu	nieuw	n iu
yu	yu	duw	d yu
e:u	e:u	sneeuw	s n e: u

Marginals

Praatalign	SAMPA	Word	Praatalign Transcription
E:	E:	crème	k r E: m
P9:	9:	freule	f r P9: l @
O:	O:	roze	r O: z @

5.3 English phone specification

Praatalign	SAMPA	Phonetics	Examples	ISO639-3
<usb>		human noise, garbage		xxx
<nib>		noise, non-human		xxx
<p:>		silence interval		xxx
a	a	nasalized central open vowel	vent	fra
E	E	nasalized lengthened front half open unrounded vowel		deu
o	o	nasalized back half closed rounded vowel	bon	fra
3:	3:	lengthened front half open unrounded vowel	furs	eng
i:	i:	lengthened front closed unrounded vowel	mieten	deu
6:	6:	lengthened central neutral unrounded vowel		aus
}:	}:	lengthened central closed rounded vowel	pool	aus
e:	e:	lengthened front half closed unrounded vowel	mehr	deu
o:	o:	lengthened back half closed rounded vowel	Sohle	deu
u:	u:	lengthened back closed rounded vowel	Hut	deu
A:	A:	lengthened back open unrounded vowel	stars	eng
O:	O:	lengthened back half open rounded vowel	cause	eng
@}	@}	diphthong		eng
Ae	Ae	diphthong		aus
{I	{I	diphthong		aus
{O	{O	diphthong		aus
oI	oI	diphthong		aus
eI	eI	diphthong	raise	eng
aI	aI	diphthong	Bein	deu
OI	OI	diphthong	noise	eng
@U	@U	diphthong	nose	eng
aU	aU	diphthong	Haus	deu
I@	I@	diphthong	dears	eng
e@	e@	diphthong	stairs	eng
U@	U@	diphthong	cures	eng
tS	tS	voiceless postalveolar affricate	English chair	xxx
dZ	dZ	voiced postalveolar affricate	English gin	xxx

e	e	front half closed unrounded vowel	US English bear	xxx
{	{	front open unrounded vowel	English cat	xxx
Q	Q	back open rounded vowel	British English not, cough	xxx
O	O	back half open rounded vowel	British English law	xxx
V	V	back half open unrounded vowel	RP and US English run	xxx
U	U	back closed rounded vowel somewhat more centralised and relaxed	English put, Buddhist	xxx
@	@	central neutral unrounded vowel	English about, winner	xxx
i	i	front closed unrounded vowel	English see	xxx
u	u	back closed rounded vowel	English soon	xxx
o	o	back half closed rounded vowel	US English sore	xxx
E	E	front half open unrounded vowel	English bed	xxx
6	6	central neutral unrounded vowel	German besser	xxx
p	p	voiceless bilabial plosive	English pen	xxx
b	b	voiced bilabial plosive	English but	xxx
t	t	voiceless alveolar plosive	English two	xxx
d	d	voiced alveolar plosive	English do	xxx
k	k	voiceless velar plosive	English skill	xxx
g	g	voiced velar plosive	English go	xxx
f	f	voiceless labiodental fricative	English fool	xxx
v	v	voiced labiodental fricative	English voice	xxx
T	T	voiceless dental fricative	English thing	xxx
D	D	voiced dental fricative	English this	xxx
s	s	voiceless alveolar fricative	English see	xxx
z	z	voiced alveolar fricative	English zoo	xxx
S	S	voiceless postalveolar fricative	English she	xxx
Z	Z	voiced postalveolar fricative	English pleasure	xxx
h	h	voiceless glottal fricative	English ham	xxx
m	m	bilabial nasal	English man	xxx
n	n	alveolar nasal	English no	xxx
N	N	velar nasal	English ring	xxx

r	r	alveolar trill	Spanish perro	xxx
l	l	alveolar lateral approxi- mant	English left	xxx
w	w	labial-velar approxi- mant	English we	xxx
j	j	palatal approximant	English yes	xxx
I	I	front closed unrounded vowel, but somewhat more centralised and re- laxed, in Polish: mid closed unrounded	English city	xxx
?	?	glottal stop	German Verein	xxx
x	x	voiceless velar fricative	Scots loch	xxx
C	C	voiceless palatal frica- tive	German Ich	xxx
W	W	voiceless labial-velar fricative		xxx
<		recording initial silence		xxx
>		recording trailing si- lence		xxx
#		inter-word silence		xxx

5.4 SAMPA phone specification

Praatalign	SAMPA	Phonetics	Example	ISO6393-9
i:	i:	lengthened front closed unrounded vowel	mieten	deu
ii	ii	lengthened front closed unrounded vowel	riisu	ekk
e:	e:	lengthened front half closed unrounded vowel	mehr	deu
ee	ee	lengthened front half closed unrounded vowel	keere	ekk
E:	E:	lengthened front half open unrounded vowel	Mär	deu
y:	y:	lengthened front closed rounded vowel	Tür	deu
2:	2:	lengthened front half closed rounded vowel	Höhle	deu
a:	a:	lengthened central open vowel	Haar	deu
u:	u:	lengthened back closed rounded vowel	Hut	deu
o:	o:	lengthened back half closed rounded vowel	Sohle	deu
3:	3:	lengthened front half open unrounded vowel	furs	eng
A:	A:	lengthened back open unrounded vowel	stars	eng
O:	O:	lengthened back half open rounded vowel	cause	eng
6:	6:	lengthened central neutral unrounded vowel		aus
}:	}:	lengthened central closed rounded vowel	pool	aus
9:	9:	lengthened front half open rounded vowel		nld
{{	{{	lengthened front open unrounded vowel	kääru	ekk
yy	yy	lengthened front closed rounded vowel	müüri	ekk
22	22	lengthened front half closed rounded vowel	nööri	ekk
uu	uu	lengthened back closed rounded vowel	kuuri	ekk
oo	oo	lengthened back half closed rounded vowel	poori	ekk
77	77	back half closed unrounded vowel	sõõre	ekk
AA	AA	lengthened back open unrounded vowel	vaaru	ekk
aU	aU	diphthong	Haus	deu
aI	aI	diphthong	Bein	deu
ai	ai	diphthong		ita
a:i	a:i	diphthong		nld
Ae	Ae	diphthong		aus
Au	Au	diphthong		nld
OY	OY	diphthong	heulen	deu
eI	eI	diphthong	raise	eng
e@	e@	diphthong	stairs	eng
ei	ei	diphthong		ita
e:i	e:i	diphthong		nld
eU	eU	diphthong		por
EI	EI	diphthong	raise	eng
Ei	Ei	diphthong		ita
{I	{I	diphthong		aus
{O	{O	diphthong		aus
I@	I@	diphthong	dears	eng
Ii:	Ii:	diphthong	accede	aus
i:@	i:@	diphthong	memorial	nze
io	io	diphthong		ita
iu	iu	diphthong		nld
ja	ja	diphthong		ita
jo	jo	diphthong		ita

ju	ju	diphthong		ita
oI	oI	diphthong		aus
oi	oi	diphthong		ita
o:i	o:i	diphthong		nld
oU	oU	diphthong		por
oE	oE	diphthong		ita
OI	OI	diphthong	noise	eng
Oi	Oi	diphthong		ita
ue	ue	diphthong		ita
ui	ui	diphthong		nld
U@	U@	diphthong	cures	eng
wa	wa	diphthong		ita
we	we	diphthong		ita
wi	wi	diphthong		ita
wO	wO	diphthong		ita
yu	yu	diphthong		nld
@U	@U	diphthong	nose	eng
@}	@}	diphthong		eng
9y	9y	diphthong		nld
QI	QI	diphthong	abide	aus
U}	U}	diphthong	abuse	aus
VU	VU	diphthong	acetone	aus
Vi	Vi	diphthong	abased	aus
{o	{o	diphthong	accounts	aus
2i	2i	diphthong		ekk
2i:	2i:	diphthong		ekk
7o:	7o:	diphthong		ekk
7u:	7u:	diphthong		ekk
7u	7u	diphthong		ekk
Ai	Ai	diphthong		ekk
Ai:	Ai:	diphthong		ekk
Ao:	Ao:	diphthong		ekk
Au:	Au:	diphthong		ekk
Ae:	Ae:	diphthong		ekk
ei:	ei:	diphthong		ekk
e:u	e:u	diphthong		nld
i	i	nasalized front closed unrounded vowel		xxx
e	e	nasalized front half closed unrounded vowel	vin	fra
a	a	nasalized central open vowel	vent	fra
o	o	nasalized back half closed rounded vowel	bon	fra
9	9	nasalized front half open rounded vowel	neuv	fra
E	E	nasalized lengthened front half open unrounded vowel		deu
O	O	nasalized back half open rounded vowel		deu
u	u	nasalized back closed rounded vowel		xxx
a:	a:	nasalized lengthened central open vowel		deu
E:	E:	nasalized lengthened front half open unrounded vowel		deu
o:	o:	nasalized lengthened back half closed rounded vowel		deu

O:	O	nasalized lengthened back half open rounded vowel		nld
ts_ɹj	ts'	palatalized voiceless alveolar affricate	c'ma	pol
dz_ɹj	dz'	palatalized voiced alveolar affricate	dz'wig	pol
s_ɹj	s'	palatalized voiceless alveolar fricative	syk	pol
z_ɹj	z'	palatalized voiced alveolar fricative	zbir	pol
n_ɹj	n'	palatalized alveolar nasal	kon'	pol
l_ɹj	l'	palatalized alveolar lateral approximant	pali	ekk
t_ɹj	t'	palatalized voiceless alveolar plosive	padi	ekk
d_ɹj	d'	voiced alveolar plosive English	gyár	hun
g_ɹj	g'	palatalized voiced velar plosive	Gienek	pol
x_ɹj	x'	palatalized voiceless velar fricative	hiacynt	pol
k_ɹj	k'	palatalized voiceless velar plosive	kierowca	pol
p_ɹj	p'	palatalized voiceless bilabial plosive	piasek	pol
tt_ɹj	t't	palatalized long voiceless alveolar plosive	pati	ekk
ss_ɹj	s's	palatalized long voiceless alveolar fricative	kassi	ekk
nn_ɹj	n'n	palatalized long alveolar nasal	panni	ekk
ll_ɹj	l'l	palatalized alveolar lateral approximant	palli	ekk
p_h	p_h	aspirated voiceless bilabial plosive		spa
t_h	t_h	aspirated voiceless alveolar plosive		spa
k_h	k_h	aspirated voiceless velar plosive		spa
tt	tt	geminate of t	fatto	ita
pp	pp	geminate of p		ita
kk	kk	geminate of k		ita
dd	dd	geminate of d		ita
gg	gg	geminate of g		ita
bb	bb	geminate of b		ita
ttS	ttS	geminate of tS		ita
tts	tts	geminate of ts		ita
ddZ	ddZ	geminate of dZ		ita
ddz	ddz	geminate of dz	zona	ita
vv	vv	geminate of v		ita
ss	ss	geminate of s		ita
SS	SS	geminate of S		ita
rr	rr	geminate of r		ita
nn	n	geminate of n		ita
mm	mm	geminate of m		ita
LL	LL	geminate of L		ita
ll	ll	geminate of l		ita
JJ	JJ	geminate of J		ita
jj	jj	geminate of j		ekk
ff	ff	geminate of f		ita
hh	hh	geminate of h		ekk
ttS_cl		closure of ttS		ita
ttS_rl		release of ttS		ita
tts_cl		closure of tts		ita
tts_rl		release of tts		ita
ddZ_cl		closure of ddZ		ita
ddZ_rl		release of ddZ		ita
ddz_cl		closure of ddz	zona	ita

ddz_rl	release of ddz	zona	ita
tS_cl	closure of tS		ita
tS_rl	release of tS		ita
ts_cl	closure of ts		ita
ts_rl	release of ts		ita
dZ_cl	closure of dZ		ita
dZ_rl	release of dZ		ita
dz_cl	closure of dz		ita
dz_rl	release of dz		ita
tt_rl	release of tt		ita
tt_cl	closure of tt		ita
pp_cl	closure of pp		ita
pp_rl	release of pp		ita
kk_cl	closure of kk		ita
kk_rl	release of kk		ita
dd_cl	release of dd		ita
dd_rl	release of dd		ita
gg_cl	release of gg		ita
gg_rl	release of gg		ita
bb_cl	release of bb		ita
bb_rl	release of bb		ita
t_cl	closure of t		ita
t_rl	release of t		ita
p_cl	closure of p		ita
p_rl	release of p		ita
k_cl	closure of k		ita
k_rl	release of k		ita
g_cl	closure of g		ita
g_rl	release of g		ita
d_cl	closure of d		ita
d_rl	release of d		ita
b_cl	closure of b		ita
b_rl	release of b		ita
<	recording initial silence		xxx
>	recording trailing silence		xxx
#	inter-word silence		xxx
<nib>	noise, non-human		xxx
<p:>	silence interval		xxx
<usb>	human noise, garbage		xxx

5.5 Spanish phone specification

The spanish mapping is an exact mapping with SAMPA².

Consonants

Plosives

Symbol	Word	Transcription
p	padre	p a D r e
b	vino	b i n o
t	tomo	t o m o
d	donde	d o n d e
k	casa	k a s a
g	gata	g a t a

Affricatives

Symbol	Word	Transcription
tS	mucho	m u tSo
jj	hielo	jj e l o

Fricatives

Symbol	Word	Transcription
f	fácil	f a T i l
B	cabra	k a B r a
T	cinco	T i n k o
D	nada	n a D a
s	sala	s a l a
x	mujer	m u x e r
G	luego	l w e G o

Nasals

Symbol	Word	Transcription
m	mismo	m i s m o
n	nunca	n u n k a
J	año	a J o

Liquids

Symbol	Word	Transcription
l	lejos	l e x o s
L	caballo	k a b a L o
r	puro	p u r o
rr	torre	t o r r e

²<http://www.phon.ucl.ac.uk/home/sampa/spanish.htm>

Semivowels

Symbol	Word	Transcription
j	rei	rr e j
	pie	p j e
w	deuda	d e w D a
	muy	m w i

Vowels

Symbol	Word	Transcription
i	pico	p i k o
e	pero	p e r o
a	valle	b a L e
o	toro	t o r o
u	duro	d u r o

5.6 Version history

1.0 (2015-01-0x)	<ul style="list-style-type: none"> • Converted the readme to a pdf. • Speeded up the process by disabling pitch, intensity, spectrum, pulses and formants while aligning, the settings do get restored afterwards. • Fixed a bug that led to a messed up view.
0.9a (2014-12-02)	<ul style="list-style-type: none"> • Small bugfix in dictionary generation fixed.
0.9	<ul style="list-style-type: none"> • Cleaned up some parts of the readme. • Added language specific information. • Added english as language. Although there is no phonetizing implemented. • README.html better with light background for code blocks. • Updated citing method with bibtex.
0.8 (2014-10-31)	<ul style="list-style-type: none"> • Removed all the binary folders. • Made the binary finding interactive. • Made all the file chooser dialogs interactive.
0.7 (2014-10-29)	<ul style="list-style-type: none"> • Added windows support. • Cleaned up documentation. • Removed binaries due htk licence.
0.6 (2014-10-22)	<ul style="list-style-type: none"> • Refactored and cleaned up the source.
0.5a (2014-09-08)	<ul style="list-style-type: none"> • Added comments to source code(praat). • Cleaned up source.
0.5 (2014-09-04)	<ul style="list-style-type: none"> • Fixed acronyms in spanish. • Fixed cleaning with extended boundaries. • Added rudimentary ruleset implementation.
0.4 (2014-08-29)	<ul style="list-style-type: none"> • Added option for enlarging the boundaries automatically.
0.21 (2014-08-13)	<ul style="list-style-type: none"> • Settings split in non interactive and interactive so that the interactive one reflects the current settings.
0.2 (2014-08-11)	<ul style="list-style-type: none"> • Better mac compatibility.
0.1a (2014-06-30)	<ul style="list-style-type: none"> • Tier alignment fixed. • Readme for dutch.
0.08 (2014-04-29)	<ul style="list-style-type: none"> • Cleaned up some stuff. • Added dutch. • Readme for spanish and sampa.
0.07 (2014-04-28)	<ul style="list-style-type: none"> • Non interactive alignment implemented. • Table of contents in readme.
0.06 (2014-04-25)	<ul style="list-style-type: none"> • Conversion to editor scripts.
0.05 (2014-04-03)	<ul style="list-style-type: none"> • Better readme. • Functional program for linux.
0.04 (2014-04-03)	<ul style="list-style-type: none"> • Pronunciation variants implemented.
0.03 (2014-03-31)	<ul style="list-style-type: none"> • Aligner works in python.
0.02 (2014-03-27)	<ul style="list-style-type: none"> • Python script around aligner started. • Phonetizer skeleton done.

Table 5.3: Version history