



Speech Science WiSe 2024/2025

Exercise 4: Introduction to Praat

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Quick recap: Phonation



• How does phonation work?

Air from lungs pushes closed vocal folds apart \rightarrow Sudden heavy airflow creates suction \rightarrow Vocal folds get pulled shut again \rightarrow Repeat \rightarrow Vibrations \rightarrow Sound/Voicing

- Different phonation types: creaky, breathy, whisper, falsetto etc.:
 Paralinguistic and linguistic function
- Source-Filter-Model: Signal produced from source (larynx) is modified by a filter in the vocal tract to form the sounds



Introduction to Praat



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Praat

19.11.2024

- Acoustic analysis program
- Widely used in field of Phonetics for its ability to:
 - Visualize, label, and segment audio files
 - Perform spectral and temporal analyses
 - Synthesize and manipulate speech





Praat





Paul

http://www.fon.hum.uva.nl/praat/

The Netherlands

Objects-Window

Praat Objects							—		\times
Praat	New	Open	Save						Help
)bjects:						9	Sound help		
I <mark>. Soun</mark> 2. Text0	<mark>d 1212</mark> ìrid 1212	2				N	√iew & Edit		
							Play		
							Draw -		
							Query -		
							Modify -		
							Annotate -		
						Analy	yse periodici	ty-	
						Anal	lyse spectrur	m -	
						Te	o Intensity		
						M	1anipulate -		
							Convert -		
							Filter -		
							Combine -		
Rer	name		Сору						
In	spect	1	Info						
Be	move	1							

Praat works with "objects"

ie. Sound-Objects or TextGrid-Objects

Keep in mind: The options for object management and object actions differ depending on the object type.

Here: Sound-Object

Objects-Window

Praat New Open Save He Objects:	p
Objects: Sound help 1. Sound 1212 View & Edit 2. TextGrid 1212 View & Edit	
1. Sound 1212 2. TextGrid 1212 View & Edit	1
Play	1
Draw -	
Query -	
Modify -	
Annotate -	A L
Analyse periodicity -	
Analyse spectrum -	l ll
To Intensity	
Manipulate -	1
Convert -	
Filter -	
Combine -	
Rename Copy	
Inspect	
Remove	

Objects are transient.

Actions cannot be undone most of the time.

i.e. "Remove" deletes objects definitively and without asking for confirmation!

Here: Sound-Object

Objects-Window

_									
🔳 Praa	t Obje	cts					_		×
Praat	New	Open	Save						Help
Objects:						TextG	rid help		
 Sound TextGri 	1212 id 1212					View & E	Edit alone	e .	
						View & Edit	with Sou	ind?	
						Dr	aw -		
						Tabu	ulate -		
						Qu	ery -		
						Mo	dify -		
					Analyse				
						Extract	one tier		
						Extrac	:t part		
						To Table (te)	d alignme	ent)	
						Analyse ir	nterval tie	er -	
						Analyse	point tier		
					Synthesize				
						- Me	яge		
						Conca	atenate		
						ToDura	tionTier		
Rena	ame		Copy						
Insp	pect		Info						
Ren	nove								

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Loading files

$$\hookrightarrow$$
 Open $ightarrow$ Read from file...

```
(Open long sound file...)
```

Saving files

$$\hookrightarrow$$
 Save \gg Save as WAV file...

$$\hookrightarrow$$
 Save \gg Save as text file...

Opening Editor-Windo

🔳 Praa	at Objec	cts				—		×	
Praat	New	Open	Save					Help	
Objects:				 		Sound help			
1. Sound 2. TextGr	1212 id 1212			 		View & Edit			
						Play			
						Draw -			
						Query -			
						Modify -			
						Annotate -			
					Ana	alyse periodic	ity -		
					An	alyse spectru	m -		
						To Intensity			
						Manipulate -			
						Convert -			
						Filter -			
						Combine -			
Rena	ame		Сору						
Insp	pect		Info						
Ren	nove								

Editor-Window

Oscillogram and Spectrogram

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The speech signal is shown as...

...the change in **sound pressure** *p* over **time** *t*.

...the frequency *f* over time *t*. The sound pressure *p* is shown by the degree of blackening.

Sound pressure \rightarrow **volume** Time \rightarrow **duration** Frequency \rightarrow **pitch**

Editor-Window

Opening Editor-Window

Praat Objects	- 0	×
Praat New Open Save		Help
Objects:	View & Edit	□
1. Sound 1212 2. TextGrid 1212	Draw	
	Extract -	
	Modify TextGrid	
	Scale times	
	Modify Sound	
	Clone time domain	
Rename Copy		
Inspect Info		
Remove		

Editor-Window

Creating a TextGrid

Praat Objects	– 🗆 X		
Praat New Open Save	Help		
Objects:	Sound help		_
1. Sound 1212	View & Edit	interval tier	intorvol
	Play	inter var tier	IIItervar
	Draw -		
	Query -		
	Modify -		
	Annotate -		
	Annotation tutorial	noint tier	
	To TextGrid	pontetier	point
	To TextGrid (silences)		1
	Manipulate -		
	Convert -		
	Filter -		
	Combine -		
	Sound: To	o TextGrid	
		All tier names: Mar	y John bell
			-
		Which or these are point tiers?	비
	Η Ηε	elp Standards C	Cancel Apply C
Rename Copy			
Inspect Info		· · · · · · · · · · · · · · · · · · ·	
Remove			

Х

Annotating data

To add a boundary, choose a point in time and click on the little circle in the corresponding tier.

Boundaries can then be moved manually.

Press to move multiple boundaries in different tiers at once.

To delete a boundary, select it and press

TextGrid – An example

Recording sound

Recording sound

- (A) Dismiss a recording: **Record** again or **Close**
- (B) Keep a recording: Save to list Or Save to list & Close
 - \rightarrow The recording appears as a sound object in the object window, but is not saved yet
 - \rightarrow Save \rightarrow Save as WAV file...
- (C) Keep a long recording: File → Save as WAV file... Open → Open long sound file...

Longer recordings (> a few minutes) cannot directly be turned into a sound object: Need to be saved as WAV file from within the sound recorder and then opened as a long sound file in object window

Recording sound

Perform a test recording to balance the input signal. Stay within the green area of the meter to avoid clipping.

SoundRecorder					_		×
File Query Meter							Help
Channels:		Meter			Sampling frequ	lency:	
🗴 Mana					🔘 8000 Hz		
Stereo					🔍 11025 H		
					🔘 12000 H	12	
					16000 H	12	
(use Windows mixer				-1	22050 H	lz	
without meters)					🔘 24000 H	12	
					🗢 32000 H	12	
					O 44100 H	12	
					🗢 48000 H	12	
					🗢 64000 H	12	
					🗢 36000 H	2	
					• 192000		
			_				
Record Stop	Play				Name: unt	itled	
	l	Close	Save to list		Save to I	ist & Close	

Creating illustrations with Praat

- Fancier alternative to screenshots to create graphics for your paper
- Draw in the picture window

Creating illustrations with Praat

5. TextGrid waterfire

Creating illustrations with Praat

Praat scripts

- Praat scripting language
- Offers possibility to write and execute scripts to:
 - Easily process large amounts of data \rightarrow Save time in the long run
 - Minimize human error \rightarrow consistency
 - Allow others to repeat your process identically \rightarrow replicability

Using Praat scripts

💽 Pra	aat Obje	ects						_	\times
Praat	New	Open	Save						Help
1	New Pra	at scrip	t		- 1				
(Open Pr	aat scrip	ot						
(Goodies				>				
F	Preferen	ces			>				
1	Technica	al			>				
(Quit			Ctrl-Q					
Rer	name	1	Сору						
	anaat		Info						
In	spect		Inito						
Re	emove								

Using Praat scripts

- Make sure your labels are in the correct tier
- Make sure your files are in the correct folder

Premade Praat scripts

- <u>http://menzerath.phonetik.uni-frankfurt.de/tools/tools.html</u>
- <u>https://phonetics.linguistics.ucla.edu/facilities/acoustic/praat.ht</u>
 <u>ml</u>
- <u>https://github.com/stylerw/styler praat scripts</u>
- Scripting manual:

https://www.fon.hum.uva.nl/praat/manual/Scripting.html

Exercise 1: Measuring speech rate

- Load the audio file "3Speakers.wav" from the materials section
- Separate the three speakers from each other using boundaries in an interval tier
- Calculate the speech rate of all three speakers

Exercise 1: Measuring speech rate

Speaker	No. Syllables	Duration (in s)	Speech rate (in syl/s)
1			
2			
3			

Exercise 1: Measuring speech rate

Speaker	No. Syllables	Duration (in s)	Speech rate (in syl/s)
1	34	4.62	7.36
2	31	6.25	4.96
3	38	9.84	3.86

Exercise 2: Using WebMAUS

- Please try to use WebMAUS to create a TextGrid file with segmentation and transcription of the "Speaker_1.wav" file.
- In order to do so:
 - Create a .txt-File containing a orthographic transcription of the audio
 - Upload the resulting file together with the audio file to WebMAUS
 - Download and open the TextGrid-file produced by WebMAUS with Praat

Exercise 2: Using WebMAUS

WebMAUS - Munich AUtomatic Segmentation

https://clarin.phonetik.uni-muenchen.de/BASWebServices/interface/WebMAUSBasic

Assignment 4

- Please record your own sound in a silent environment
- Words: <beetle>, <symbol>, <noodle>, <football>, <father>, <metal>
- "Try saying <Word> three times in a row."
- Save the sound in your list
- Create a TextGrid in which you mark the vowels of the stressed syllables as intervals
- Label the intervals (i, I, u, U, A, E)
- Save sound and TextGrid and name it <FirstName.wav> and <FirstName.TextGrid>
- Please send me the resulting files via MSTeams or e-mail

The resulting TextGrid should look as follows:

Useful / interesting links

• Praat tutorial series on YouTube:

https://www.youtube.com/@linguistiklaboralbert-ludw3514/videos

• Premade Praat scripts:

http://menzerath.phonetik.uni-frankfurt.de/tools/tools.html

https://phonetics.linguistics.ucla.edu/facilities/acoustic/praat.html

https://github.com/stylerw/styler_praat_scripts

• Praat scripting tutorial:

https://praatscripting.lingphon.net/

Thank you for your participation!

