



Workshop on Praat Applications for Research and Teaching

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What is Praat?

Acoustic analysis with Praat

- General Praat interface
- Basic operations with Praat
- Acoustic analysis with Praat
- Creating graphical output





Introduction of Praat



Freeware program for the analysis and reconstruction of acoustic speech signals.

Developed by 2 phoneticians from the University of Amsterdam, Paul Boersma and David Weenink



You can ...

- make and edit your recordings
- > extract individual sounds for further analysis
- generate waveforms, wide and narrow band spectrograms, intensity contour and pitch tracks
- Set information about pitch, intensity, formants, pulses, etc.
- segment and label words, syllables, or individual phonemes
- > put your work in graphic form for printing



Where we can get it

It can be downloaded (for free) from http://www.Praat.org



How to start

When you open the Praat, the following two windows pop out.

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Make new recordings in Praat

Go to **"New**" button and choose "**Record mono record**". The Sound Recorder window appears.

Praat O	bjects		SoundRecorder		
Praat Ne	ew] Open Save	Help	File Query		Help
Objects:	Record mono Sound Ctrl-R	Sound help	Channels:	Meter	Sampling frequency:
1 Soun	Record stereo Sound Sound	View & Edit Play	 Mono O Stereo 		© 8000 Hz © 11025 Hz
	Matrix Tables Tiers	Draw - Query -	(use Windows mixer without meters)		 12000 Hz 16000 Hz 22050 Hz 0.0000 Hz
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	Articulatory synthesis Create Permutation Polynomial Multidimensional scaling	alyse spectrum - To Intensity Manipulate - Convert -			 64000 Hz 96000 Hz 192000 Hz
Rer In TRettons Institute	Acoustic synthesis (Klatt) Constraint grammars Symmetric networks Neural nets KNN classifiers KNN classifiers KNN classifiers KNN classifiers	Filter -	RecordStop	PlayCloseSave to list	Name: untitled

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Start your recording

Set the sampling rate as **22050HZ** and then take a deep breath and click the "Record" button.

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Record Stop Close	Play Save to list	 64000 Hz 96000 Hz 192000 Hz Name: untitled Save to list & Close 	Record Stop	Play Close Save to list	Name: untitled Save to list & Close
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If the recording is to your satisfaction, you can give it a name after "Name" and click on the "Save to list & Close" button. This will put your recording in the "Objects window".



Load existing files

Apart from creating a new recording, you could also read an existing sound file from your

computer.

Praat New	Open Save	Help		
Objects:	Read from file	Ctr		
1. Sound best	Open long sound file	Ct		
	Read separate channels from so	und file		
	Read from special sound file			
	Read Matrix from raw text file			
	Read Strings from raw text file			
	Read TableOfReal from headerless spreadsheet file			
	Read Table from tab-separated file			
	Read Table from comma-separa	ted file		
	Read Table from whitespace-sep	parated file		
	Read from special tier file			
		wanipulate -		
		Convert -		
Rename	Copy	Filter -		
Inspect	Info	Combine -		
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View&Edit

Select the speech object and then choose "View &Edit" from the main menu on the right-hand side of the "Objects window".



Praat Objects

Praat New Open Save

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Help

Editor window

The "Sound Editor window" appears



Select the recording

You can move the red dash line to change the scope of recording.



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Play the selected recording

You can play the chosen part by clicking the rectangle below and get the duration of the selected parts.



Measure speaking rate

Speaking rate (spm) = Total syllables / number of minutes (duration of the utterance)



Measure silent pause



Top menu of Editor window I Sound best File Edit Query View Select Spectrum Pitch Intensity Formant Pulses 0.06781

File (to draw, save, and extract selections of speech sounds, etc.)

Edit (to copy or paste parts of a speech etc.)

Query (to get information on the cursor position, selection boundaries, define settings for logs and reports etc.)

View (to select the contents of the window (spectrogram, pitch, intensity etc.) and control zoom settings)

Select (to control cursor positions)

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Extract one part from an utterance



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Pull-down menu of Edit

You can open more than one sound, and then <u>cut, copy</u>, and <u>paste</u> between the sounds.



Spectrum

Spectrum: to control the spectrogram settings and extract information. The frequency value at the cursor position is indicated on the left hand outside of the panel in a red font.



The Hong Kor **Dropd**own menu of Spectrum

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These concentrations of acoustic energy in vowels are called "formants" or natural resonances.



Four acoustic properties of plosives

- •*Duration of stop gap* silent period in the closure phase (1)
- *Voicing bar* a dark bar that is shown at the low frequencies and it's usually below 200Hz (2)
- •*Release burst* a strong vertical spike (3)
- •*Aspiration* a short frication noise before vowel formants begin and it is usually in 30ms (4)



What is pitch?

Pitch is a term used to refer to variations in fundamental frequency (F0), which serves as important acoustic cue for tone, lexical stress, and intonation.



Four Chinese tones in Praat

Pitch

Pitch: to control the pitch settings and extract information



Dropdown menu of Pitch

Pitch contour in Praat



a. Extracting information about pitch

- 1. Display the pitch track: Pitch \rightarrow Show pitch
- 2. At this point, you can place the cursor at the point and read **the blue number on the right side** of the window.
- Or you can position the cursor in a stable middle part of the blue track and click "Pitch"→ "Get pitch". A local pitch value will be displayed in a separate window.





b. Getting Maximum/Minimum pitch for a section of speech

 Select the portion of the sound for which you'd like the Maximum, Minimum or Average Pitch
 Select the proper command for your task from the top menu: Pitch→Get Pitch/Get Maximum Pitch/Get Minimum Pitch





c. Adjusting the pitch settings

The fundamental frequency of the voice (pitch) usually varies according to different speakers:

•Males' pitch ranges: 50-180Hz •Females'pitch ranges:80-250Hz •For general usage: 50-400 Hz



If the pitch contour is too low in spectrogram, you can increase the maximum value of the pitch range (e.g. increase from 400 to 500); if the pitch contour is too high, you can decrease the maximum value of the pitch range (e.g. decrease from 400 to 300). ond Kong Institute of Education

Intensity

Intensity: to control the intensity signal settings and extract information



Dropdown menu of Intensity

Intensity contour in Praat



Extracting information about intensity

1. Position the cursor in a stable middle part of the sound .

2. Go to "Intensity" and select "Get intensity". A local intensity value will be displayed in a separate window.



Formant

Formant: to control the formant settings and extracts information; by default the formants are shown in red dotted lines.



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Formant contour in Praat

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Extracting information about formant values

- Position the cursor in a stable middle part of the sound.
- 2. Go to 'Formant' and select 'Get first formant' (F1).The local first formant value will be displayed in a separate window.
- 3. Do the same for the second formant (F2), third formant (F3), and



Pulses

Pulses: to set pulses (necessary for e.g., pitch analysis) and to extract specific information on voice parameters like jitter and shimmer; pulses are indicated in the top panel with vertical blue solid lines



Draw pictures in Praat

Using the Praat picture window can be thought of as a **five step** process:

- 1. Create an object
- 2. Choose your size
- 3. Draw your object into the picture window
- 4. Garnish
- 5. Export (Styler 2012 :41)



Example: draw spectrum in Praat.

- 1. Open the Editor window,
- Determine the physical size of the plot by changing the selection in the 'Praat picture' window (pink rectangular shape) before you draw the graph.



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Click the Spectrum and find "Paint visible spectrogram", then click it.



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4. When the Paint window pops up, just click OK, and the Spectrum will be drawn.

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Paint visible spectrogram	X	0.00286279909 5000+	
Picture window:	☐ Erase first		
Margins:			
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		0	0.5

Time (s)

good marning

Draw formant contours

Formant contours can also be drawn by using the same steps. If you still select the same area in **Picture window**, the formants that are newly drawn will overlap with the old spectrum.



5. Export your pictures

First, you should make sure you have selected what you want, and then click File to choose the format you want to save as.



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Part 2.

Using Praat in acoustic analysis of speech sounds



Spectrograms of vowels





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(Ladeforged 2006:185-187)

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Spectrograms of vowels



Spectrograms of vowels



Vowel Chart

Vowel chart of NE



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http://videoweb.nie.edu.sg/phonetic/vowels/measure ments.html

empty template

Wolf RP values



Spectrograms of consonants

Four acoustic properties of plosives

Duration of stop gap – silent period in the closure phase

Voicing bar – a dark bar that is shown at the low frequencies and it's usually below 200Hz

Release burst – a strong vertical spike Aspiration – a short frication noise before vowel formants begin and it is usually in 30ms



A spectrogram of "a pam, a tan, a kang"



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Voice onset time (VOT)

Voice onset time (VOT) is a feature of the production of plosive (stop) consonants.

It is defined as the length of time that passes between the **release of a plosive (stop) consonant** and the **onset of voicing**



Graphical representation of the VOT



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'apa'



a

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VOT

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'aspa'

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Lexical stress

reCORD (v.)

REcord (n.)



Pitch contours

reCORD (v.) REcord (n.)







Excerpt from http://web.mit.edu/jinzhang/www/pinyin/tones/

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Four Chinese tones in Praat



http://corpus.ied.edu.hk/phonetics/ViewPassageOne.aspx?id

Intonation

Will you manage to make progress, \nearrow or will you just give up? \searrow



The effects of English language learning experiences on prosody and fluency: evidence from acoustic measures and perceptual judgments



I used Praat for measuring the four aspects of suprasegmental featuers of the English production of college students from Hong Kong and Mainland China, including

Speaking rate measures---duration
 Pause measures ---duration
 Prominent stress measures---pitch
 Overall pitch range measures (intonation)



Stress measures

>number of stressed words
per minute(Pace)

>proportion of prominent
words(Space)



Pause measures

number of silent pauses,
mean length of silent pauses,
number of filled pauses,
proportion of atypical topic boundary
pause



Speaking rate measures

articulation rate
mean length of run
phonation-time ratio



Recommendation of video

Praat tutorial 1. Introduction of Praat http://www.youtube.com/watch?v=EDNhmB sOXcM&feature=related

Praat tutorial 2. Download and use Praat http://www.youtube.com/watch?v=UkeOC9I mTS4&feature=related

Praat tutorial 3. Sound Analysis with Praat

http://www.youtube.com/watch?v=B



Other recommended Praat tutorials

- 1. Praat Tutorial Stanford University
- 2. Praat Language Lab (2006).
- 3. Praat short tutorial: An introduction. (Version 4.3)-van Lieshout, Pascal (2005).
- 4. Beginners guide to Praat-Wood, Sidney (2005).
- 5. Praat 初學者使用手冊 -- 台灣高雄師範大學英語研究所 黃耀煌 編譯 (2003)
- 6. Praat 语音软件使用手册-中国社会科学院语言研究所-熊子瑜(2004)
- 7. Praat tutorial and resources-Goldman, Jean-Philippe (2004).
- 8. Praat scripting tutorial basics (IE only) Jaeger, Florian (2004)
- 9. Praat tutorial -Welby, Pauline, & Ito, Kiwako (2002).
- 10. Praat tutorial-Yoon, Kyuchul(2002).
- 11. Speech Analysis using PRAAT-A brief guide prepared by Pranav Jawale
- 12. Praat Tutorial(2002) made by Pauline Welby and Kiwako Ito in The Ohio State University, retrieved from <u>http://public.tfh-</u> <u>berlin.de/~mixdorff/tsv/files/praat-tutorial.pdf</u>





Our Praat Beginner Manual

http://ec-concord.ied.edu.hk/phonetics_and_phonology/wordpress/

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