

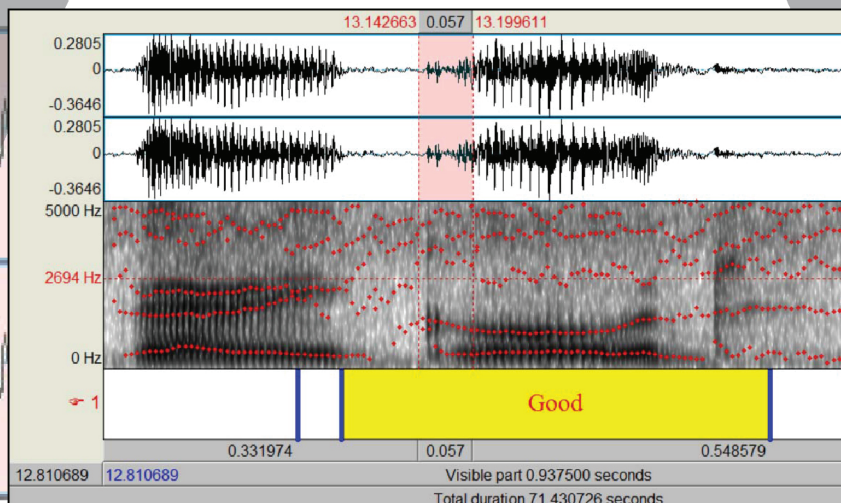
Министерство образования и науки Российской Федерации
Тольяттинский государственный университет
Гуманитарно-педагогический институт
Кафедра «Теория и методика преподавания
иностраннных языков и культур»

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ANALYZING SPEECH WITH COMPUTER TECHNOLOGIES

АНАЛИЗИРУЕМ РЕЧЬ С ПОМОЩЬЮ КОМПЬЮТЕРНЫХ ТЕХНОЛОГИЙ

Практикум



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Основная цель практикума – закрепить полученный лекционный материал, а также научить студентов работе с компьютерными программами анализа явлений английского языка и речи. Практикум может быть использован на практических занятиях, а также при самостоятельной внеаудиторной работе.

Предназначен для студентов, изучающих дисциплину «Практическая фонетика с использованием компьютерных технологий», направления подготовки 45.03.02 «Лингвистика» очной формы обучения.

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To the Teacher

Методические рекомендации преподавателю

Практикум включает восемь лабораторных работ, предусмотренных по курсу «Практическая фонетика с использованием компьютерных технологий», он рассчитан на 16 часов аудиторных занятий и 8 часов самостоятельной работы. Каждая лабораторная работа представлена вопросами для активизации знаний, полученных на лекционных занятиях, а также заданиями, предусматривающими работу в сети Интернет (просмотр тематических видеозаписей, работа с программой Praat). Кроме того, практикум содержит видео- и аудиозаписи, разбитые в соответствии с тематикой лабораторных работ.

Цель практикума – научить студентов применять компьютерные программы анализа явлений языка и речи.

Задачи:

- познакомить студентов с программой Praat;
- научить анализировать звуковые явления английского языка с помощью компьютерных программ.

По окончании курса проводится тестирование в компьютерном классе. По результатам теста и при наличии всех выполненных лабораторных работ выставляется зачет.

Практикум предназначен для студентов 3-го курса специальности 45.03.02 «Лингвистика» очной формы обучения и разработан в соответствии с ФГОС ВО и программой подготовки бакалавров соответствующей специальности. Практикум может использоваться как на аудиторных занятиях, так и при внеаудиторной самостоятельной работе студентов.

Образовательные технологии

При изучении дисциплины используются следующие образовательные технологии:

- технология традиционного обучения, основанная на лекционно-семинарско-зачетной форме обучения. В ходе лабораторных работ студенты активизируют знания, полученные на лекциях, а также в процессе изучения таких дисциплин, как «Практический курс первого иностранного языка» и «Теоретическая фонетика».

Учебные вопросы, представленные в практикуме, способствуют повторению и закреплению изученного материала;

- технология контекстного обучения, направленная на моделирование содержания будущей профессиональной деятельности студента. Видеозаписи, содержащие аутентичный материал, способствуют созданию языкового контекста и могут в дальнейшем применяться студентами в ходе их собственной педагогической и/или научно-исследовательской работы;

- интерактивные технологии, призванные активизировать деятельность студентов в процессе взаимодействия. Каждое занятие строится таким образом, что вводная беседа преподавателя со студентами стимулирует их дальнейшую самостоятельную деятельность. Кроме того, на протяжении всего занятия поощряется взаимодействие студентов между собой и с преподавателем (могут быть заданы уточняющие вопросы, студенты помогают друг другу выполнять наиболее сложные задания и т. п.);

- информационные технологии, используемые с целью усовершенствования процесса обучения. Эти технологии включают работу в Интернете и/или с видео, приложенными к данному практикуму. Накануне лабораторной работы поощряется предварительный просмотр обучающих видео. Таким образом, студент может заранее подготовить уточняющие вопросы, что предотвратит трудности, которые могут возникнуть в ходе выполнения лабораторной работы.

Критерии оценки

Лабораторные работы 1, 3, 5: максимальное количество баллов – 9. Лабораторные работы 2, 4, 6, 7, 8: максимальное количество баллов – 8.

0 баллов – студент не выполнил лабораторную работу;

1–2 балла – студент не принимал или принимал незначительное участие в обсуждении материала, выполнил менее 50 % заданий;

3 балла – студент принимал участие в обсуждении материала, допускал незначительное количество ошибок, выполнил 50 % заданий;

4 балла – студент активно участвовал в обсуждении материала, не допускал ошибок в речи, выполнил 60 % заданий;

5–6 баллов – студент принимал активное участие в обсуждении материала, допускал незначительные ошибки в речи, выполнил более 60 % заданий;

6–7 баллов – студент активно участвовал в обсуждении материала, допускал незначительные ошибки в речи, выполнил более 70 % заданий;

8–9 баллов – студент принимал активное участие в обсуждении материала, не допускал ошибок в речи, выполнил более 80 % заданий.

To the Student

Рекомендации студентам по выполнению лабораторных работ

Дорогие студенты, работа с практикумом начинается с изучения вводной части “Introduction to the Work with Praat”. Вам следует ознакомиться с программой Praat и особенностями работы с ней, пройдя по ссылке <http://www.praat.org>. Затем переходите непосредственно к проведению лабораторных работ: внимательно изучите тему, цель, знания и умения, формируемые в процессе выполнения заданий. Для актуализации изученного ранее материала ответьте на учебные вопросы. Кроме того, обратите внимание, что в конце практикума находится глоссарий, в котором можно найти все используемые в лабораторных работах термины, а также их аббревиатуры.

Выполнять задания каждой лабораторной работы следует в той последовательности, в которой они представлены в практикуме. Закончив работу, заполните форму отчета (прил. D). В конце занятия сдайте отчет преподавателю, который его проверит, а затем выставит баллы на образовательном портале в соответствии с критериями оценки.

Introduction to the Work with Praat

Dear student, before you start doing the laboratory works, study the information connected with Praat program and ways of transcribing speech with it.

Task 1. Study the following articles:

- “Using Praat and Moodle for Teaching. Segmental and Supra-segmental Pronunciation” by Ian Wilson (Appendix A);
- “Speak and unSpeak with PRAAT” by Paul Boersma and Vincent van Heuven (Appendix B).

The articles will give you essential terms and basic definitions of acoustic analysis. They also have the algorithm of work with Praat program.

Task 2. Download and install Praat to your computer following the official site link <http://www.praat.org>. This is free program. The information from this site contains the algorithm of work with Praat as well.

Task 3. Watch the video “Introduction to Spectrogram Analysis”. It is applied to this manual, or you can watch it on YouTube (see bibliography list). In this video you are going to know how to analyze speech with the help of Praat.

Bibliography

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Laboratory work 1

ANALYZING VOWELS

The purpose is: to revise the characteristics of English vowels; to study measuring of formants (F1 and F2).

Students' knowledge and skills:

- Basic knowledge on English vowels;
- Skills in measuring formants.

Materials: computers, microphones, headphones, access to the Internet, paper, a pencil or a pen.

Questions

- What is a vowel sound?
- How can English vowels be characterized?



Task 1. Write the short vowel symbols for the following words. Check yourself with the answers.

E.g.: rough [ʌ]

- | | | | |
|----------|----------|---------|-----------|
| A) rough | C) bread | E) foot | G) hymn |
| B) pull | D) cough | F) mat | H) friend |

Task 2. Write the long vowel symbols for the following words. Check yourself with the answers.

E.g.: broad [ɔ:]

- | | | |
|----------|----------|---------|
| A) broad | D) learn | G) err |
| B) ward | E) cool | H) seal |
| C) calf | F) team | I) curl |

Task 3. Write the diphthong symbols for the following words. Check yourself with the answers.

E.g.: tone [əʊ]

- | | | |
|----------|---------|---------|
| A) tone | D) way | G) hair |
| B) style | E) beer | H) why |
| C) out | F) coil | I) prey |

Task 4. Watch the video “Reading Spectrograms – Vowels”. It is available on YouTube channel (see bibliography list) and it is also applied to this manual. The video gives the algorithm of measuring different formants (F1, F2 and F3).

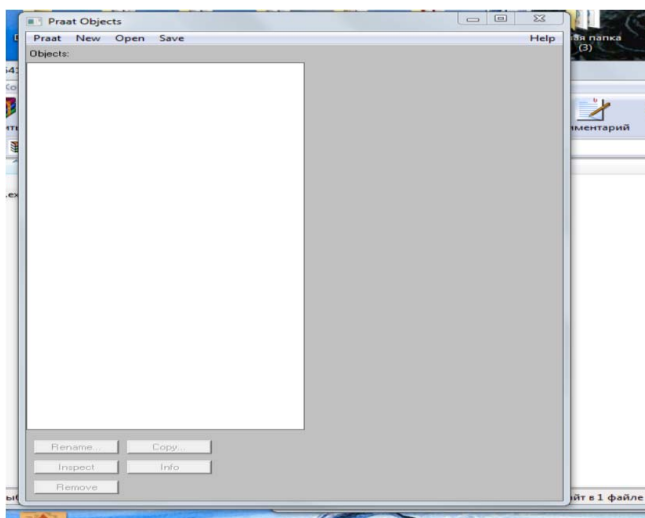
Task 5. Record the given words (see Tasks 1, 2 and 3) into Praat. Measure F1 and F2, compare your results with the chart (see Answers). Put down formants’ data.

E.g.: Open Praat, choose *New---Record Mono sound* (pic. 1–2). Use the microphone to record a word from tasks 1-3. Give the name to the recorded sound and save it to list.

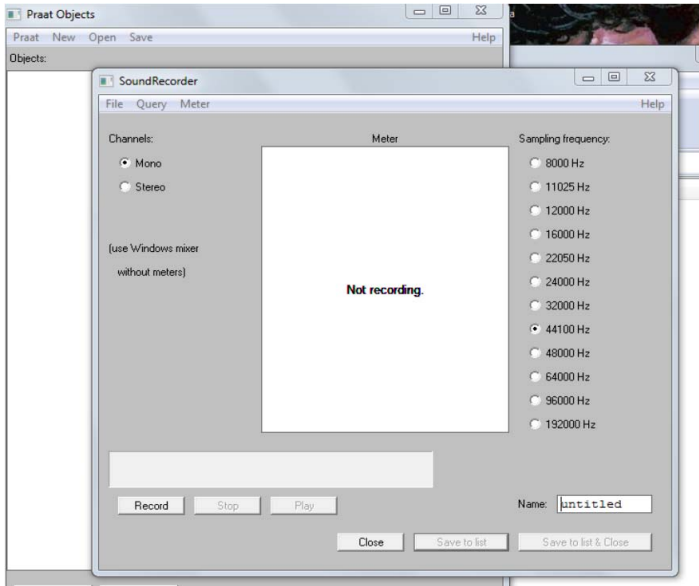
Choose *View&Edit*, then click *Spectrum---Show Spectrum*, click also *Formant---Show Formants*. You will get the picture similar to the following one (pic. 3).

Put the cursor to the dark bar in the spectrogram, then click *Formant---Get the First Formant*. You will get F1 datum. Copy this information into your Laboratory report. Do the same for F2.

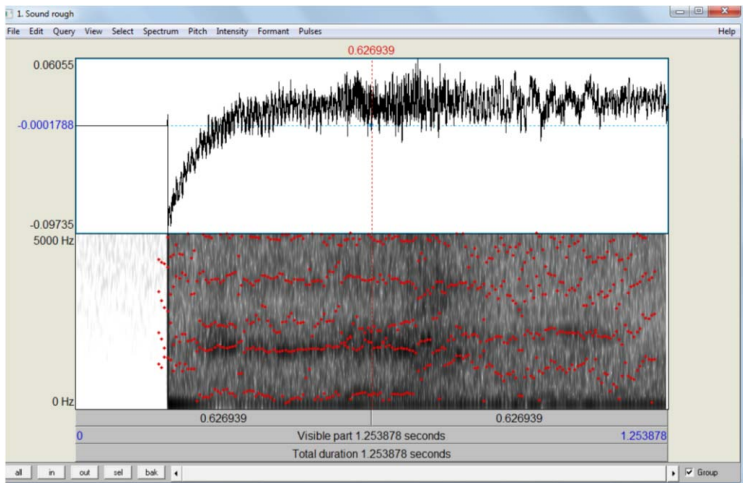
Complete the Laboratory report, the form is in Appendix D.



Pic. 1. Praat Manipulating window



Pic. 2. Praat Sound Recorder



Pic. 3. Praat Spectrum

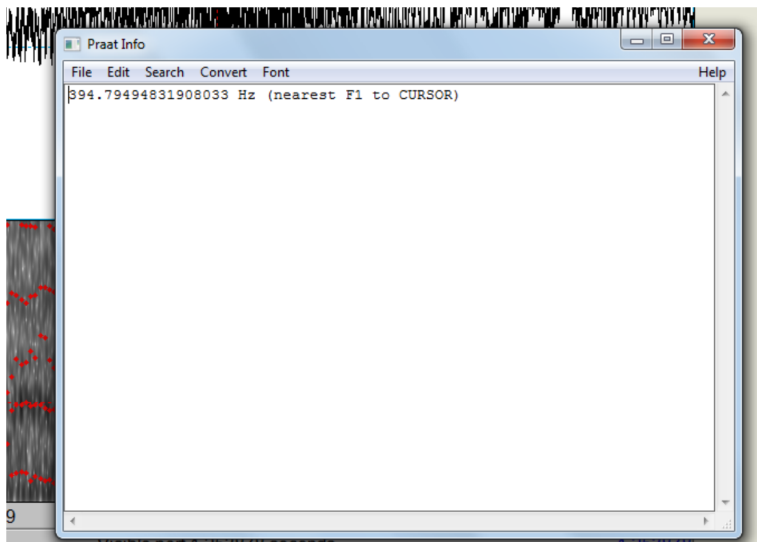


Рис. 4. Formant 1 Datum

Bibliography

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Laboratory work 2

ANALYZING CONSONANTS AND SPEECH

The purpose is: to revise the system of English consonants; to study how to transcribe the speech and to analyze the consonants with Praat.

Students' knowledge and skills:

- Basic knowledge on English consonants;
- Skills in transcribing speech;
- Skills in analyzing consonants with Praat.

Materials: computers, microphones, headphones, access to the Internet, paper, a pencil or a pen.

Questions

- What is a consonant sound?
- How can English consonants be characterized?
- How do English consonants change in speech?



Task 1. Watch the video “Transcribing Speech with Praat”. It is available on YouTube channel (see bibliography list) and it is also applied to this manual. With the help of the video you will be able to transcribe and analyze different texts.

Task 2. Listen to the dialogue “Good English”. The recording is applied to this manual. Transcribe it into Praat according to the video instruction you’ve seen.

E.g.: Open Praat, choose *Open---Read from File*, open the file you need (pic. 5).

Now the file is in the list (pic. 6).

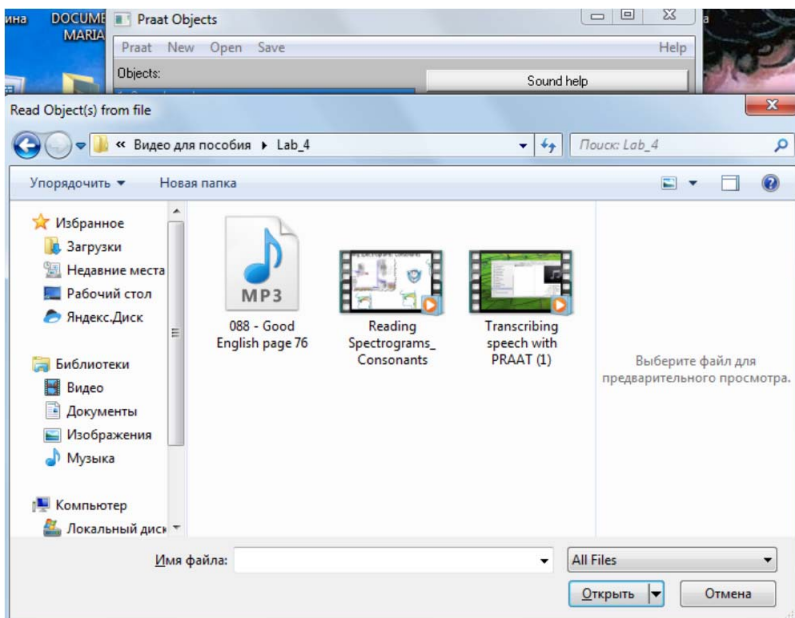
Click *Annotate---To TextGrid* (pic. 7–8).

In *All tier names* print ‘words’ (pic. 8).

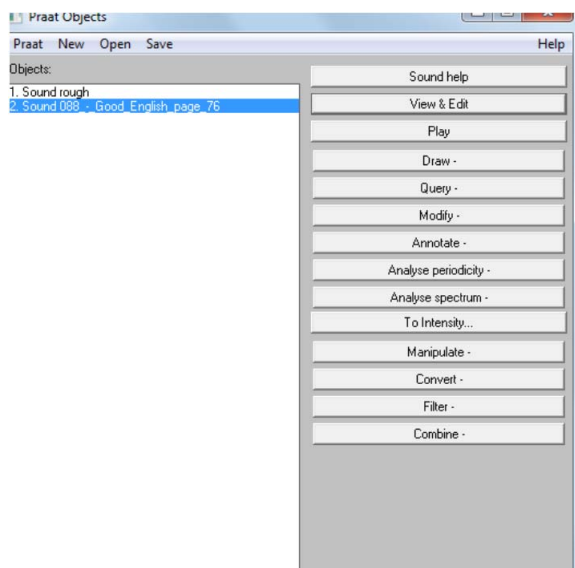
Press Ctrl key and select both sound and text grid (pic. 9).

Click *View&Edit*. You will get the picture close to the following one (pic. 10).

Select an extract and print a word or a phrase you hear into the suitable area, this in white color above the waveform (pic. 11). Do the same for the whole recording.



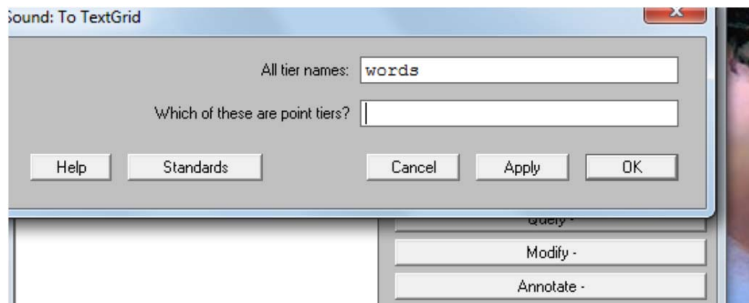
Pic. 5. Choosing Objects from File for Reading in Praat



Pic. 6. List of Praat Objects



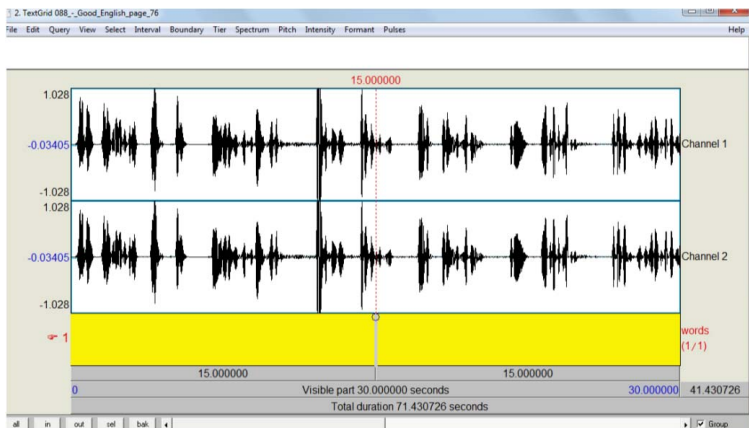
Pic. 7. 'Annotate' Button



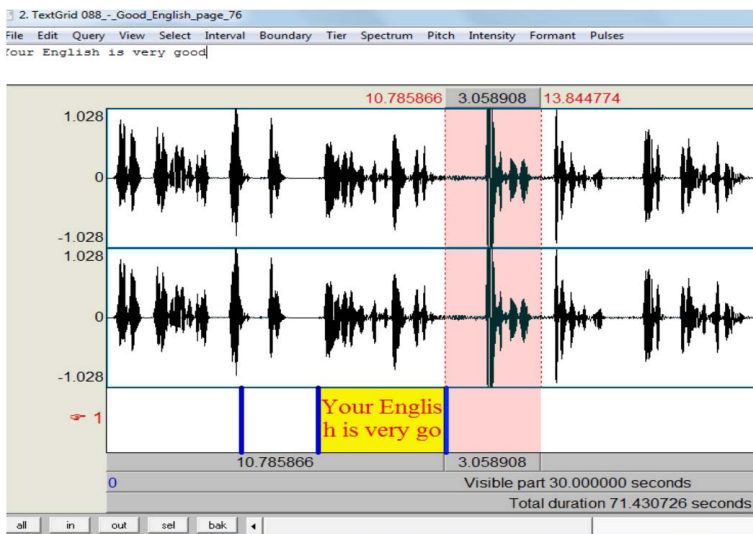
Pic. 8. 'Sound: To TextGrid' Window



Pic. 9. Selecting Praat Objects



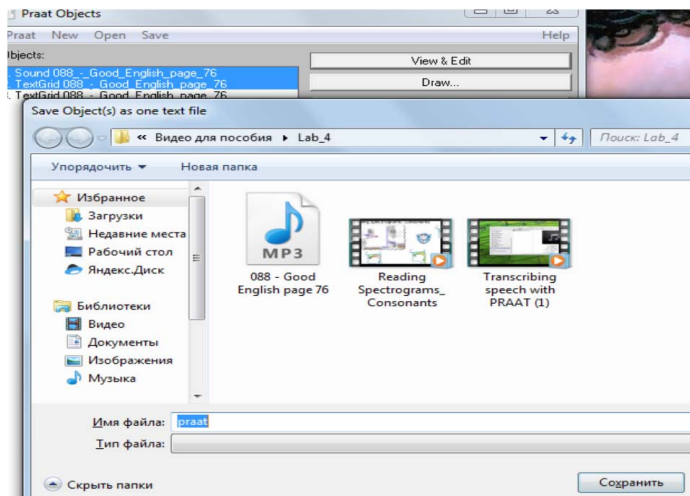
Pic. 10. Object's Waveform



Pic. 11. Transcribing Sound File

When everything is ready, click *Save*---*Save as Text File* (pic. 12).

When you open the document, you can see the following information (pic. 13–14). You need to include it into your Laboratory report.



Pic. 12. Saving Text File

```
praat — Блокнот
Файл Правка Формат Вид Справка
File type = "ooTextFile"
Object class = "collection"

size = 2
item []:
  item [1]:
    class = "Sound 2"
    name = "088_-_Good_English_page_76"
    xmin = 0
    xmax = 71.43072562358276
    nx = 3150095
    dx = 2.2675736961451248e-005
    x1 = 1.1337868480725624e-005
    ymin = 1
    ymax = 2
    ny = 2
    dy = 1
```

Pic. 13. Transcription of Sound File (1)

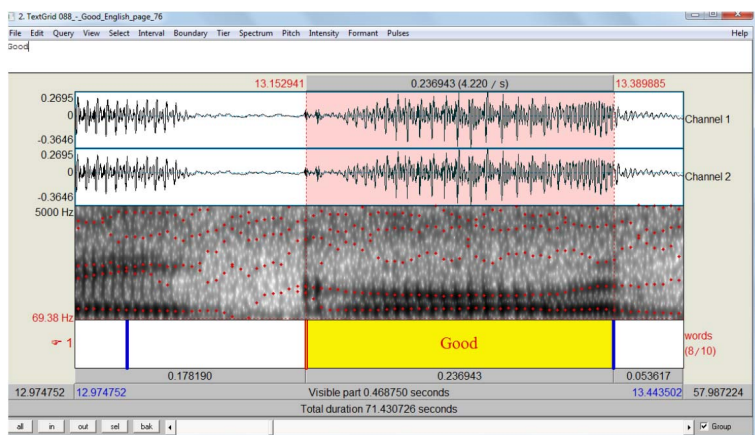
```
item [2]:
  class = "TextGrid"
  name = "088_-_Good_English_page_76"
  xmin = 0
  xmax = 71.43072562358276
  tiers? <exists>
  size = 1
  item []:
    item [1]:
      class = "intervalTier"
      name = "words"
      xmin = 0
      xmax = 71.43072562358276
      intervals: size = 4
      intervals [1]:
        xmin = 0
        xmax = 4.310093250093137
        text = ""
      intervals [2]:
        xmin = 4.310093250093137
        xmax = 6.750711229523927
        text = ""
      intervals [3]:
        xmin = 6.750711229523927
        xmax = 10.818407861908577
        text = "Your English is very good"
      intervals [4]:
        xmin = 10.818407861908577
        xmax = 71.43072562358276
        text = ""
```

Pic. 14. Transcription of Sound File (2)

Task 3. Watch the video “Reading Spectrograms – Consonants”. It helps you to measure place of articulation, manner of articulation and voicing. The video is available on YouTube channel (see bibliography list) and it is also applied to this manual.

Task 4. Choose an extract from the transcription of the dialogue and analyze the consonants.

E.g.: Select a word from the recording. Mark the boundaries. Print the word into the suitable space above the waveform (pic. 15).

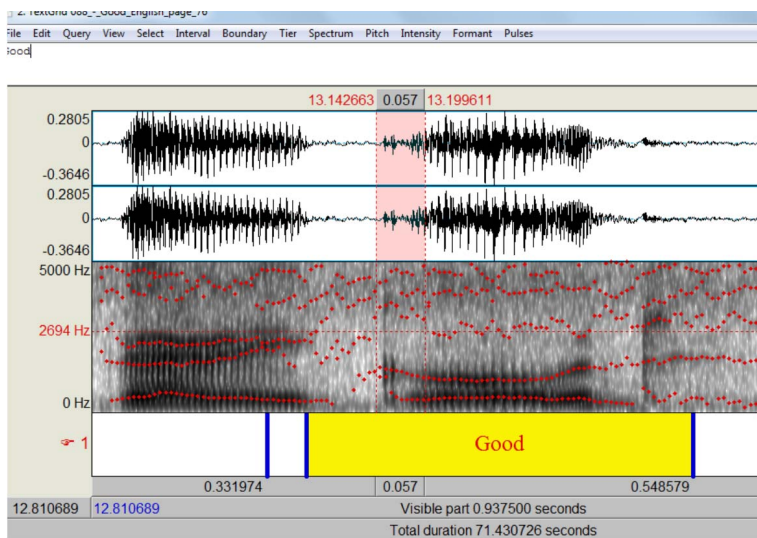


Pic. 15. Word ‘Good’ Spectrum and Analysis

Put down the frequency of consonant sounds of the word. Measure voice onset time (VOT) according to the following algorithm (taken from Praat official manual (see bibliography list)):

1. Find the stop release ---
2. Find the start of voicing ---
3. Select the span between these two points ---
4. Read the duration of the selection (in seconds) from the duration bar along the bottom of the Editor window.

In the picture below you can see [g] consonant, which frequency is about 2694 Hz and VOT is 0.057 seconds (pic. 16).



Pic. 16. Sound [g] Analysis

Laboratory report form is in Appendix D.

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Laboratory work 3

ENGLISH STRESS AND INTONATION (1)

The purpose is: to summarize the information on English stress and intonation; to study measuring of intonation in Praat.

Students' knowledge and skills:

- Basic knowledge on English stress and intonation;
- Skills in writing tone marks and drawing tonograms;
- Skills in measuring of intonation in Praat.

Materials: computers, microphones, headphones, access to the Internet, paper, a pencil or a pen.

Questions

- What do you know about English stress?
- What is intonation?
- What is the purpose of intonation?
- What are basic characteristics of the English intonation?



Task 1. Watch the video “12 Intonation”, check your answers to the questions above. It helps you to revise some essential information on English intonation. This video is on the CD, applied to this manual. You can also watch it on YouTube (see bibliography list).

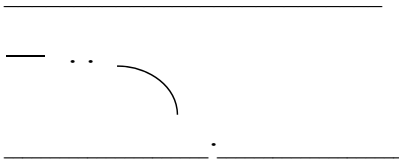
Task 2. Write a tone mark (/, \, /, \) just in front of each syllable in the underlined words. Check yourself with the answers.

E.g.: /Leeds

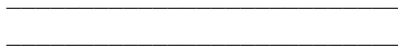
- 1 This train is for Leeds, York and Hull.
- 2 Can you give me a lift? – Possibly. Where to?
- 3 No! Certainly not! Go away!
- 4 Did you know he'd been convicted of drunken driving? – No!
- 5 If I give him money he goes and spends it. If I lend him the bike he loses it. He's completely unreliable.

Task 3. Draw the tonograms. Check yourself with the answers.

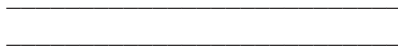
E.g.: 'Only when the \ sun ·shines



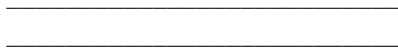
a) 'Only when the \ wind ·blows



b) /When did you ·say



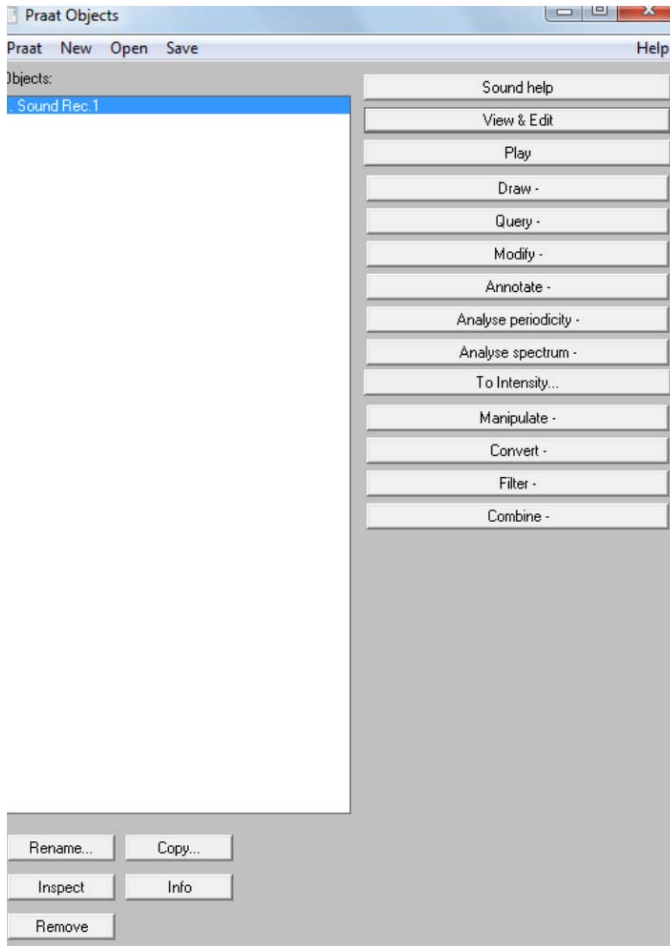
c) 'What was the \ name of the ·place



Task 4. Record the given sentences into Praat (www.praat.org). Use the algorithm from laboratory work 1. Then measure intonation in the following way:

1. Select the sound in object list (pic. 17) ---
2. Click View&Edit (pic. 18) ---
3. Pitch---
4. Tick show pitch (pic. 19).

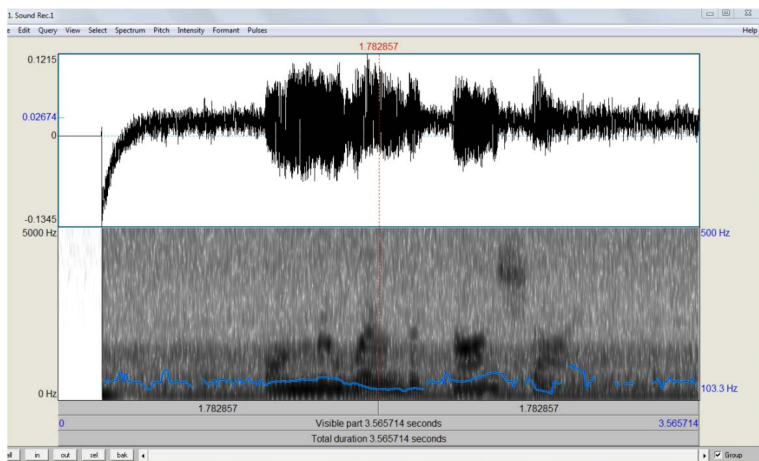
The algorithm is taken from Praat official manual (see bibliography list).
Print waveforms and spectrograms.



Pic. 17. Selecting Praat Object



Pic. 18. 'View & Edit' Button



Pic. 19. Spectrum and Pitch (blue contour)

Laboratory report form is in Appendix D.

Bibliography

1. Практическая фонетика английского языка : учеб. для фак. англ. яз. пед. ин-тов / М.А. Соколова [и др.]. – М. : ВЛАДОС, 1997. – 384 с.
2. Roach, P.J. English Phonetics and Phonology : a practical course / Peter Roach. – 4th ed. – Oxford: Oxford University Press, 2009. – 231 p.
3. 12 Intonation [electronic resource]. URL: www.youtube.com/watch?v=IdaKEvp27oo. (accessed: 09.09.2015).
4. Praat Manual [electronic resource]. URL: ec-concord.ied.edu.hk/phonetics_and_phonology/wordpress/learning_website/praahtome.htm (accessed 5.09.2015).

Laboratory work 4

ENGLISH INTONATION (2)

The purpose is: to revise the information connected with English intonation; to study work with waveforms.

Students' knowledge and skills:

- Basic knowledge on English stress and intonation;
- Skills in working with waveforms.

Materials: computers, microphones, headphones, access to the Internet, paper, a pencil or a pen.

Questions

- How does English intonation differ from the intonation in your language?
- Is it easy to imitate English intonation?



Task 1. Watch the video “British English Pronunciation Practice!” This video is on the CD, applied to this manual. You can also watch it on YouTube (see bibliography list). It helps you to revise English intonation.

Task 2. Read out the dialogue from the video in pairs, try to imitate the given intonation.

Life is a question of choice – or chance?

Charles: If you could recapture your childhood, Richard, would you change much?

Richard: Life is a sort of arch. Arrival to departure. You can't switch direction, Charles. Each century brings changes but actually, Nature doesn't change.

Charles: But you can reach different decisions. With television, you can choose which channel to watch, switch to another picture. You could catch a different train. Given the chance, Richard, would *you* change trains?

Richard: Life is a rich adventure and largely a question of chance. You don't choose your future as you choose a chocolate or a piece of cheese.

Charles: But, Richard, you *do* choose. You forge your own fortune – a butcher? a 'cellist? a teacher? a merchant? Each choice suggests a further choice – *which* tree, *which* branch, *which* twig?

Richard: Let's adjourn to the kitchen for chicken and chips. No choice for lunch, you see, Charles!

Charles: But *you* actually *choose* chicken and chips! Chops would have been much cheaper!

Task 3. Record your voice into Praat, print waveforms. Measure the intonation (see laboratory work 3).

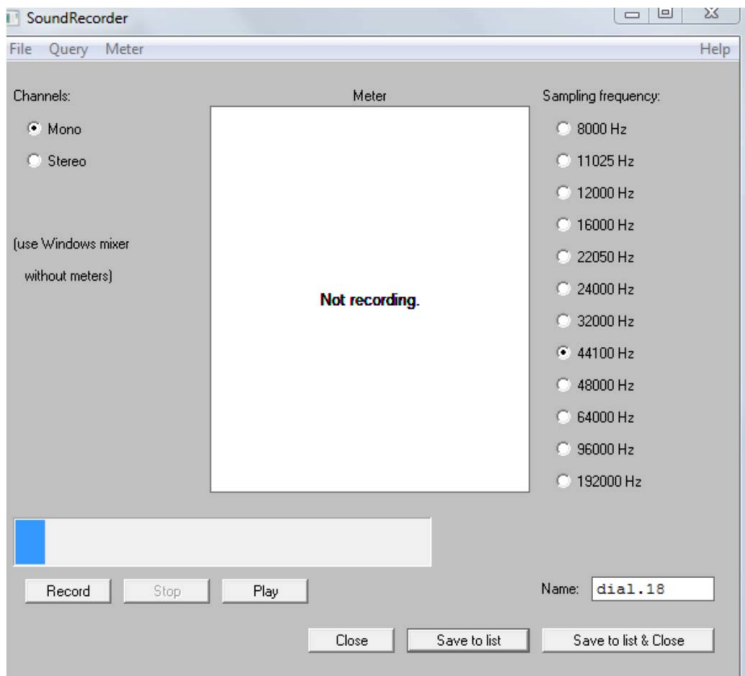
E.g.: click in Praat window *New---Record mono sound*. Record your voice, then give *the name* to the recording and save it to *list* (pic. 20).

When it is done, click *View&Edit* (pic. 21–22).

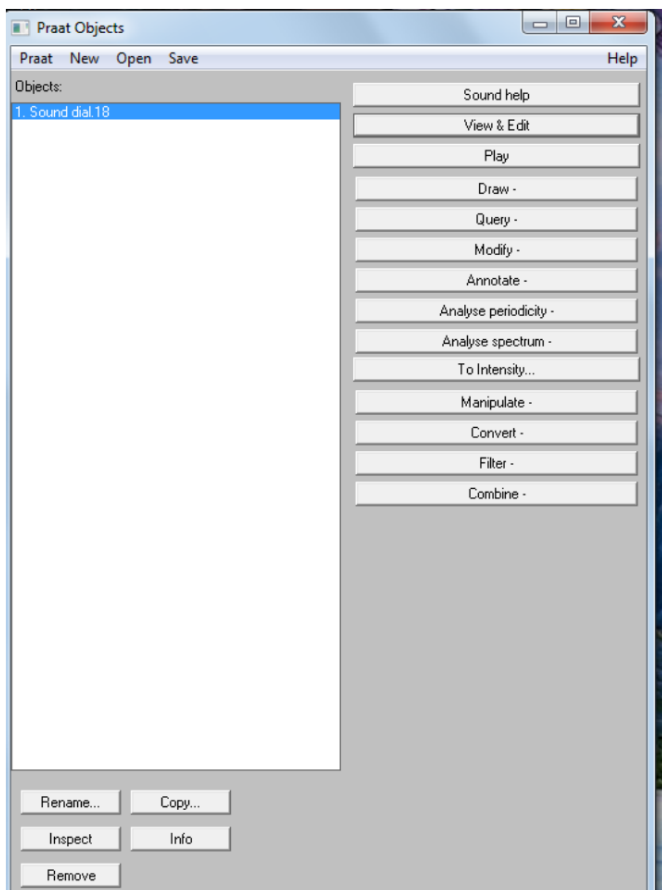
You will get the picture similar to the following one.

Add the final picture to your Laboratory report.

Laboratory report form is in Appendix D.



Pic. 20. Praat Recording Window



Pic. 21. Praat Manipulating Window



Pic. 22. 'View & Edit' Button

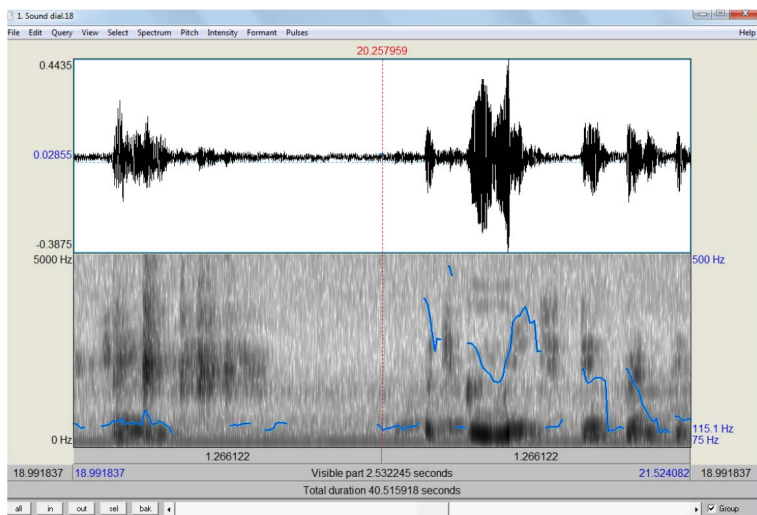


Fig. 23. Spectrum and Pitch

Bibliography

1. Практическая фонетика английского языка : учеб. для фак. англ. яз. пед. ин-тов / М.А. Соколова [и др.]. — М. : ВЛАДОС, 1997. — 384 с.
2. Roach, P.J. English Phonetics and Phonology: a practical course / Peter Roach. — 4th ed. — Oxford: Oxford University Press, 2009. — 231 p.
3. British English Pronunciation Practice! [electronic resource]. URL: www.youtube.com/watch?v=le43iKTDw4M. (accessed: 23.09.2015).

Laboratory work 5

BRITISH ACCENT AND RP

The purpose is: to revise the peculiar features of BBC English; to study British accent speech analysis.

Students' knowledge and skills:

- Basic knowledge on British accent;
- Skills in imitating of British accent;
- Skills in British accent speech analysis in Praat.

Materials: computers, microphones, headphones, access to the Internet, paper, a pencil or a pen.

Questions

- What are peculiar features of British accent?
- What do we mean by RP or BBC English?
- Where do we use RP and why?



Task 1. Watch the videos on British accent (see Bibliography list). You can find them on YouTube, or watch the videos on the CD, applied to this manual. You are going to revise some peculiar features of BBC pronunciation.

Task 2. Read out the following text with British accent.

Age and Language Learning

Most people think that the older you get, the harder it is to learn a new language. That is, they believe that children learn more easily and efficiently than adults. Thus, at some point in our lives, maybe around age 12 or 13, we lose the ability to learn languages well. Is this idea fact or myth?

Is it true that children learn a foreign language more efficiently than adults? On the contrary, research studies suggest that the opposite may be true. One report, on 2,000 Danish children studying Swedish, concluded that the teenagers learned more, in less time, than the younger children. Another report, on Americans learning Russian, showed a direct improvement of ability over the age range tested; that is the ability to learn increased as the age increased from childhood to adulthood.

There are several possible explanations for these findings. For one thing, adults know more about the world and therefore are able to understand meanings more easily than children. Moreover, adults can use logical thinking to help themselves see patterns in the language. Finally, adults have more self-discipline than children.

All in all, it seems that common idea that children are better language learners than adults may not be a fact, but a myth.

(from “Clear Speech” by J. B. Gilbert)

Task 3. Record your voice, reading the text above, in Praat. Use the algorithm from the previous laboratory work. Print the spectrogram and the waveform.

Task 4. Analyze vowels and consonants according to the algorithms from laboratory works 1 and 2.

Laboratory report form is in Appendix D.

Bibliography

1. Карневская, Е.Б. Практическая фонетика английского языка. Для продвинутого этапа обучения / Е.Б. Карневская, Е.А. Мисунно, Л.Д. Раковская ; под общ. ред. Е.Б. Карневской. – 3-е изд., испр. и доп. – М. : Эксмо, 2009. – 416 с.
2. British Accent Tip [electronic resource]. URL: www.youtube.com/watch?v=GTrVjWj5y7Q. (accessed: 26.10.2015).
3. How To Do a British Accent [electronic resource]. URL: www.youtube.com/watch?v=4RWQLJkr4N0. (accessed: 27.10.2015).
4. The Vowel Sounds in Received Pronunciation [electronic resource]. URL: www.youtube.com/watch?v=TEExpZYF5zY. (accessed: 27.10.2015).

Laboratory work 6

American Accent and GA

The purpose is: to revise the peculiar features of American accent; to study American accent speech analysis.

Students' knowledge and skills:

- Basic knowledge on American accent;
- Skills in imitating of American accent;
- Skills in American accent speech analysis in Praat.

Materials: computers, microphones, headphones, access to the Internet, paper, a pencil or a pen.

Questions

- What are peculiar features of American accent?
- What do we mean by General American?
- What are the main differences between RP and GA?



Task 1. Watch the videos on American accent (see Bibliography list). You can find them on YouTube, or watch the videos on the CD, applied to this manual. You are going to revise some peculiar features of GA pronunciation.

Task 2. Read out the text from laboratory work 5 with American accent.

Task 3. Record your voice in Praat, print the spectrogram and the waveform. Use the algorithm from the previous laboratory work. Compare them to the British variant.

Task 4. Analyze vowels and consonants according to the algorithms from laboratory works 1 and 2.

Laboratory report form is in Appendix D.

Bibliography

1. Карневская, Е.Б. Практическая фонетика английского языка. Для продвинутого этапа обучения / Е.Б. Карневская, Е.А. Мисунно, Л.Д. Раковская ; под общ. ред. Е.Б. Карневской. – 3-е изд., испр. и доп. – М. : Эксмо, 2009. – 416 с.

2. American vs. British English [electronic resource]. URL: www.youtube.com/watch?v=LIZ78RwhSPc. (accessed: 08.11.2015).
3. British vs. American English [electronic resource]. URL: www.youtube.com/watch?v=2nAnT3PASak. (accessed: 08.11.2015).

Laboratory work 7

CANADIAN ACCENT

The purpose is: to revise the peculiar features of Canadian English; to study Canadian accent speech analysis.

Students' knowledge and skills:

- Basic knowledge on Canadian accent;
- Skills in imitating of Canadian accent;
- Skills in Canadian accent speech analysis in Praat.

Materials: computers, microphones, headphones, access to the Internet, paper, a pencil or a pen.

Questions

- What are peculiar features of Canadian accent?
- How does Canadian accent differ from General American?



Task 1. Watch the videos on Canadian accent (see Bibliography list). You can find them on YouTube, or watch the videos on the CD, applied to this manual. You are going to revise some peculiar features of Canadian pronunciation.

Task 2. Read out the text from laboratory work 5 with Canadian accent.

Task 3. Record your voice in Praat, print the spectrogram and the waveform. Use the algorithm from the previous laboratory work. Compare them to RP and GA variants.

Task 4. Analyze vowels and consonants according to the algorithms from laboratory works 1 and 2.

Laboratory report form is in Appendix D.

Bibliography

1. Карневская, Е.Б. Практическая фонетика английского языка. Для продвинутого этапа обучения / Е.Б. Карневская, Е.А. Мисуно, Л.Д. Раковская ; под общ. ред. Е.Б. Карневской. – 3-е изд., испр. и доп. – М. : Эксмо, 2009. – 416 с.

2. All About Canadian Accents [electronic resource]. URL: www.youtube.com/watch?v=8YTGeIq4pSI. (accessed: 22.11.2015).
3. Canadian and American Accents [electronic resource]. URL: www.youtube.com/watch?v=_jSYtAAxDuQ. (accessed: 22.11.2015).
4. Talking Canadian [electronic resource]. URL: www.youtube.com/watch?v=eIoTpkM5N64. (accessed: 23.11.2015).
5. Unseen & Rare Interview – Avril [electronic resource]. URL: www.youtube.com/watch?v=bc00RyZLOFM. (accessed: 23.11.2015).

Laboratory work 8

AUSTRALIAN ACCENT

The purpose is: to revise the peculiar features of Australian English; to study Australian accent speech analysis.

Students' knowledge and skills:

- Basic knowledge on Australian accent;
- Skills in imitating of Australian accent;
- Skills in Australian accent speech analysis in Praat.

Materials: computers, microphones, headphones, access to the Internet, paper, a pencil or a pen.

Questions

- What are peculiar features of Australian accent?
- How does Australian accent differ from British one?



Task 1. Watch the videos on Australian accent (see Bibliography list). You can find them on YouTube, or watch the videos on the CD, applied to this manual. You are going to revise some peculiar features of Australian pronunciation.

Task 2. Read out the text from laboratory work 5 with Australian accent.

Task 3. Record your voice in Praat, print the spectrogram and the waveform. Use the algorithm from the previous laboratory work. Compare them to RP, GA and Canadian variants.

Task 4. Analyze vowels and consonants according to the algorithms from laboratory works 1 and 2.

Laboratory report form is in Appendix D.

Bibliography

1. Карневская, Е.Б. Практическая фонетика английского языка. Для продвинутого этапа обучения / Е.Б. Карневская, Е.А. Мисунно, Л.Д. Раковская ; под общ. ред. Е.Б. Карневской. – 3-е изд., испр. и доп. – М. : Эксмо, 2009. – 416 с.

2. Australian Accent Tip!_2 Syllables [electronic resource]. URL: www.youtube.com/watch?v=bj05ICDL6Cc. (accessed: 10.12.2015).
3. Australian Accent Tip!_O [electronic resource]. URL: www.youtube.com/watch?v=Fp364ZUWdeM. (accessed: 09.12.2015).
4. How to Do an Australian Accent (with slang) [electronic resource]. URL: www.youtube.com/watch?v=dG0v9tZStAk. (accessed: 10.12.2015).
5. How to Speak with an Australian Accent [electronic resource]. URL: www.youtube.com/watch?v=QVgiG7_Ey9k. (accessed: 09.12.2015).

Answers to the tasks

LW 1

Task 1

A) Λ B) υ C) e D) \mathfrak{v} E) υ F) æ G) ɪ H) e

Task 2

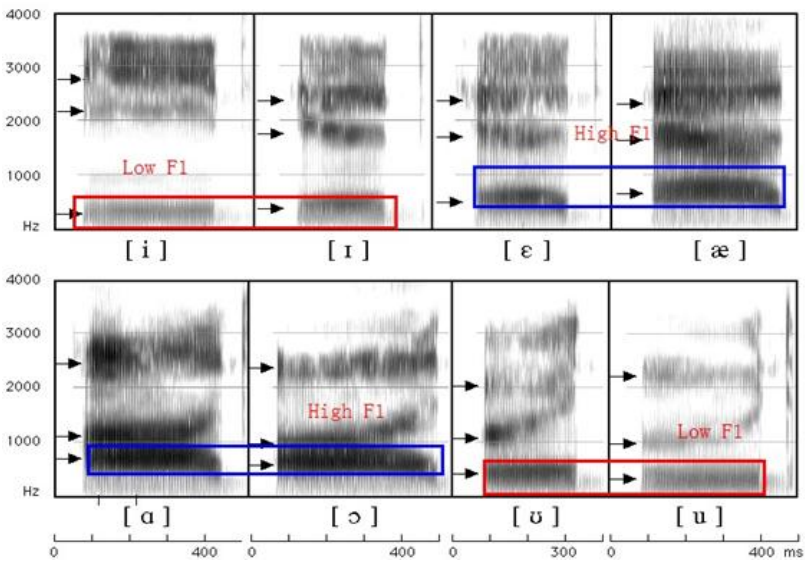
A) \mathfrak{v} : B) \mathfrak{v} : C) a : D) ə : E) u : F) i : G) ə : H) i : I) ə :

Task 3

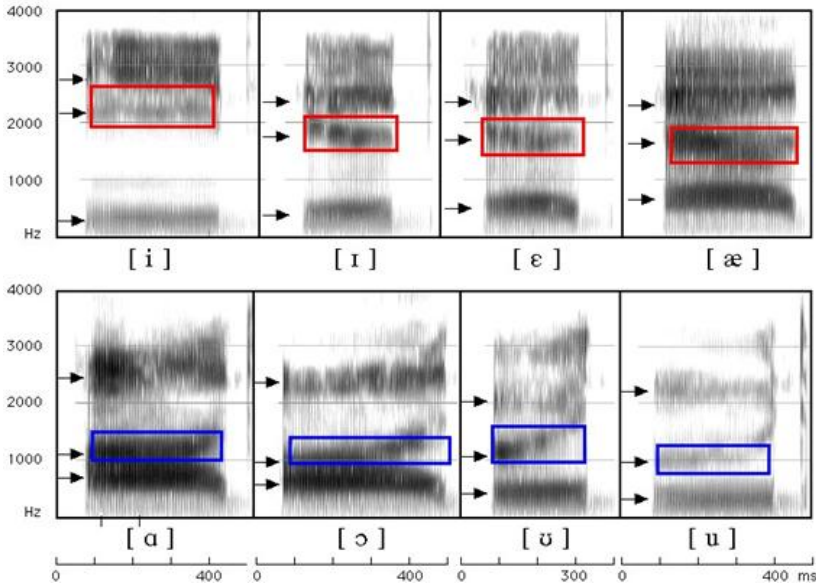
A) $\text{ə}\upsilon$ B) $\text{a}\text{ɪ}$ C) $\text{a}\upsilon$ D) $\text{e}\text{ɪ}$ E) $\text{ɪ}\text{ə}$ F) $\mathfrak{v}\text{ɪ}$ G) $\text{ɛ}\text{ə}$ H) $\text{a}\text{ɪ}$ I) $\text{e}\text{ɪ}$

Task 5

The first formant (F1)



The second formant (F2)



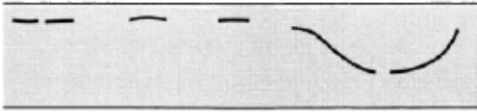
LW 2

Task 2

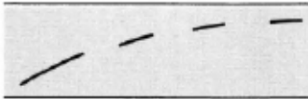
- 1 This train is for /Leeds/ York and \Hull
- 2 Can you give me a /lift
 √Possibly Where \to
- 3 \No Certainly \not Go a \way
- 4 Did you know hed been convicted of drunken /driving ^No
- 5 If I give him /money he goes and \spends it
 If I lend him the /bike he \loses it
 Hes completely unre\liable

Task 3

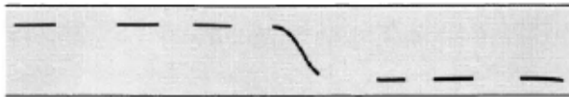
a) 'Only when the vwind ·blows



b) /When did you ·say



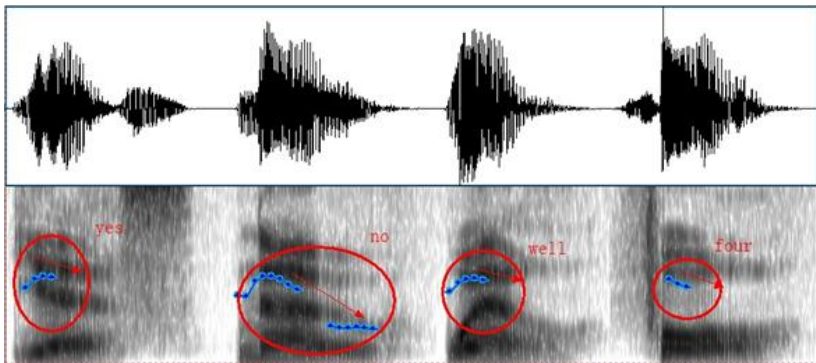
c) 'What was the \name of the ·place



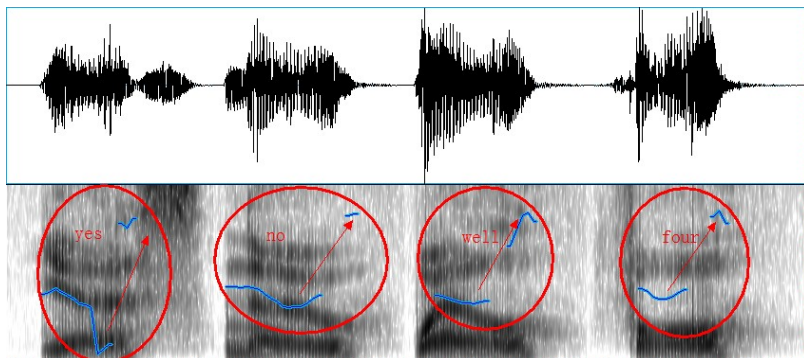
Task 4

Common types of tones in English

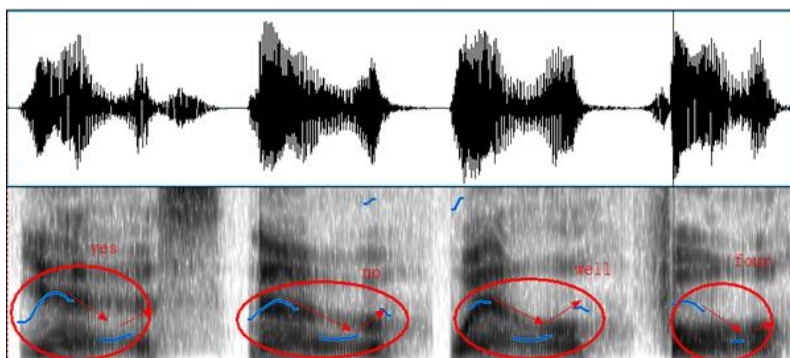
a) Fall



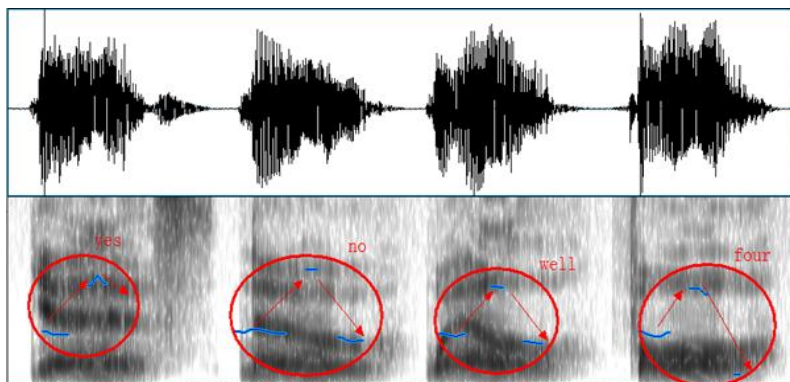
b) Rise



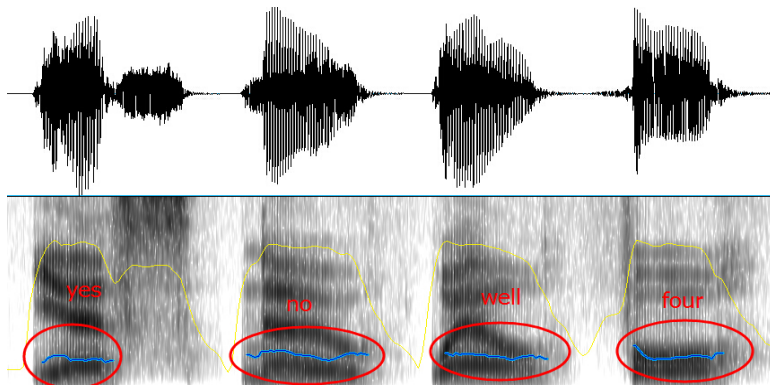
c) Fall-rise



d) Rise-fall

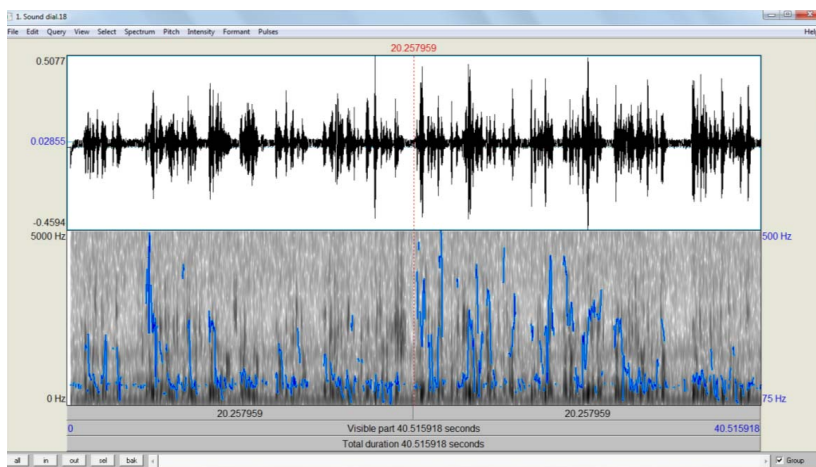


e) Level



LW 3

Task 3



Bibliography

1. Карневская, Е.Б. Практическая фонетика английского языка. Для продвинутого этапа обучения / Е.Б. Карневская, Е.А. Мисунно, Л.Д. Раковская ; под общ. ред. Е.Б. Карневской. – 3-е изд., испр. и доп. – М. : Эксмо, 2009. – 416 с. + 1 CD.
2. Практическая фонетика английского языка : учеб. для фак. англ. яз. пед. ин-тов / М.А. Соколова [и др.]. – М. : ВЛАДОС, 1997. – 384 с.
3. Roach, P.J. English Phonetics and Phonology: a practical course / Peter Roach. – 4th ed. – Oxford: Oxford University Press, 2009. – 231 p.

Useful Links

1. Accents with Amy Walker [electronic resource]. URL: www.youtube.com/channel/UCmLYm0beiL9yuQXgVOTZKeg (accessed 17.10.2015).
2. Praat Manual [electronic resource]. URL: ec-concord.ied.edu.hk/phonetics_and_phonology/wordpress/learning_website/praathome.htm (accessed 5.09.2015).
3. Rachel's English [electronic resource]. URL: www.youtube.com/channel/UCvn_XCl_mgQmt3sD753zdJA (accessed 1.10.2015).
4. The Virtual Linguistics Campus [electronic resource]. URL: www.youtube.com/user/LinguisticsMarburg; www.youtube.com/channel/UCaMпов1PPVXGcKYgwHjXB3g (accessed 13.11.2015).

List of Essential Definitions

Amplitude: The amplitude is marked by darkness of the bands: the greater the intensity of the sound energy presents in a given time and frequency, the darker will be the mark at the corresponding point on the screen.

Formant (F1–F4): A formant is a concentration of acoustic energy around a particular frequency in the speech wave. There are several formants (F1, F2, F3 and F4), each at a different frequency, roughly one in each 1000Hz band. To put it differently, formants occur at roughly 1000Hz intervals. Each formant corresponds to a resonance in the vocal tract.

Frequency: Frequency relates to the individual pulsations produced by vocal cord vibrations for a unit of time. The rate of vibration depends on the length, thickness, and tension of the vocal cords, and thus is different for child, adult male and female speech. A speech sound contains two types of frequencies: fundamental frequency (F0) which relates to vocal cord function and reflects the rate of vocal cord vibration during phonation (pitch) and formant frequency which relates to vocal tract configuration.

Time: Time as a property of speech sounds reflects the duration of a given sound.

Voice onset time (VOT): VOT is a feature of the production of stop consonants. It is defined as the length of time that passes between the release of a stop consonant and the onset of voicing. It is the time interval including the release burst, a short frication noise after the spike, and the aspiration.

Using Praat and Moodle for Teaching Segmental and Suprasegmental Pronunciation

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The use of Praat (open-source acoustic analysis software) to provide feedback for learning vowels and diphthongs was described by Brett (2004 - ReCALL 16:103-113). However, his conclusion, and that of Setter and Jenkins (2005 - Language Teaching 38:1-17), was that formant plot interpretation using Praat's interface is too complex for learners. In this paper, classroom data elucidates the use of Praat for measurements such as the duration, pitch, and intensity of sounds. It is shown that a combination of Praat and the Choice activity in Moodle (an open-source Learning Management System) provides a method of pinpointing the weaknesses of each student, thus helping the teacher to make efficient use of class time.

1. Introduction

The use of Praat (open-source acoustic analysis software) to provide feedback in pronunciation classes promotes autonomous learning in a field that has had to rely on native-listener judgements, traditionally, for evaluation. Its use for learning vowels and diphthongs was described by Brett (2004), who concluded that a better interface was needed for the pronunciation learner. Setter and Jenkins (2005) in their state-of-the-art review of pronunciation teaching, point out that being able to successfully interpret formant plots produced by Praat requires "a sophisticated level of understanding" on the part of both teacher and learner (p.10). However, Praat can be used for more than simply plotting formants. It is straightforward for students to measure the duration of speech sounds and to identify which words have higher pitch and intensity (loudness).

In Section 2 of this paper, I will demonstrate how to use Praat for teaching aspects of both segmental and suprasegmental pronunciation such as: (1) vowel length differences before voiced and voiceless stops (e.g., *code* versus *coat*), (2) voice onset time (VOT) of stops (e.g., *goat* versus *coat*), (3) spectrogram differences distinguishing /t/ from /l/ from /ʃ/ (e.g., *heating* versus *healing* versus *hearing*), and (4) intonation and stress. In Section 3 of this paper, I will show teachers how to set up a Choice activity (a method of polling students) within Moodle (an open-source course management system), enabling students to enter

their Praat measurements and allowing teachers to pinpoint student problems efficiently.

2. Using Praat to Measure Pronunciation

Praat is open-source software for the acoustic analysis of speech. It can be downloaded freely from <<http://www.praat.org>> for a range of operating systems, such as Mac, Windows, Linux, Solaris, etc. An in-progress Japanese user manual, including audio and video files, can be found at <http://clrlab1.u-aizu.ac.jp/praat_j.html>.

Although Praat is used by many pronunciation teachers and students, its interface is designed more with the scientist/researcher in mind. Nonetheless, it is extremely useful in pronunciation classes and is currently being used as both a teaching tool and a pronunciation aid in Phonetics and Pronunciation courses at the University of Aizu. After being trained by the teacher on the use of Praat, students are able to record and analyse their own pronunciation. Although pronunciation is often judged and taught solely through the oral/aural medium, this use of Praat opens up analysis to the visual medium as well.

2.1 Vowel length differences

It is straightforward for students to measure the duration of speech sounds, at the level of the segment, word, sentence, or above. Students first record speech by selecting "Record mono Sound..." (or stereo) from the "New" menu of the "Praat objects" window (see Fig. 1). After

recording something and saving it to the “Praat objects” window (by clicking on “Save to list” in the SoundRecorder window that pops up), the acoustic signal may be observed by clicking on the “Edit” button (visible when an object exists in the “Praat objects” window).



Figure 1. Praat objects window

Figure 2 shows an example of the Edit window after clicking on the “Edit” button. In this figure, the two words *code* and *coat* can be seen. The vowel part of the word *code* is selected and its duration (in seconds) is indicated by the arrow.

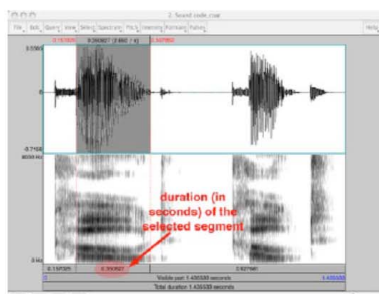


Figure 2. Code vowel selected in Praat edit window

In English, vowels that occur before voiced consonants are longer than those before voiceless

consonants and this can be measured easily by students.

2.2 Voice onset time (VOT)

VOT is the relative timing of the release of the air for a stop consonant and the onset of phonation (voicing) of a following vowel. Languages differ in how they use VOT to distinguish between voiceless (*p, t, k*) and voiced (*b, d, g*) stops. In English, voiceless stops have long VOT values and voiced stops have short (or even negative - i.e., voicing starting before the release of the air) VOT values. However, in Japanese, voiceless stops have medium or short VOT values while voiced stops have negative VOT values. Thus, when some native Japanese speakers pronounce English voiceless stops, they sound like English voiced stops.

Figure 3 shows the measurement of VOT for the */p/* in the word *peas* and the */b/* in the word *bees* for the author’s speech. After being given a table of average VOT ranges for English, students can compare them to their own VOT values and practice a more forceful release of air to lengthen their VOT. Teachers and students should be aware, though, that VOT varies from person to person, but that there are tendencies across languages that are important.

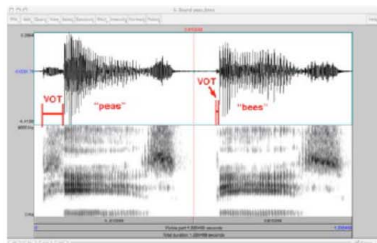


Figure 3. VOT for */p/* versus */b/*

2.3 Spectrogram cues to “Japanese R”, L and R

The North American English liquids (“l” and “r”) present difficulty for many Japanese learners, who have neither of these in their native sound inventory, but instead have a “tap” or “flap” consonant identical to that produced in the North American English pronunciation of the word *heating*.

The articulation of these two consonants (“l” and “r”) is complex in that it involves more than one part of the tongue at a time. This is readily apparent when the tongue is viewed directly with ultrasound during speech (see Wilson & Gick,

2006), but Praat can also help visualize the differences here and point out to students when they are making errors.

Figure 4 shows the waveform and spectrogram for the words *heating*, *healing*, and *hearing*. The letter “h” in the word *heating* is pronounced as /t/ in North American English, and this corresponds to the pronunciation of “Japanese R” (i.e., the consonant sound in the Japanese syllables: ろ, じ, る, れ, and ろ). In *heating*, notice the break where the tongue stops the airflow. In *healing*, the airflow continues around the sides of the tongue and in *hearing* it continues over the top of the tongue. The big difference between the /t/ in *heating* and the /t/ in *hearing* is the 3rd formant (F3). F3 remains high for /t/ in *heating*, whereas it is low (parallel to F2) for North American /t/.

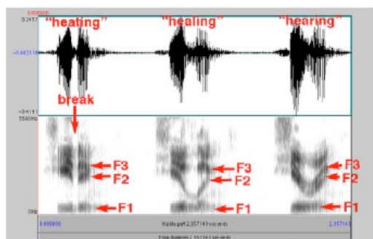


Figure 4. Formant differences in /t/, /V/, and /t/

2.4 Intonation and stress

Praat can also be used to teach aspects of suprasegmental pronunciation such as intonation and word stress. English stress can be indicated by one or more of the following: high pitch, high intensity (loudness), longer vowel duration, and full vowel quality (no reduction to schwa). Pitch and intensity displays are turned on from the *Pitch* and *Intensity* menus of the Edit window. These are straightforward to interpret and are shown in Fig. 5.

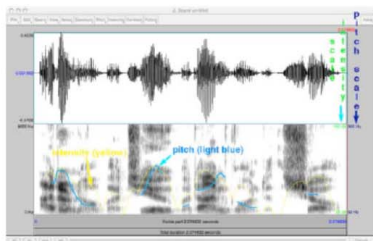


Figure 5. Pitch and intensity in the edit window

In Section 2, I have shown how to use Praat to make a variety of phonetic measurements. Once students are comfortable making those measurements, teachers can use Moodle to enable students to input their data for teachers to check.

3. Using Moodle’s Choice Activities with Praat

The *Choice* activity in Moodle is a method of quickly polling students to see which of a number of choices each student selects. In my pronunciation classes, I have set up *Choice* such that each possible selection is a different range of values on a phonetic continuum. Using Praat, students first measure those values for their own speech, and then they select the appropriate range in the *Choice* activity. An example of a *Choice* activity can be seen in Fig. 6. Students measure their VOT for /p/ in the word *peas* and then select the range that it falls in.



Figure 6. Choice activity: VOT of English /p/

The *Choice* results are instantly displayed to the teacher, and optionally to the students, as a table showing the students who have selected each choice (see Fig. 7). Thus, the teacher can determine quickly which students fall outside the normal range for a given phonetic measurement, and then efficiently give individual feedback. This saves valuable class time by helping teachers quickly choose which students need individual attention on which sounds.

Figure 7 shows the results of the VOT *Choice* for /p/ in the word “peas”. The leftmost column of students is those who have not answered the question yet. The other columns are for ranges of VOT values, from 0-9 ms, on the left (with 9 students), to 120-129 ms on the extreme right (with 1 student). The red vertical line on the left has been added to show the average VOT for *Japanese* /p/, spoken by a native Japanese speaker. The red vertical line on the right has been added to show the average VOT for *English* /p/.

spoken by a native English speaker. The VOT values contained in the two columns marked with red dots are so low that the word “peas” would typically be mistaken for “bees” by a native English listener. The 14 students in these two columns would be targeted first for extra help.

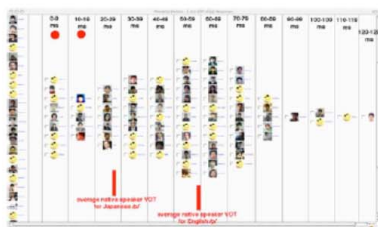


Figure 7. Choice results for VOT of English /p/

After asking the students to record the sentence *I use a computer every day*, I had them measure the duration of the vowel (i.e., schwa) in the first syllable of the word *computer*. For a native speaker of English, the schwa is extremely short - on the order of 5-20 ms. If one really drags out the pronunciation and says “come” + “pewter”, the duration of the vowel (no longer schwa) may reach 60-80 ms. A common mistake for Japanese learners of English is to pronounce schwa as a full vowel. By having students measure the duration of their schwa and entering it into a Moodle *Choice*, teachers can quickly determine who needs extra attention in this area. Figure 8 shows such results. Note that the majority of students have a schwa of duration 81-100 ms, far too long. It is possible that some students included the “m” of *computer* in their measurement of schwa. This would be something to go over with the class as a whole.

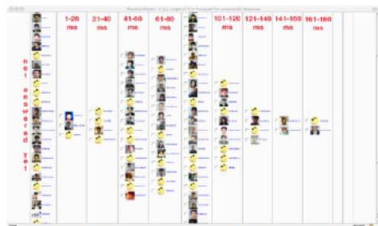


Figure 8. Choice results for schwa duration

Finally, Figure 9 shows the *Choice* results of the pitch difference between the “om” and the “u”

syllables of the word *computer*. All students falling on the left of the red line had a higher pitch on the first syllable than the second syllable.



Figure 9. Choice results for pitch difference

4. Conclusion and Future Steps

In this paper, I have demonstrated a method of setting up a *Choice* function within Moodle that has students enter measurements they have made of their pronunciation using Praat.

By using Praat to analyse their own pronunciation, learners are becoming more autonomous in a field that has had to rely on native listener judgements, traditionally, for evaluation. For a pronunciation teacher who is teaching large classes, the combination of Praat and Moodle provides a way of very quickly pinpointing which students need assistance in which areas.

In the near future, a website for teachers using Praat in pronunciation classes will be developed. The website will be located at <<http://crlab1.u-aizu.ac.jp/praat.html>>.

Acknowledgments

Thanks to John Brine (U. of Aizu) for providing and maintaining the Moodle server that hosts my courses.

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Source: Wilson I. Using Praat and Moodle for Teaching Segmental and Suprasegmental Pronunciation / I. Wilson [electronic resource]. URL: www.j-let.org/~wcf/proceedings/d-078.pdf. (accessed 27.08.2015).

Speak and unSpeak with PRAAT

By Paul Boersma and Vincent van Heuven

Introduction

By the Goodies Editor, Rob Goedemans

Many linguists use recorded speech in their research. In descriptive work, visual representations of such recordings (mostly oscillograms) are often annotated with IPA symbols and other labels, and then used to illustrate a phenomenon or defend a certain position regarding the nature of some phonetic or phonological property of the language in question. In phonetic and psychophysical research some parameter of the recorded speech (like tempo or intensity) is often altered, after which the new sound thus obtained is used in an experiment to test the sensitivity of the human ear, or brain, to certain speech properties.

The introduction of the computer has brought about a virtual revolution in the linguistic sciences with respect to the usage of speech recordings. A lab full of cumbersome machinery has now been replaced by one PC, Mac or workstation, on which anyone who puts his mind to it can record, annotate and modify speech with some simple commands or a few mouseclicks. Even the calculation of some speech parameters that were rather complicated to obtain in the past (like pitch and spectral analysis) but frequently used in phonetic research nonetheless, are now often just one or two mouseclicks away.

As a result, a growing number of colleagues find use for files with speech sounds in their linguistic explorations. The needs of this group are served by a rather small number of software packages designed for the representation, annotation and analysis of speech (and much more in many cases). In my opinion, one of these stands out in many ways. It is called "PRAAT"; the imperative form of *to speak* in Dutch. Since this package is rapidly gaining in popularity, we have decided to devote some attention to it in this issue. First, one of the authors, Paul Boersma, introduces the package and outlines its impressive functionality. Then, an experienced user, Vincent van Heuven, highlights some of the advantages and disadvantages of using PRAAT in everyday phonetic research.

It is my sincere hope that these two goodies will convince even more linguists to download PRAAT and experiment with it a little. They will see that incorporating, for example, some oscillograms of minimal pairs in their work is as easy as ABC. Their publications will undoubtedly be the better (and the livelier) for it.

PRAAT is a computer program for analysing, synthesizing, and manipulating speech. It has been developed since 1992 by Paul Boersma and David Weenink at the Institute of Phonetic Sciences of the University of Amsterdam. There are versions for most of the common operating systems: Macintosh, Windows, Linux, and several Unix workstations (Solaris, Silicon Graphics, Hewlett-Packard). By September 2001, there were more than 5,000 registered users in 99 countries.

PRAAT, a system for doing phonetics by computer

By Paul Boersma

1. Analysing speech with PRAAT

PRAAT allows you to record a sound with your microphone or any other audio input device, or to read a sound from a sound file on disk. You will then be able to have a look 'inside' this sound. The upper half of the sound window (see figure 1) will show you a visible representation of the sound (the *wave form*). The lower half will show you several acoustic analyses: the *spectrogram* (a representation of the amount of high and low frequencies available in the signal) is painted in shades of grey; the *pitch contour* (the frequency of periodicity) is drawn as a cyan curve; and *formant contours* (the main constituents of the spectrogram) are plotted as red dots.

PRAAT is most often used with speech sounds, in which case the pitch contour is associated with the vibration of the vocal folds and the formant contours are associated with resonances in the vocal tract. But the use of PRAAT is certainly not limited to speech sounds: musicians and bio-acousticians use it for the analysis of sounds produced by flutes, drums, crickets, or whales, and the interpretation of the three analyses will change accordingly.

The Sound window allows you to zoom in for more detail, to scroll to the places that you are

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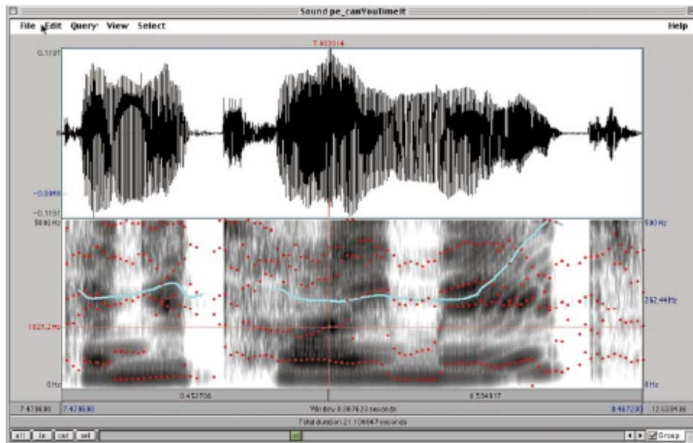


Figure 1. Praat's sound window.

interested in, to set a time cursor or select a time stretch, and to listen to the parts of the sound that you are viewing or selecting. You can easily query all the important properties of the analyses, e.g. obtain the average pitch value inside the selected time stretch. You can turn the analyses into separate objects (independent from the original sound), which is handy for further processing, e.g. it allows the

pitch contour to be saved, printed, or converted into something else.

2. Annotating speech with PRAAT

PRAAT is used by many linguists (phoneticians, phonologists, syntacticians) to label and segment their speech recordings. You can make transcriptions and

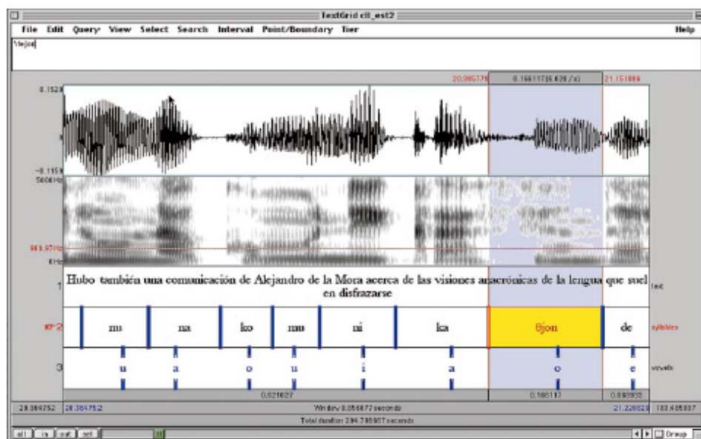


Figure 2. Praat's annotation window.

annotations on multiple levels simultaneously (see the three levels in figure 2), in a window that typically also shows visible representations of the sound, the spectrogram, and perhaps the pitch contour. PRAAT supports an easy use of special symbols in annotations, including nearly all symbols defined by the International Phonetic Association (such as the θ symbol, typed as “\te”, in figure 2).

3. Synthesizing speech with PRAAT

PRAAT is *not* a text-to-speech system: you cannot type in an English sentence and have the program read it aloud. But you can generate many types of sounds with PRAAT. First, you can use formulas to generate simple sounds like sine waves or white noise from scratch, or to generate more complicated sounds from other sounds. Second, you can create sounds from other types of data, e.g. you can turn a pitch contour in a pulse train. Third, you can do *source-filter synthesis*: from stylized pitch, intensity, and formant contours that you can build from scratch, you can create speech-like sounds. Fourth, you can perform *articulatory synthesis*: from a specification of timed muscle contractions, Praat will compute the resulting sound. Fifth, you can create sounds from other sounds by a variety of filtering and enhancement techniques.

4. Manipulating speech with PRAAT

A specialized manipulation window allows you to stylize and modify the pitch contour of an utterance.

In figure 3, the impatient-sounding question “can you time it?”, with an original final high rise, has been converted into a slightly whining command. The same window allows you to modify relative durations within this utterance. In this way, you can change the intonation and stress patterns of the utterance, which is useful when creating stimuli for research into the perception of prosody.

5. Graphical capabilities of PRAAT

PRAAT comes with a separate Picture window into which you can draw your sounds, pitch contours, spectrograms, and any other data types. You can add text (several fonts, many special symbols, several sizes, any rotation), lines (several colours, any widths, several styles), circles/ellipses/rectangles (filled or outlined), and several types of markers along and inside your drawings. Figure 4, for instance, shows the modified pitch contour of figure 3, with appropriate vertical text to its left, and a comment added above it.

The Picture window is designed for producing publication-quality graphics for your articles and dissertations. From this window, you can print to any printer (PostScript, Macintosh, Windows) and save your drawings as EPS files (best quality, but works with PostScript printers and PDF creators only), WMF files (Windows), or PICT files (Macintosh). All of these can be easily imported into your word processor. The Macintosh and Windows versions support the graphical clipboard as well, so that you can use simple copy-and-paste to move PRAAT

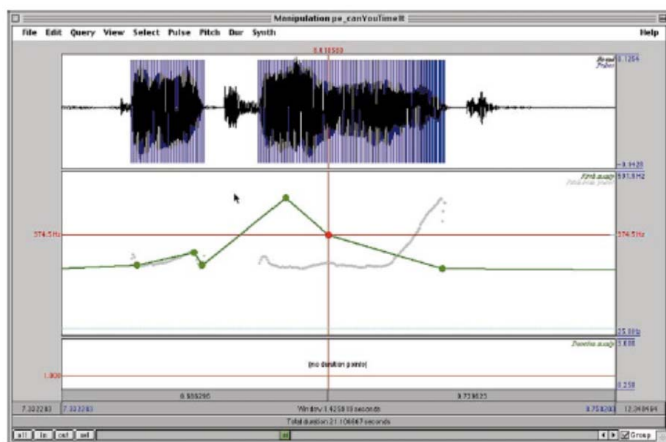


Figure 3. Praat's manipulation window.

pictures to your word processor, if you have no use for PostScript quality.

6. The PRAAT scripting language

In most parts of the world, slavery was abolished in the 19th century, but it is not unusual to see phoneticians measure the pitch values of 1500 vowels by hand. You would probably want to replace such work by an automated procedure that, say, loops over all the sound files that reside in a certain directory or over all the segments marked "u" in a vowel annotation. Such things can easily be performed by the PRAAT scripting language, which is a general-purpose programming language with special capabilities for simulating menu choices and button presses in the PRAAT program. Many people use this language for all their analyses, tabulations, statistics (there are special functions for computing levels of significance in t , χ^2 , or F tests), and complicated pictures. In fact, you can use PRAAT as a general drawing program: figure 4 shows a PRAAT script that draws the complicated figure at the top of the Picture window.

7. Other features of PRAAT

The PRAAT program contains several possibilities in areas that are only remotely connected to phonetics. Phonologists and syntacticians like its implementation of Optimality-Theoretic learning (constraint demotion, gradual learning algorithm, robust interpretive parsing), which you can apply to your own cases. Other possibilities include neural-net

modelling and extensive high-level statistics (principal-component analysis, discriminant analysis, multidimensional scaling).



Figure 5. Praat's manual window.

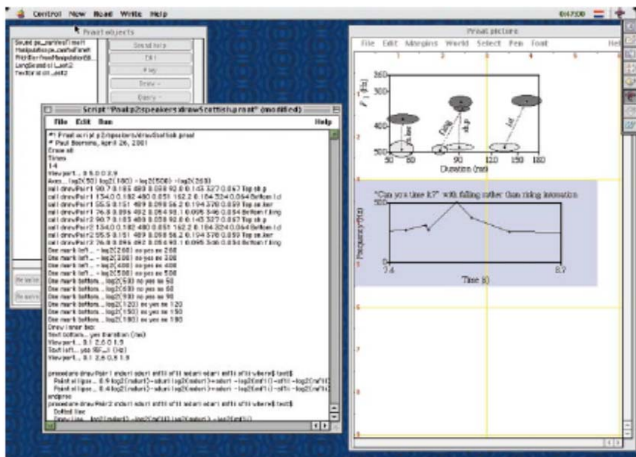


Figure 4. Praat's script and picture windows.

8. The PRAAT manual

PRAAT comes with an extensive tutorial, which you can start by choosing "Introduction to PRAAT" from the "Help" menu. The entire reference manual is contained in the program as well and consists of about 800 pages that are connected via hyperlinks (see figure 5). Help buttons are available in most windows and dialog boxes, and clicking them will take you into the part of the manual that is most appropriate in the current context.

9. Why PRAAT?

You will want to choose PRAAT for most of your phonetic research not only because it is the most complete program available (it contains *much* more than could be discussed here), or because it is distributed for free, but also because it comes with the finest algorithms. The pitch analysis algorithm is the most accurate in the world; the articulatory synthesis is the only one that can handle dynamic length changes (ejectives), non-glottal myo-elastics (trills), and sucking effects (clicks, implosives); and the gradual learning algorithm is the only linguistically-oriented learning algorithm that can handle free variation. But of course, there will always be things related to phonetics that other programs are better at. For your convenience, PRAAT has therefore been designed to interface reasonably well with Matlab, SPSS, Excel, and the Klatt synthesizer.

10. How to get the PRAAT program

You can get the PRAAT program through its web site, www.praat.org. By writing an e-mail message to the first author, you obtain a free licence to download all current and future versions of the program, install as many copies as you like on as many computers as you like, and use the program for any legal purpose at your work, at home, and in the field. You will also be informed about major updates of the program, which appear approximately twice a year. The source code of the PRAAT program is distributed under the General Public Licence.

A user's comments on PRAAT

By Vincent J. van Heuven

Introduction

PRAAT is probably the most comprehensive toolbox for phonetic research available worldwide, and it is certainly the most affordable; it actually costs no money at all. In fact, it is so diverse that I have never met anyone – apart from its authors – who could claim to have experience with all the modules that the program contains. I for one will have to limit the present appraisal to just those few modules that my co-workers and I have used in our laboratory. Moreover, PRAAT rejuvenates at an alarming rate. The

release that I am currently using is version 3.9.36 running on the Windows NT platform.

PRAAT started out as a collection of programs that were specifically designed to produce top-quality graphic representations of speech, i.e. oscillograms, spectra, spectrograms, fundamental frequency and intensity plots, etc. However, the flexible and well-planned structure of the program allowed its maker(s) to extend PRAAT's functionality almost indefinitely. Often, the same tasks can be done by PRAAT using different modules with different algorithms. Pitch extraction, for example, can be done with the aid of at least four different algorithms: autocorrelation, cross-correlation, SPINET, and subharmonic summation. Help files are available for each of the algorithms, explaining the meaning of the many parameter values that can be specified in for each algorithm and providing references to the literature. Each algorithm comes with a set of default parameter settings that can be overridden by the user. Also, there is an unmarked algorithm (which turns out to be an autocorrelation technique) that allows no special tuning.

In all, there would seem to very little that PRAAT cannot do for you. However, some things can be done instantaneously, other tasks can be performed only in non-obvious ways that the novice user will never discover by himself. Fortunately, the makers of PRAAT take great pride in their product, and are willing to answer queries from the floor 24 hours a day, or so it seems, again at no cost.

It should be pointed out that PRAAT is not a self-study course in experimental/instrumental phonetics. To be true, a detailed on-line technical reference manual is included with the program, but it generally does not discuss the pros and cons of alternative approaches/solutions to speech analysis problems. The user must decide on his own which algorithm will suit his purposes best. In this respect PRAAT is not unlike the magic broom that takes off with the sorcerer's apprentice. The general advice would be: do not try this at home, and always consult your local phonetician.

Multipanel editors

A recent development seems to have been toward providing smorgasbord-like complex presentations which display speech parameters as a function of time in multiple synchronized panels. Two such complex editors are provided.

1. The first is the basic waveform editor (which is invoked by a Sound object), which can be tailored to the user's taste. It allows for simultaneous display of the waveform, spectrogram, formant tracks (in red), a pitch curve (blue) and an intensity curve (yellow), all superimposed on the spectrogram. Each of the five displays can be switched on/off, scales can be adjusted for optimal visual resolution, there is a (limited) choice of algorithms that can be invoked for each display, and parameter settings can be chosen

independently for each display. Values can be eye-balled and read out under cursor control; digital readouts can be obtained through data queries. The edit functions allow cut, copy and paste, zero, and time-reverse. The parameter tracks can be extracted from each display and stored separately.

2. The second is the editor that is used for Manipulation objects. The waveform is displayed together with a pitch track (default pitch determination algorithm) and a relative duration parameter. In the waveform the moments of glottal closure are indicated by vertical blue lines. The corresponding pitch-synchronous frequency value is displayed in light gray in the pitch manipulation display. Presence/absence and location of glottal pulses can be manipulated. Also the user can stylize the pitch curve and/or change the pitch curve in any way he wants. Similarly, time intervals can be selected and given different relative durations. This allows portions of the utterance to be stretched or compressed in time. After manipulation the sound can be resynthesized using two different analysis-resynthesis schemes:

a. PSOLA resynthesis: a relatively simple waveform manipulation technique that affords the manipulation of pitch and duration but detracts very little from the original sound quality.

b. LPC resynthesis: a statistical data reduction technique that generally leads to considerable loss of sound quality but affords – in principle – the manipulation not only of prosodic parameters (pitch and duration) but also of spectral parameters (sound quality or timbre). Unfortunately, the display and manipulation (smoothing, stylization, frequency shift) of spectral parameters (formant tracks) is not implemented in the manipulation editor, nor are these functions easily available elsewhere in the package.

It should be doable, in principle, to reduce the two editors to just one generalized editor that allows the display, interactive measurement and manipulation of all the relevant properties of the speech signal. The manipulable properties should include the intensity curve. This parameter is currently displayed in the waveform editor (optionally) but cannot be manipulated.

Additional displays

Cochleagrams. Hidden further down the hierarchy of

PRAAT functions are the possibilities to create auditory spectrograms (or cochleagrams). As an option with the cochleagram the loudness (expressed in Sones) of a time-slice can be queried. It is not possible, in its present state, to instruct **PRAAT** to produce a loudness trace as a function of time (although the user can generate and print such a contour, using the built-in programming language).

Vowel diagrams. It is also possible to plot a vowel, or even a series of vowels, as points in a vowel diagram, i.e. a two-dimensional graph plotting the

first formant frequency F1 against the second formant frequency F2. Optionally, dispersion ellipses can be drawn around the scatter clouds of vowel points in the F1-by-F2 display. Such plotting facilities are also provided by the – expensive – Kay Computerized Speech Lab (CSL) package. Using the annotation tools incorporated in **PRAAT**, beautiful print-quality vowel diagrams can be produced. For teaching purposes it would be attractive if this display could also be used as part of a user interface to generate vowel sounds by moving the cursor around in the display (interactively or from predefined custom-made trajectories), using LPC synthesis. The authors at one time promised that this facility would be made available but I have not seen it (yet). As far as I know, there is no interactive software around that can do this sort of vowel synthesis (although the Vowel Hunter program developed at the Phonetics Laboratory of Bonn University, Germany, comes close). Also, there is the talking vowel diagram provided on the Speech Production and Perception I CD-ROM issued by Sensimetrics. However, this product does not provide for on-line vowel synthesis; it just plays a fairly small number of pre-stored vowel waveforms.

Scripting language

PRAAT comes with a full programming language which can be used to create script that can be run in batch mode, allowing the user to analyze large quantities of data automatically – with or without user intervention, and to store measurements in a database for off-line statistical data analysis using such packages as SPSS. **PRAAT** scripts can be programmed from scratch or the user can build upon a basic script that is generated by the **PRAAT** macro-recorder. **PRAAT** keeps a log of any button pressed or keystroke entered during the interactive session. At any moment the session's history can be loaded into a text editor and used as a starting point for a program.

Using the programming tool, the user can extend **PRAAT** any way he likes, defining new functions and making these easily accessible in the **PRAAT** user interface as optional buttons. Any user with a basic grasp of computer programming will be able to construct **PRAAT** scripts. The **PRAAT** interactive manual provides lots of sample scripts to give the novice a basic feel of how to go about generating scripts.

PRAAT as a sound generator and teaching tool

For the teaching of basic acoustics – often a tough subject for undergraduate language students with a non-technical background – **PRAAT** provides a complex tone generator with very limited possibilities. To be true, **PRAAT** also allows the user to define any waveform by typing in and/or editing full formulae such as:

$$1/2 * \sin(2 * \pi * 377 * x) + \text{randomGauss}(0, 0.1),$$

which generates a 377-Hz sine wave with some white noise superimposed, but this is not an option for the beginner. It would therefore be more fun if the simple tone generator could be extended such that the user could interactively set and adjust the fundamental and the intensities of a number of harmonics in a spectral display, observe the effects of the spectral adjustments in a waveform display and listen to it, all at the same time. Conversely, it would be ideal if some pre-stored or external sound (either from a tape recording of from a live microphone) could be simultaneously displayed in an on-line fashion as a waveform and as a spectrum. Older (UNIX) versions of the GIPPOS speech processing package developed at the former Institute of Perception Research at the Technical University of Eindhoven, The Netherlands,

contained such a facility as a goody, but it is no longer included with the Windows edition of GIPPOS.

Especially amusing and instructive is the function for generating Shepard tone spirals. This is a complex tone signal with a pitch that seems to be continually rising, without getting anywhere.

Conclusion

In summary, PRAAT is a formidable research and teaching tool for phonetics. This report has not done justice to its makers in two respects: first, it singled out only a small part of PRAAT's many possibilities, and second, it put undue emphasis on things PRAAT cannot (yet) do. I end this review by reinstating that PRAAT is unrivalled as a general purpose speech analysis tool.

Source: Boersma, P. Speak and unSpeak with Praat / P. Boersma, V. van Heuven [electronic resource]. URL: www.fon.hum.uva.nl/paul/papers/speakUnspeakPraat_glott2001.pdf. (accessed 10.02.2016).

A. Good English ☺

- \Your ,English is ,very ,good. You've \been to ,England, I sup,pose.
- \No, I \haven't. I ,learned \English ξ in \Moscow \only.
- \Did you ^really? \You must be \gifted ξ for \languages.
- \It's ,very \kind of you | to \say so, | but I 'don't \think my ,self I \am.
- In \fact, ξ "so ,far | I 'haven't come a\cross many ,foreigners, | ,speaking ,better ,English | than ,you do.
- \Well, ξ \I \have, | but \thank you \all the \same.
- \What sur,prises \me ξ is that you have ,such a cor,rect pronun,ci\ation.
- \Well, | with \modern e,quipment to ,day | it's \not very ^difficult.
- \Oh \yes, | \that's \all very \well, | but 'even \so | ,learning a ,language ξ is a ,hard \job.
- I \couldn't a,gree \more. \Quite a \number of ,people | ,lose ,heart ξ and ,give it \up.

Source: Карневская, Е.Б. Практическая фонетика английского языка. Для продвинутого этапа обучения / Е.Б. Карневская, Е.А. Мисуно, Л.Д. Раковская ; под общ. ред. Е.Б. Карневской. — 3-е изд., испр. и доп. — М. : Эксмо, 2009. — С. 76.

Name _____ Group _____

Date _____

Laboratory ___ Report

Theme _____

Task 1. _____

Task n. _____

Draw conclusions _____
