Doing corpus phonetics using data on the web

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Data for studying mother-child interaction: Introducing the CHILDES database

https://childes.talkbank.org

Overview of the CHILDES system

- CHILDES = Child Language Data Exchange System
- Basic components of CHILDES
  - A database of child language transcripts
  - CHAT = a system of Codes for the Human Analysis of Transcripts of child speech
  - CLAN = a collection of Child Language Analysis programs

Database

- Variety of languages
- Typically developing populations
- Atypically developing populations
  - Down syndrome
  - Autism
  - Specific language impairment
  - Brain lesions

CHAT: Codes for the human analysis of transcripts

@Begin

@Participants: ROS Ross Child, BRI Brian Father

*ROS: why isn’t Mommy coming?

%com: Mother usually picks Ross up around 4 pm.

*BRI: don’t worry.

*BRI: she’ll be here soon.

*ROS: good (be)cause I’m xxx hungry.

*BRI: what would you like to eat?

@End

CLAN: Child Language Analysis Program

- FREQ: count items
- KWAL: search for individual keywords in context
- MLU: mean length of utterance

Download the program at
http://childes.talkbank.org

Command syntax

mlu	+t*CHI	adam01.cha
command	option	filename

- mlu: the name of the program you wish you execute
- +t*CHI: a list of options you select for the program
- adam01.cha: the name of the transcripts you wish to analyze

options

- +t: speaker code
  - freq +t*CHI adam01.cha
  - freq –t*CHI adam01.cha
- +s: focus analysis on particular strings
  - freq +s”who” adam01.cha
  - freq –s”who” adam01.cha
  - kwal +s”who” adam01.cha

- *: wild card
  - freq +t*CHI +s”toy” adam01.cha
  - freq +t*CHI +s”toy*” adam01.cha
  - freq +t*CHI +s”toy*” adam0*.cha
- +u: perform a combined analysis
  - freq +t*CHI +s”toy*” +u adam0*.cha
- w: provides a window for the context
  - kwal +t*MOT -w2 +w2 +sno adam01.cha
- @: include file
  - kwal +s@whwords adam01.cha

Multiple keywords in a file (whwords.txt)

- Open a text editor
- The contents of the file:

  who

  where

  why

  where

  what
- Save it in a .txt format

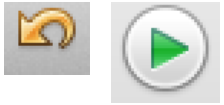
freq +t*CHI +s@whwords.txt *.cha

- The above command will search for the frequency of the words included in the super.txt file.
- **+t*CHI**: analyze the child's tier only
- **+s@whwords.txt**: include the words from the file whwords.txt
- ***.cha**: analyze all files ending in .cha
- **+u**: adding this option will merge all the input files into a combined analysis

Sound symbolism

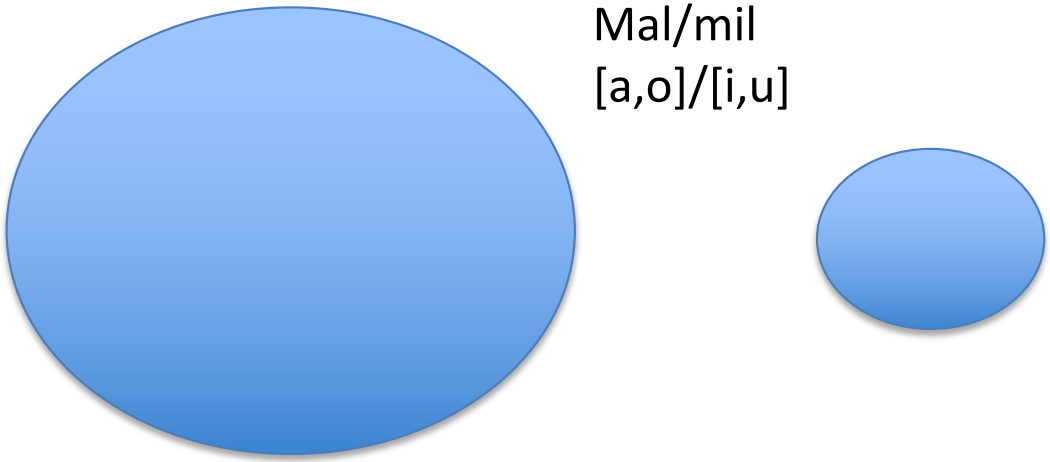
Three types of signs

Charles Saunders Peirce (1838-1914)

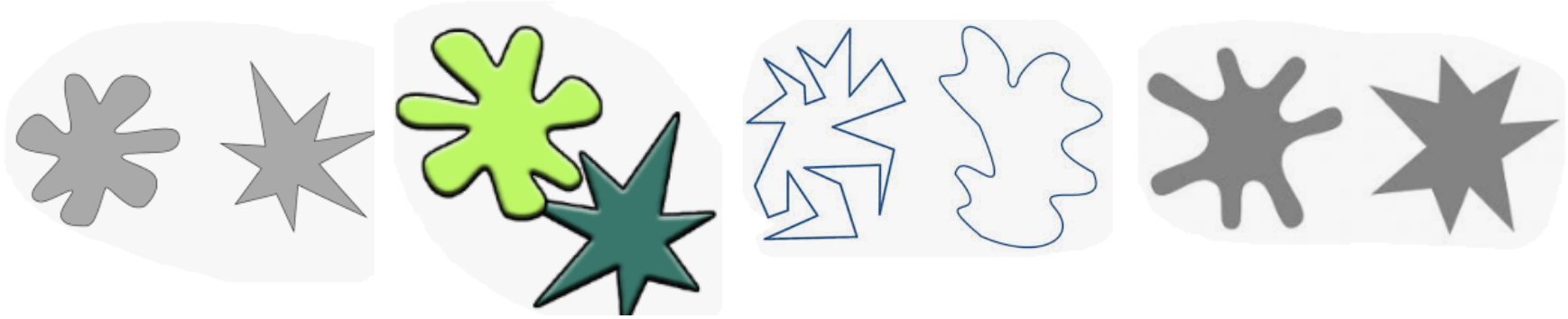
- Icons: signs that *resemble* the things they represent
  - e.g., mirror images, photos, paintings, maps 
- Indices: signs that are spatially, temporally, or causally related to what they represent
  - e.g., smoke as a sign of fire; arrows indicating directions 
- Symbols: the relationship between the form and meaning is arbitrary.

Sound symbolism

- Some words are classified as ‘iconic’, rather than symbolic.
  - The sound of a word represents its lexical meaning.



Takete/baluba (maluma), kiki/bouba (Köhler1929)



✓ **Sound symbolism bootstrapping hypothesis** (Imai and Kita, 2014)

"sound symbolism provides a scaffolding mechanism for children in various stages of language development."

- Infants are sensitive to sound symbolism, due to naturally occurring multi-modal mapping (e.g., sound + vision).

- Sound symbolism helps infants realize that speech sounds refer to entities in the world.

- We can hypothesize that words with sound symbolism (e.g. woof, or hu:ge) might help infants to learn vocabulary because of the close resemblance in form and meaning in the expressions.

- Words that resemble the sound of manner of certain meaning conveyed by words are called mimetics or onomatopoeia.

- If the hypothesis above were true, we might expect parents to use sound symbolism more frequently to younger children than older. Let's investigate this question.

- Find words with sound symbolism in parents' speech. Using the "freq" command, generate a list of all words that the mother produced.

  freq +t*MOT *.cha > freq.txt

  This command will give you a list of words in an alphabetical order.

- If you want to view the list in the order of frequency so that the most frequently used words appear on the top, run the following command.

  freq +t*MOT +o *.cha > freq_o.txt

  What are the most frequent 5 mimetic words in the freq_o.txt output?

- We would like to know how often sound symbolism is used in mothers' speech as a function of child's age. For this task, make a file called "mimetic.txt" which contains a list of words that you will be searching for in each file.

- If you run the following command, it will extract all the mimetic words contained in the mimetic.txt file from Naima's mother's tier.

  freq +t*MOT +u +s@mimetic.txt *.cha, etc.**

- Now add "+3" option to generate an excel file that contains the same information.

  freq +t*MOT +d3 +s@mimetic.txt *.cha, etc.**

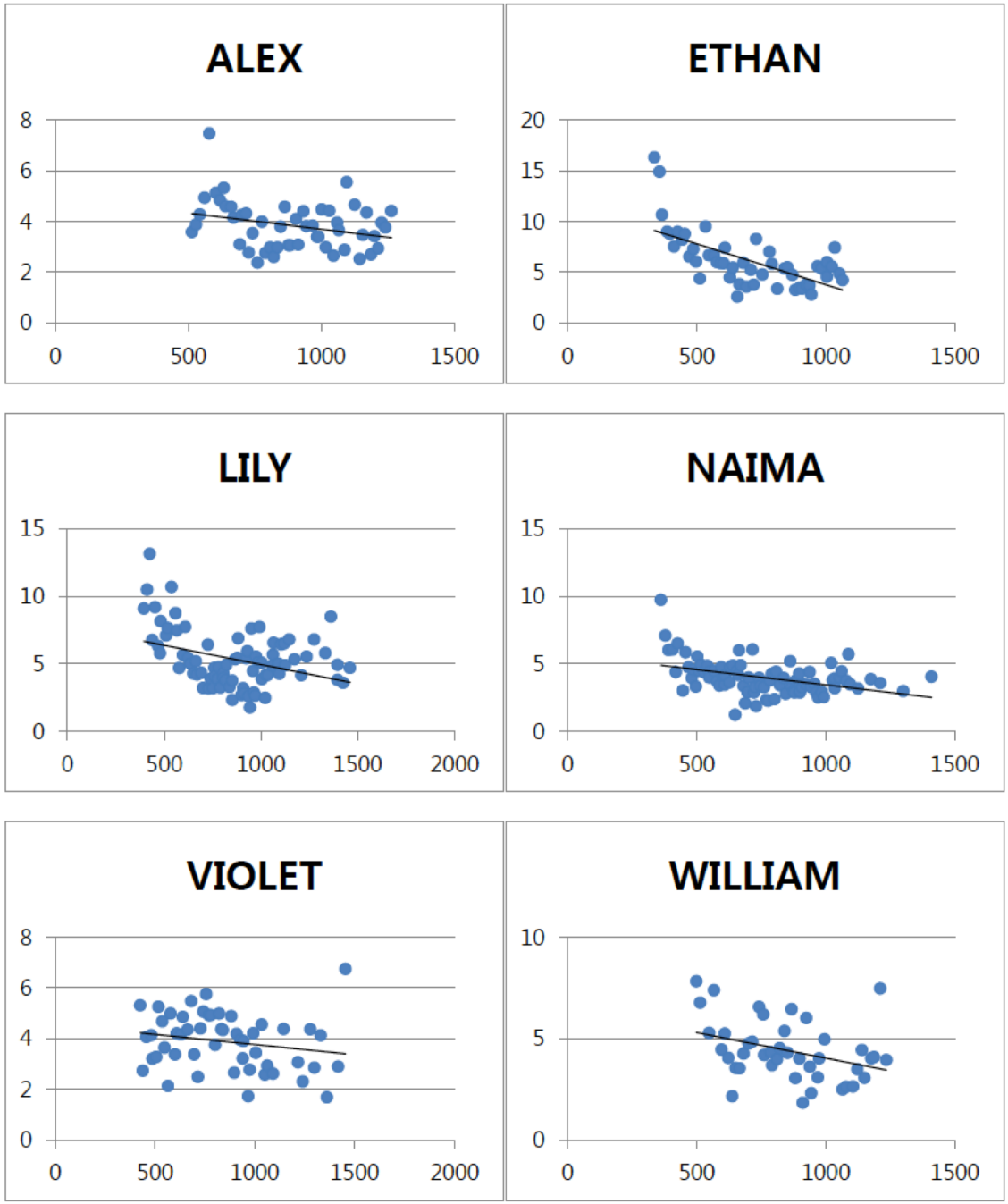
Report the number of mimetic words in each file for each mother.

- In order to account for differences in the amount of speech across parents, we need to determine how many words each parents produced. The MLU program generates this information.

- **mlu +t*MOT –t%mor +d *.cha**

- **Report the number of total words (not morphemes) for each of the six mothers.**

- **Plot a graph where x-axis has information on each child and y-axis on the usage of the mimetic words per 100 words.**


ALEX
8
6
4
2
0
0
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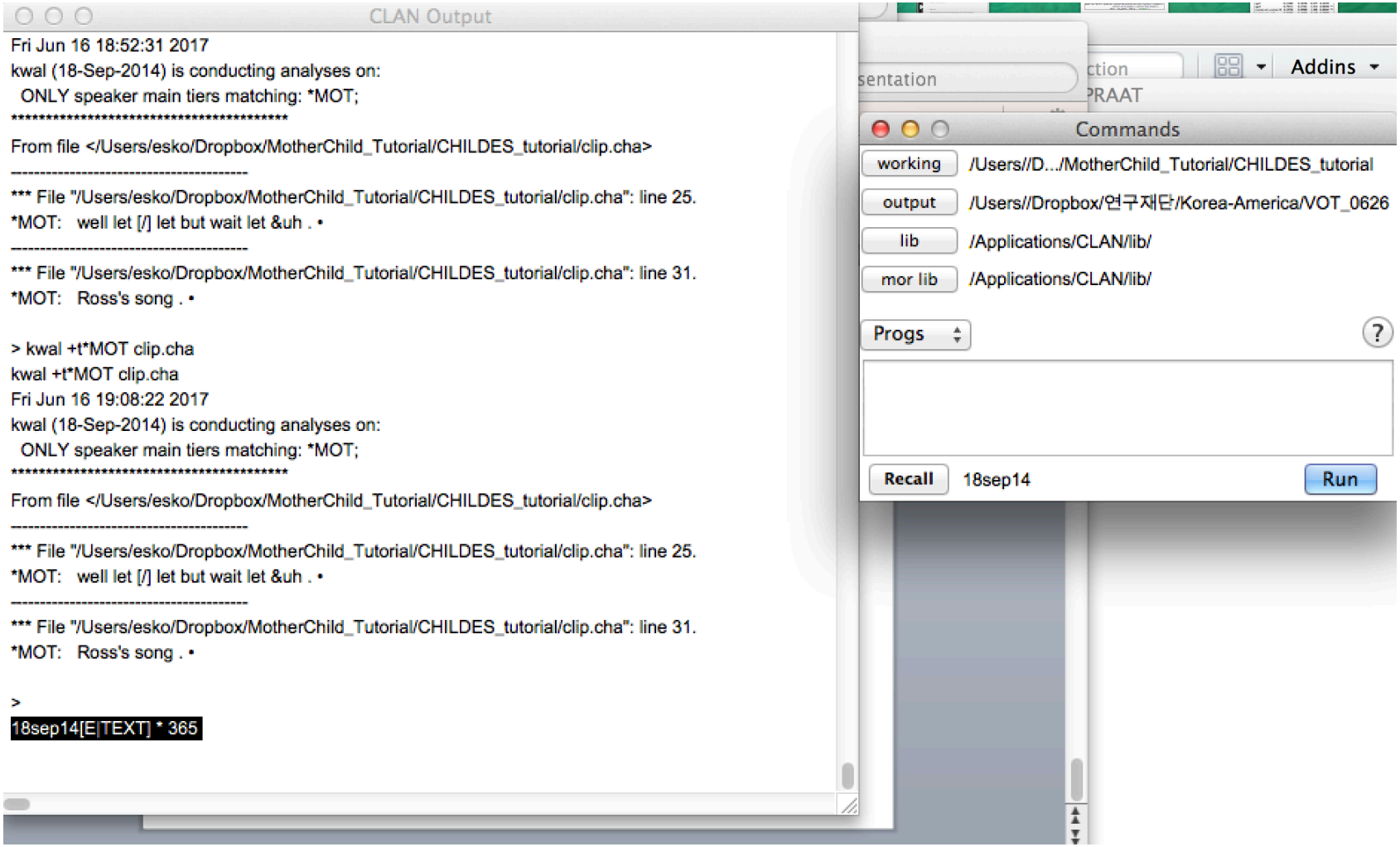
1000
1500
ETHAN
20
15
10
5
0
0
500
1000
1500
LILY
15
10
5
0
0
500
1000
1500
2000
NAIMA
15
10
5
0
0
500
1000
1500
VIOLET
8
6
4
2
0
0
500
1000
1500
2000
WILLIAM
10
5
0
0
500
1000
1500

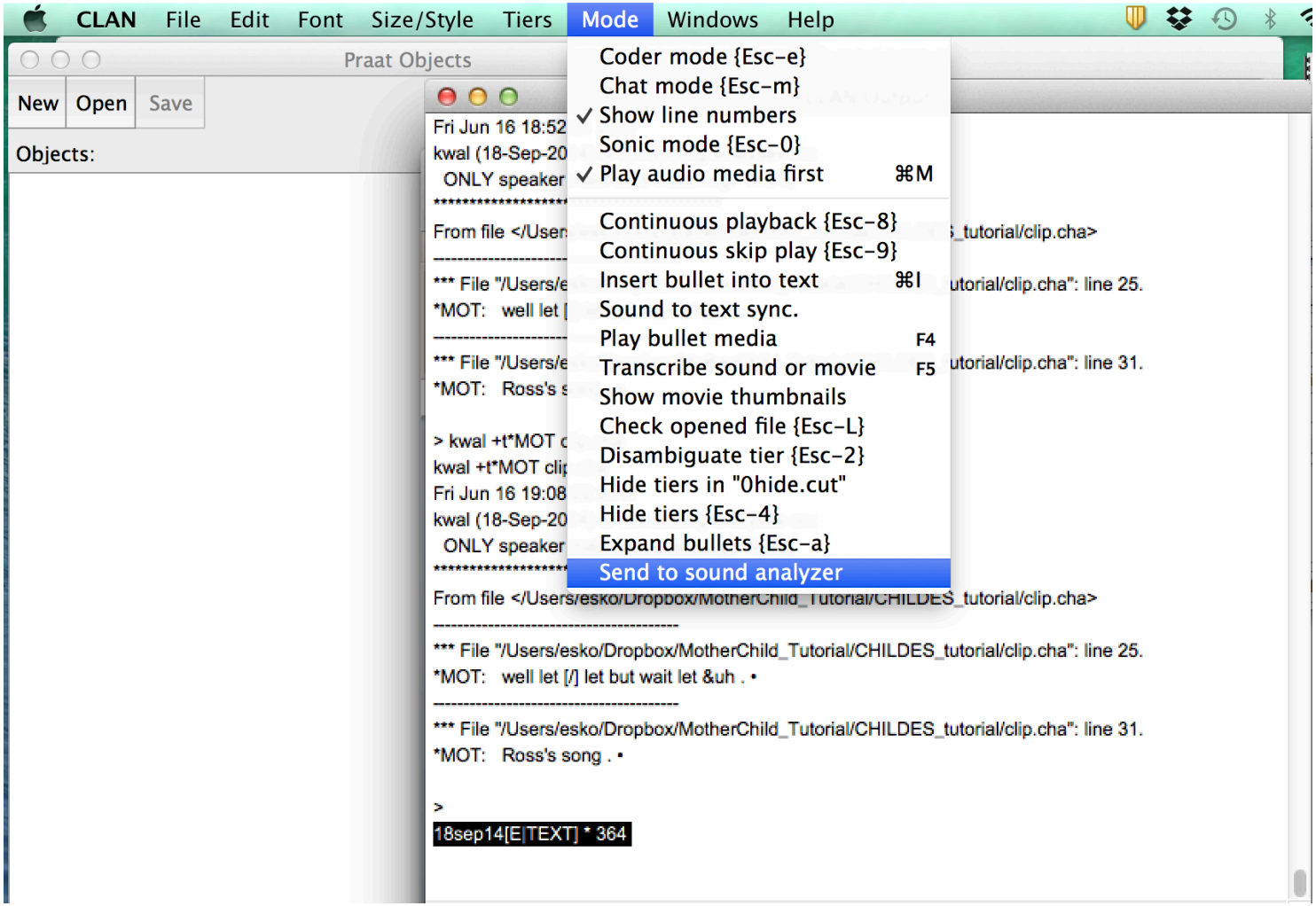
CLAN and Praat

- CLAN 에서 kwal 명령어를 이용하여 분석하고자 하는 단어가 포함된 문장을 뽑는다.
  - kwal +t*MOT +s”book” *.cha
  - kwal +x=5w +t*MOT 011116.cha
- Praat 을 구동한다.
- Send to sound analyzer 명령어를 이용하여 Praat 의 object 창으로 해당 음성 구간을 이동한다.
- ObjectstoFiles 스크립트를 이용하여 음성 파일로 저장한다.
- Grid-maker 스크립트를 이용하여 코딩한다.
- Analyze_tier 스크립트를 이용하여 음장, 피치, 포먼트 등의 값을 추출한다.

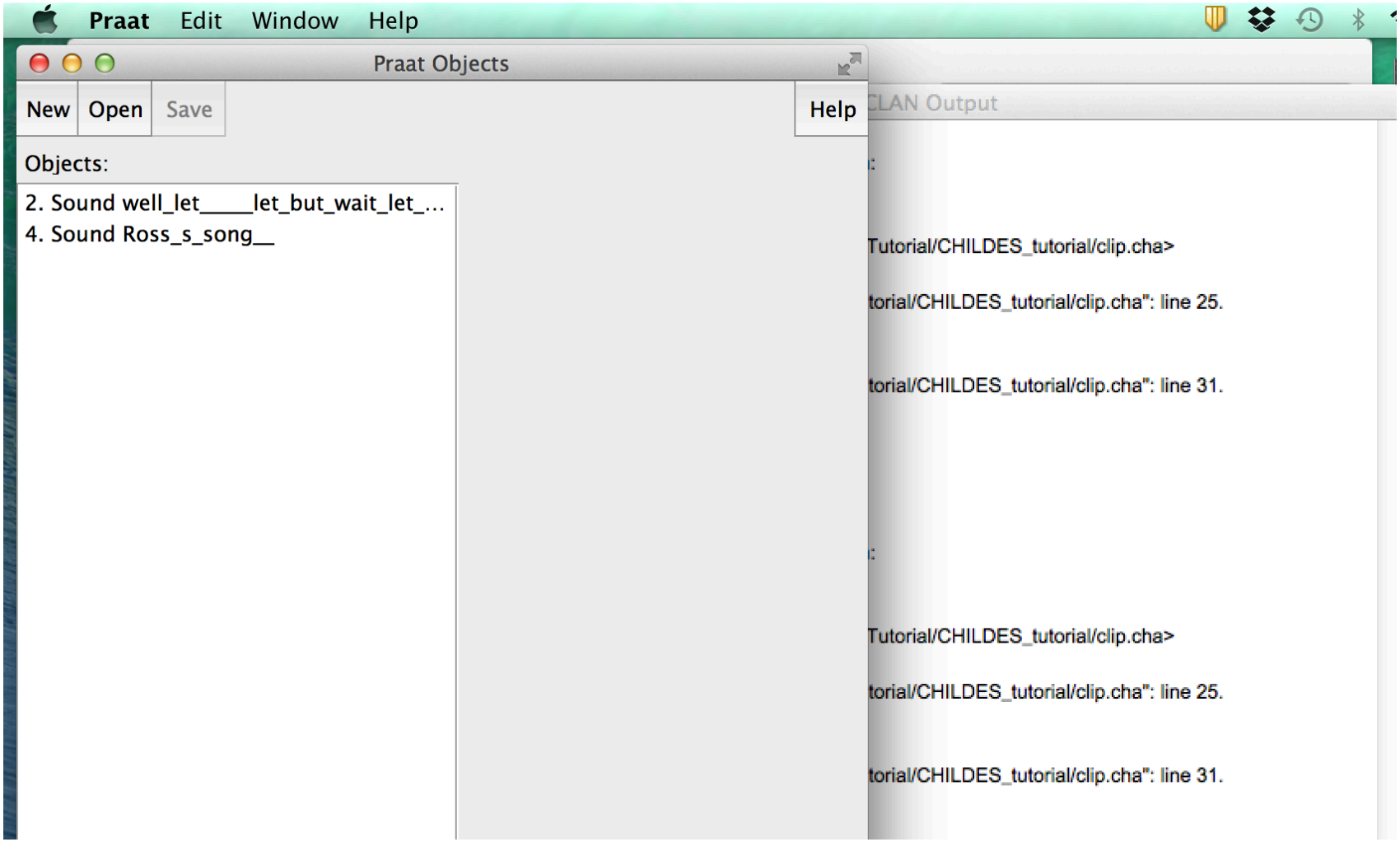
Kwal 을 이용해 문장 추출하기



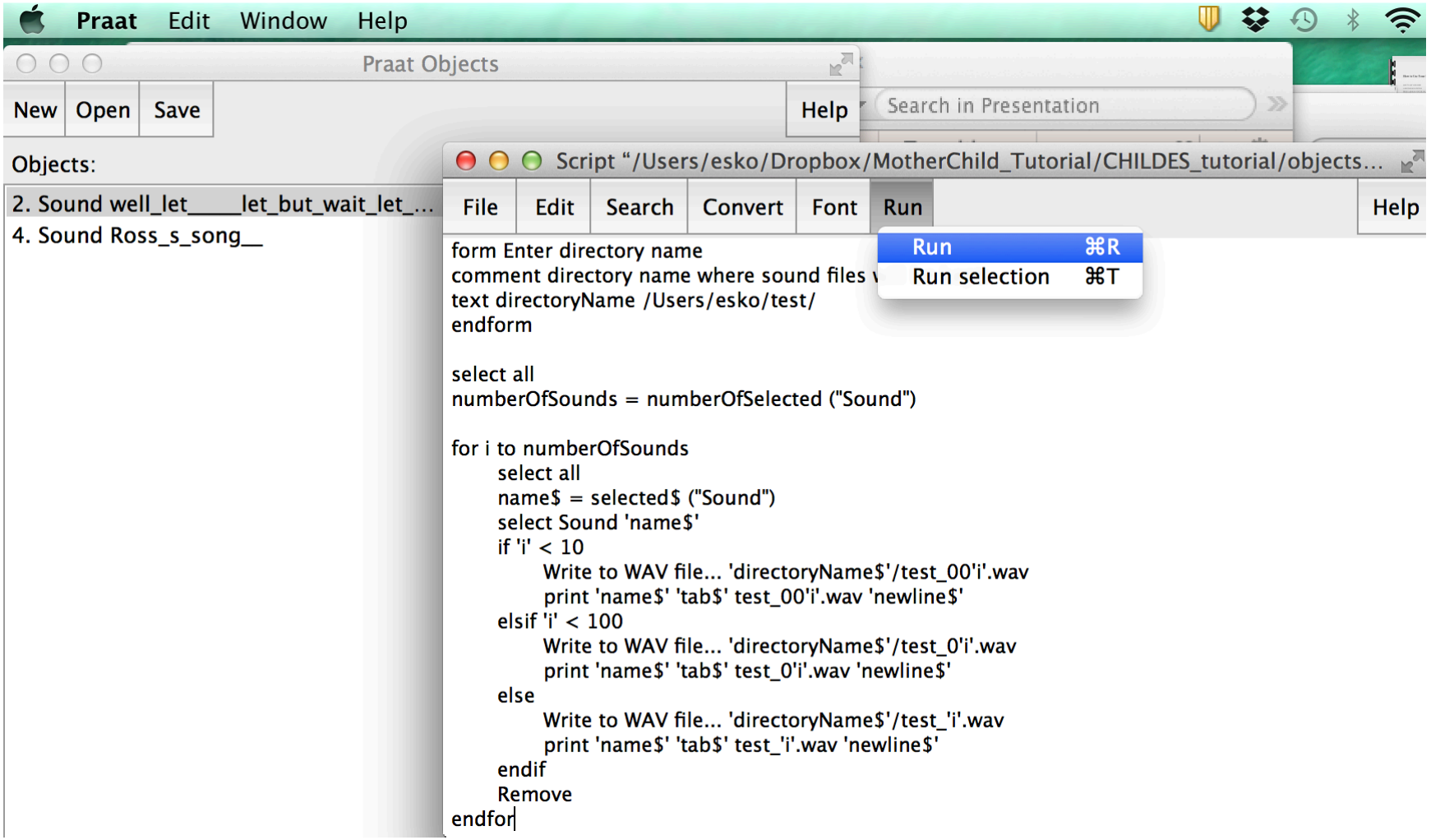
Send to sound analyzer



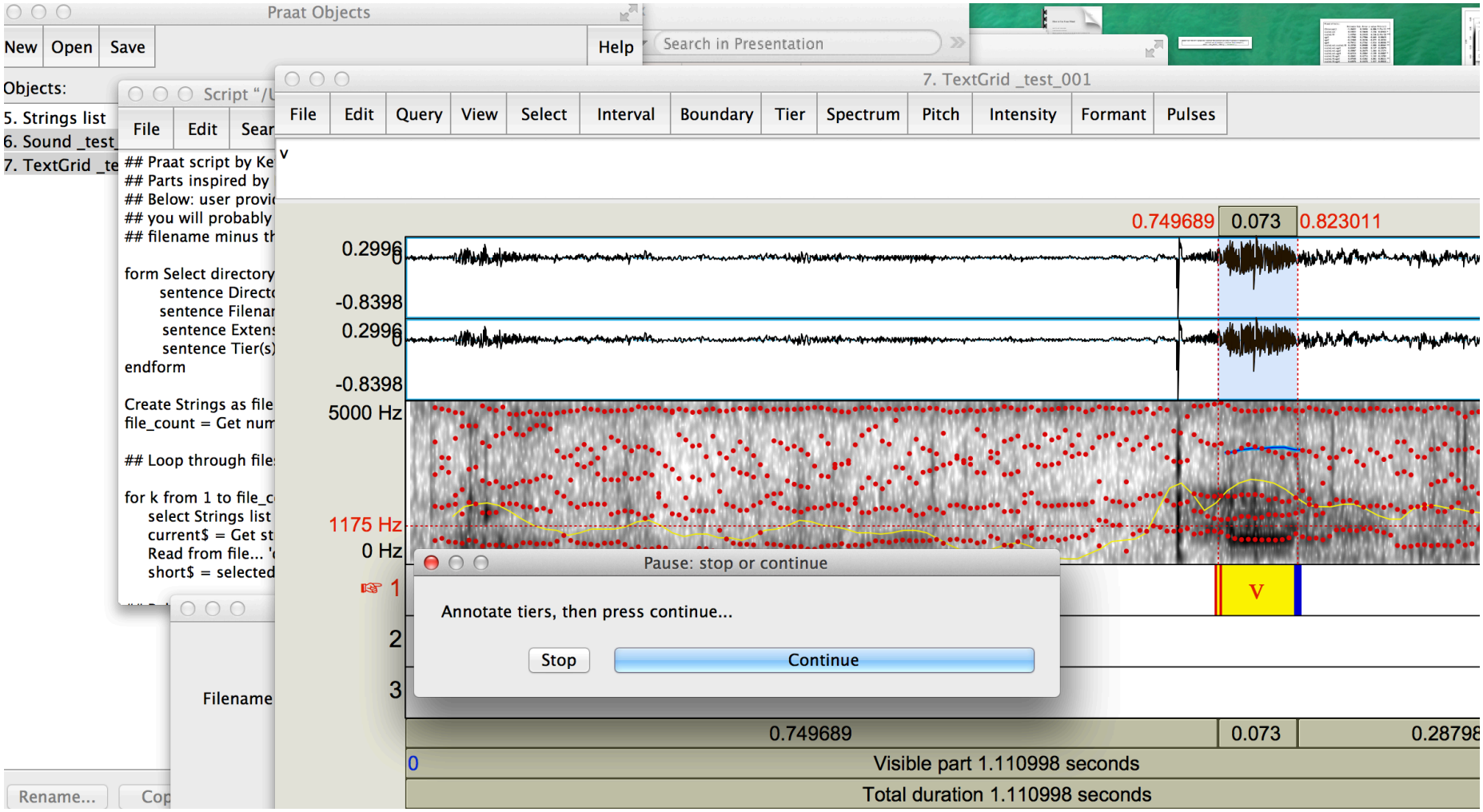
Sound objects created in praat



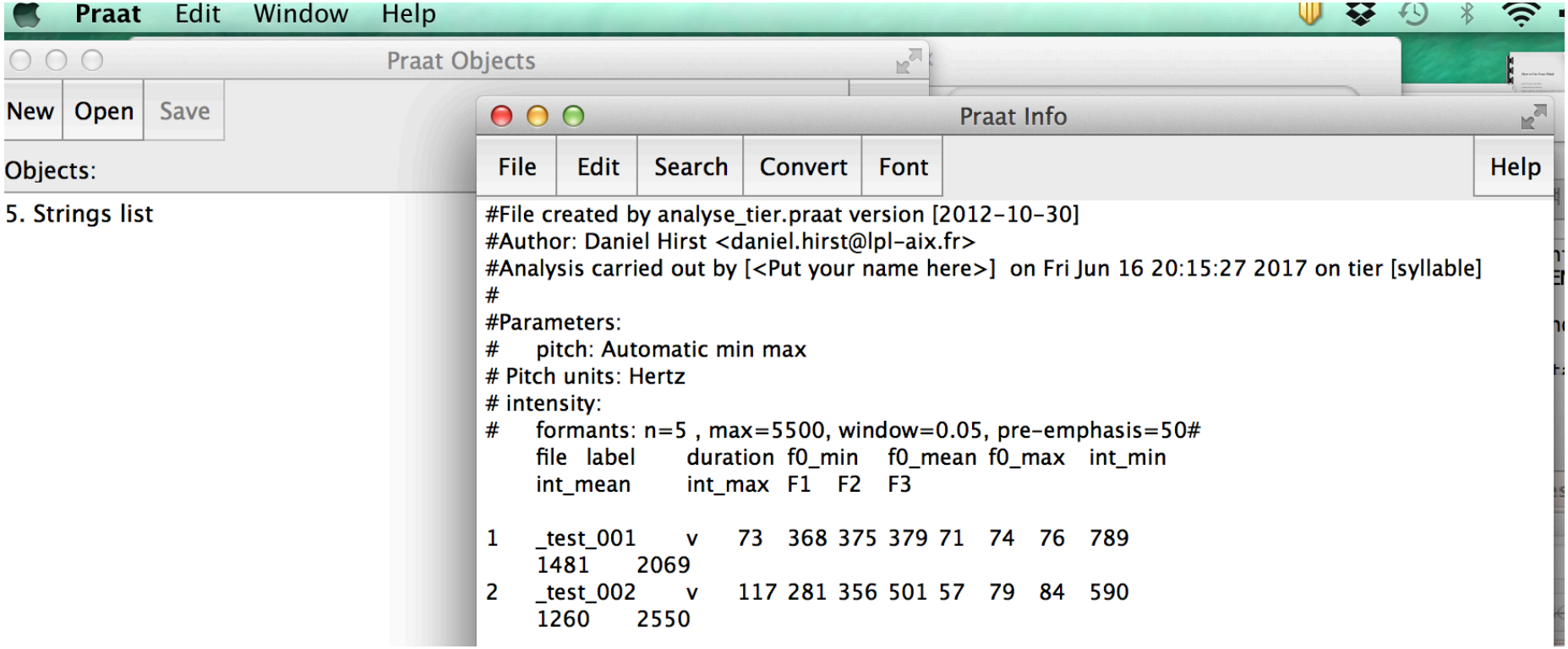
Save the sound objects as files



Annotate the target vowels



Extract the results



- For more information, please refer to the CLAN manual at talkbank.org