LIGN 110 Section 25202 Week 7

Yuan Chai
11/16/2020

Reminder

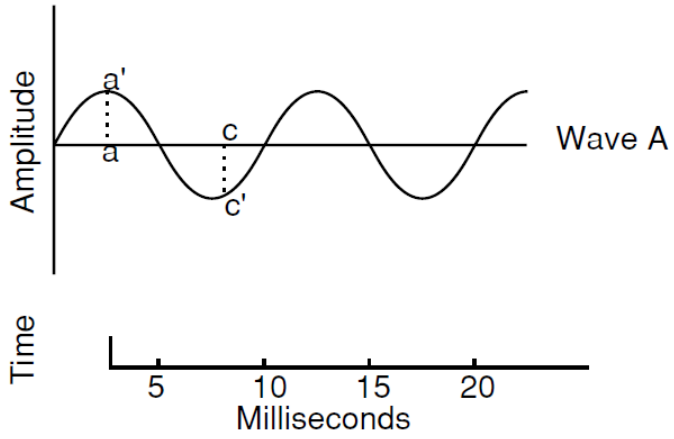
- Questions on lecture materials, quizzes, homework, final project?
- Reminder: Quiz Week 7 on Nov. 19 (this Thursday)

Acoustics review

- Exercise:

- Which of the following two waves could be perceived as louder?

A



B

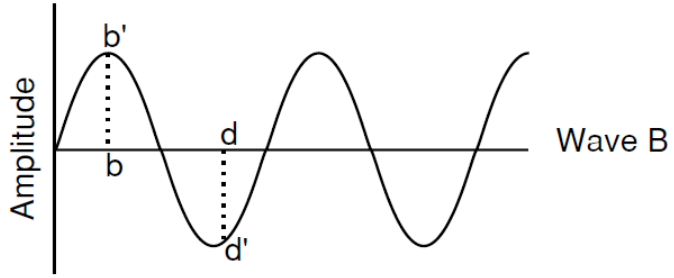


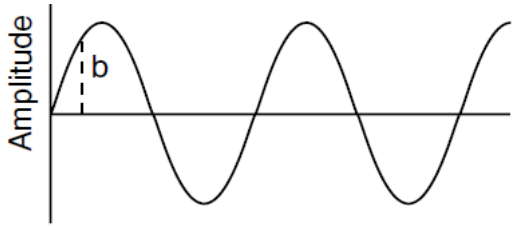
Figure 7.4 Two sine waves with different amplitudes

Acoustics review

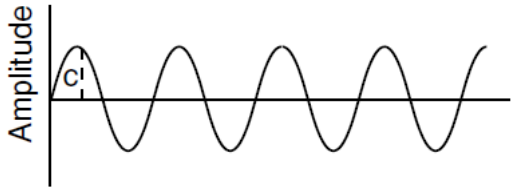
- Exercise:

- Which of the following two waves could be perceived as having higher pitch?

A



B



Acoustics review

- Exercise:

- Which of the following graphs does NOT provide information of frequency (on the x or y axis)?

- A. Waveform
- B. Spectrum
- C. Spectrogram

Acoustics review

- Key concepts: Harmonics

- Harmonics (represented by Hn): component frequency that is a multiple of the fundamental frequency (represented by F0)

- H1 = F0 = 100 Hz
- H2 = 100*2 = 200 Hz
- H3 = 100*3 = 300 Hz
- Hn = 100*n Hz

Acoustics review

- Key concept: Formants (Represented by F)
- All objects have resonant frequencies, frequencies they tend to "amp up"
- rooms, musical instruments, tubes all have resonant frequencies
- the vocal tract is sort of like a little room on top of your vocal chords
- In speech, the resonant frequencies of the vocal tract are called **FORMANTS**

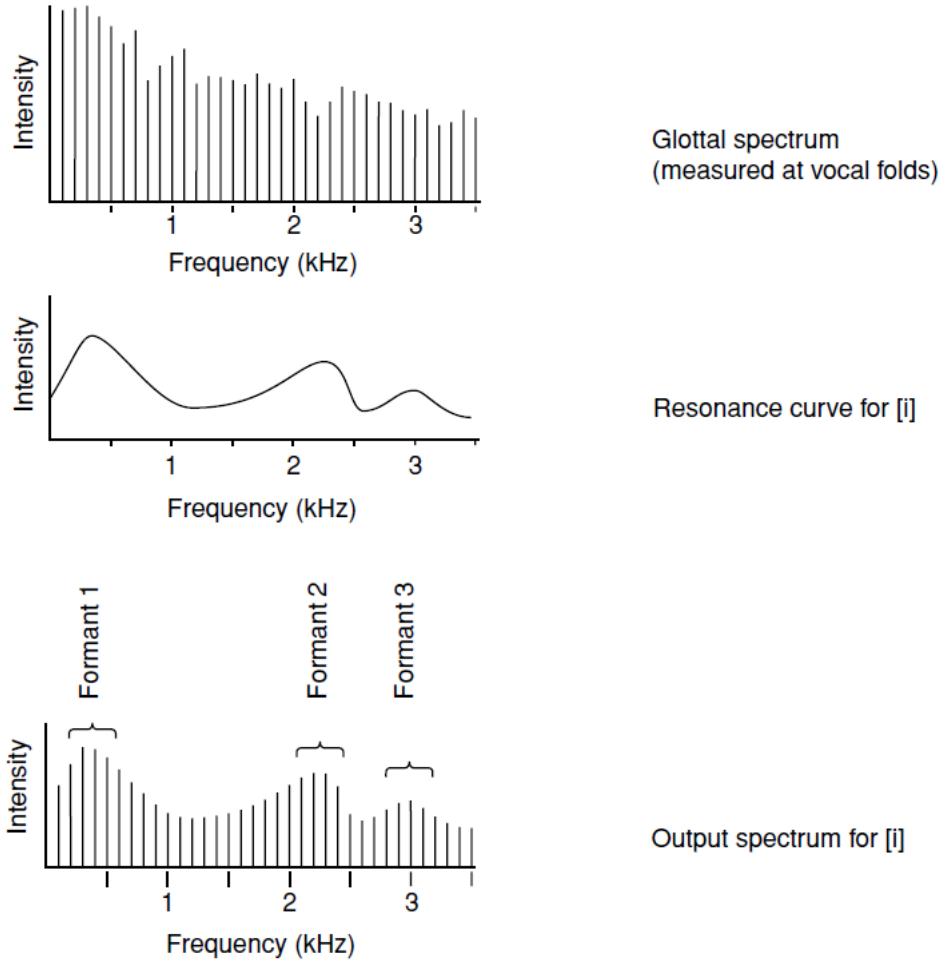
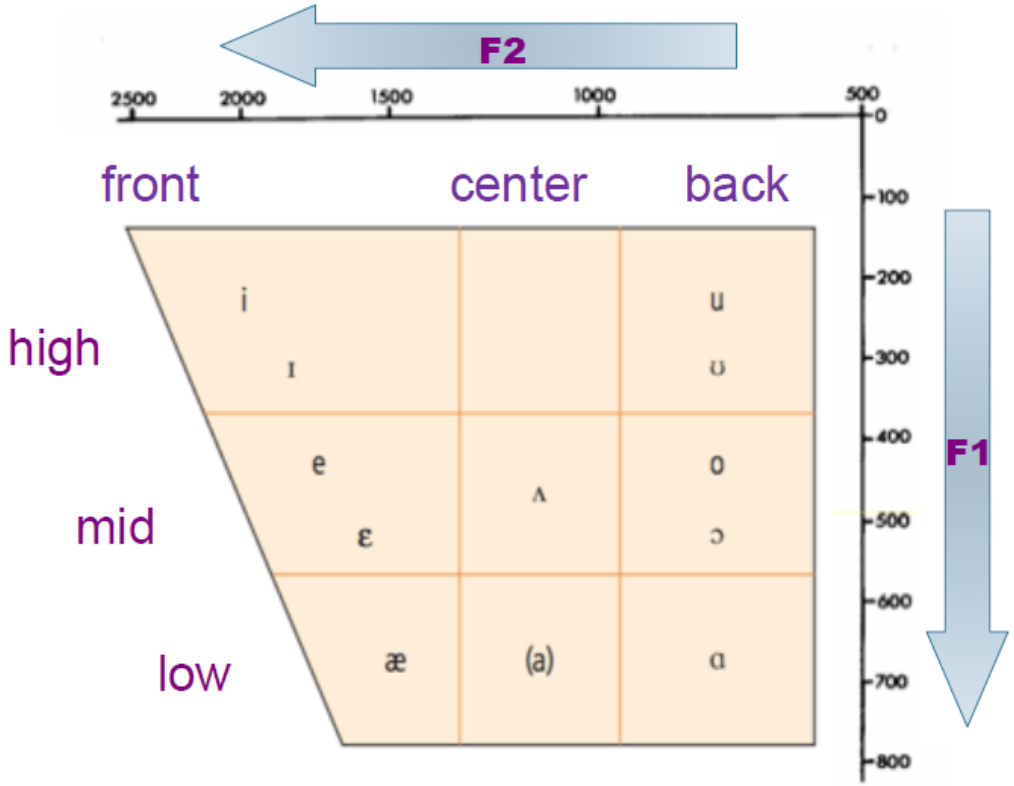


Figure 7.14 Glottal spectrum, resonance curve, and spectrum (after passing though the resonating vocal tract). The vocal tract is shaped for [i]

Acoustics review

- Relation between vowel height and frontness and formant frequency
- The lower the vowel, the higher the F1
- The fronter the vowel, the higher the F2



Acoustics review

- Relation between vowel height and frontness and formant frequency
- The **lower** the vowel, the **higher** the F1
- The **fronter** the vowel, the **higher** the F2

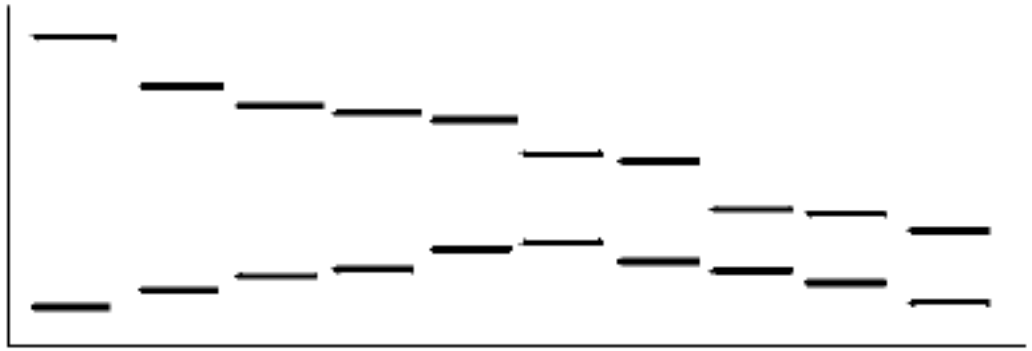


Figure 8.4 The pattern of the first two formants for the simple vowels of English

Exercise:

1. Comparing [i] with [u]:
Is the F1 of [i] higher or lower than [u]?
Is the F2 of [i] higher or lower than [u]?
Why?

2. Comparing [i] with [æ]
Is the F1 of [i] higher or lower than [æ]?
Is the F2 of [i] higher or lower than [æ]?
Why?

Acoustics review

- Relation between vowel height and frontness and formant frequency
- The **lower** the vowel, the **higher** the F1
- The **fronter** the vowel, the **higher** the F2

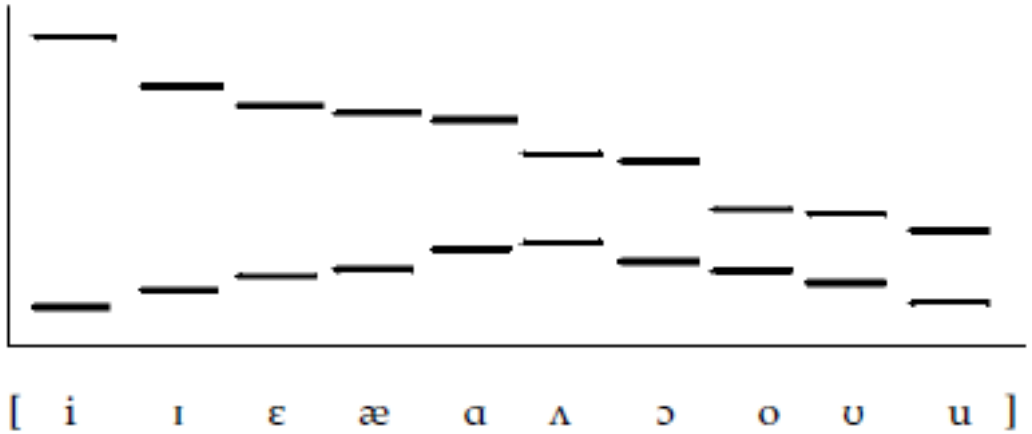


Figure 8.4 The pattern of the first two formants for the simple vowels of English

Exercise:

1. Comparing [i] with [u]:
Is the F1 of [i] higher or lower than [u]? Same
Is the F2 of [i] higher or lower than [u]? Higher
Why? Because [i] is of same height as [u]; and is fronter than [u]

2. Comparing [i] with [æ]
Is the F1 of [i] higher or lower than [æ]? Lower
Is the F2 of [i] higher or lower than [æ]? Higher
Why? Because [i] is higher than [æ]; and is fronter than [u]

Acoustics review

- Exercise:

- If you produce a vowel [u], and want to make the frequency of F1 higher, how should you move your articulators?

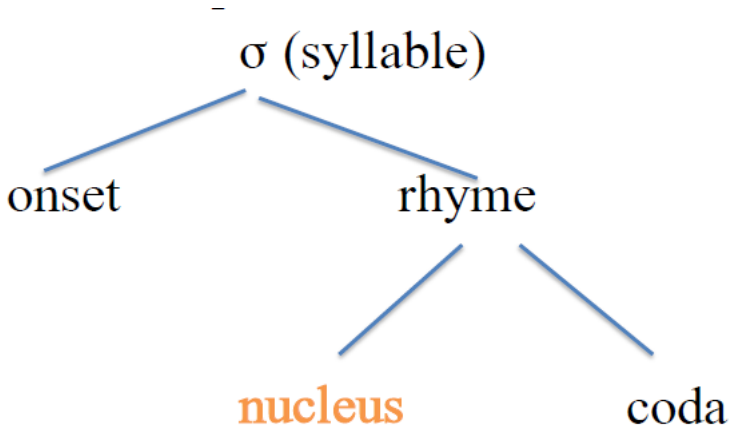
- A. Move tongue forwards
- B. Move tongue backwards
- C. Close jaw more
- D. Open jaw more

This week: suprasegmentals

- Key concepts:
- Segmentals vs. Suprasegmentals
  - Segmentals: Consonants and vowels: /p/, /d/, /k/, /i/, /u/ …
  - Suprasegmental: hosted by segments/syllables; can span over several segments/syllables

This week: suprasegmentals

- Key concepts:
- Syllable
  - A segment being **syllabic** means that it is the nucleus of a syllable
  - A segment being **non-syllabic** means that it is not the nucleus of a syllable
- Useful diacritics:
- Indicating a segment (usually consonant) is **syllabic**: [bʌ.ʔn̩.] “button”
- Indicating a segment (usually vowel) is **non-syllabic**: [baɪ̯] “buy”



This week: suprasegmentals

- Exercise
- A language has the following rules:
  - Rule 1: All the intervocalic non-syllabic segments go to codas
  - Rule 2: All vowels are syllabic by default
  - Rule 3: All consonants are non-syllabic by default
- How to syllabify the sequence of [patvskitn̩]

This week: suprasegmentals

- Exercise
- A language has the following rules:
  - Rule 1: All the intervocalic non-syllabic segments go to codas
  - Rule 2: All vowels are syllabic by default
  - Rule 3: All consonants are non-syllabic by default
- How to syllabify the sequence of [patvskitn̩]

Answer: [patvsk.it.n̩]

Explanations:

- First syllable: [p] is not intervocalic, and as a consonant, it is not syllabic, so it has to be an onset; [a] is a vowel, so it is a nucleus; [tvsk] are intervocalic consonants, so they are codas (c.f. Rule 1)
- Second syllable: [i] is a vowel, so it is a nucleus; [t] is a consonant, so it is coda (Rule 1)
- Third syllable: [n̩] is syllabic, so it is a nucleus.

This week: suprasegmentals

- Tones
- Three ways of representing tones

		Chao letters	Chao numerals	Accents
High	Extra high	a ˥	a 55	a̋
	High	a ˦	a 44	á
Mid		a ˧	a 33	ā
Low	Low	a ˨	a 22	à
	Extra low	a ˩	a 11	ȁ
Rising	High rising[1]	a ˧˥	a 35	ǎ
	Low rising[2]	a ˨˧	a 13	
Falling	High falling[3]	a ˥˩	a 53	â
	Low falling[4]	a ˧˩	a 31	
[1234] Note that the starting and ending point of the high and low rising/falling are relative. A high rising tone can be 35, 45, 34 etc. A low rising tone can be 13, 12, 23, etc.				

This week: suprasegmentals

- Tones
- Three ways of representing tones
- Chao numeral: Example: [a 55]
  - The first 5 represents the beginning level of the tone; The second 5 represents the end level of the tone
  - Indicate a high-level tone
  - There can be more than two numerals to represent a complex contour tone: Example: [214]: a falling and rising tone.

This week: suprasegmentals

- Example of a language with a complex tonal system

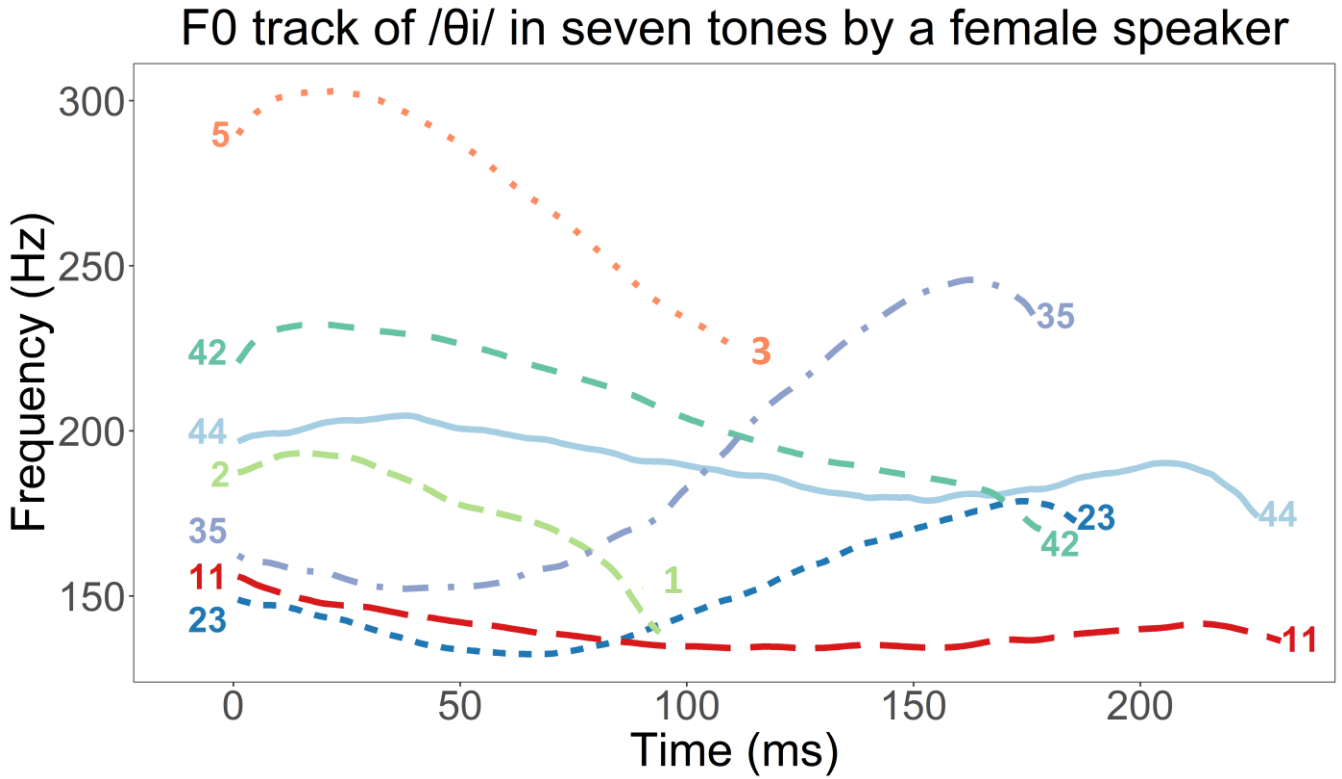


Table 1. Tone minimal pairs

	/θi44/	诗	“poem”
	/θi11/	时	“time”
	/θi35/	四	“four”
	/θi23/	寺	“temple”
	/θi42/	死	“die”
	/θiʔ53/	湿	“wet”
	/θiʔ21/	实	“true”

This week: suprasegmentals

- Exercise

- Which of the following symbols is NOT a representation of falling tone?

- A. [i 51]
- B. [i 31]
- C. [ù]
- D. [û]
- E. [uꜜ]

This week: suprasegmentals

- Pitch accent
- Example: Swedish
- Accent 1: There is a pitch accent on the first syllable (H.L)
- Accent 2: There is a pitch accent on both the first and second syllables (HL.HL)

Accent 1	**Accent 2**
[án.dn̩] “duck”	[ân.dn̩] “spirit”

- More Swedish examples: https://www.sayitinswedish.com/learning-center/swedish-pitch-accents/#.X7BZe2hKg2w