

English Consonants & Vowels

- Phonetics: a study on speech

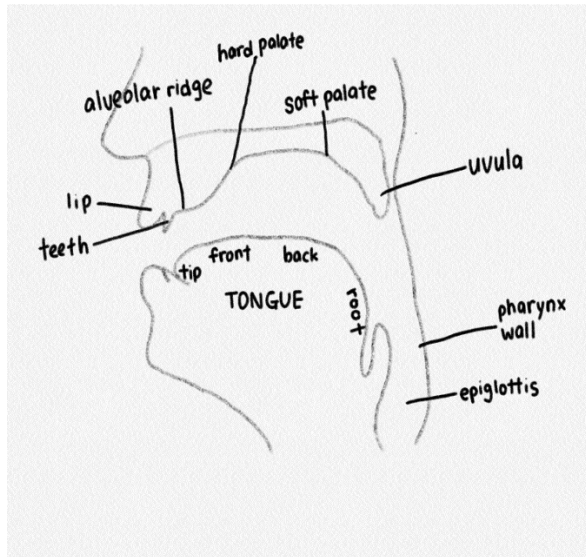
articulatory phonetics (from mouth) → how to produce speech

acoustic phonetics (through air) → how to transmit speech

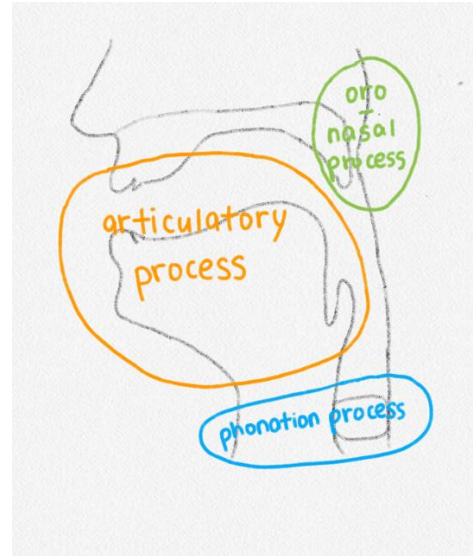
auditory phonetics (to ear) → how to hear speech

Articulation

- Vocal tract:



- 5 speech organs = constrictors = articulators



Phonation Process in Larynx

- larynx = voicebox: voiced → can feel vibration

ex. v, z, l, m, a, i

voiceless → can't feel vibration

ex. f, s, k, p, h

Oro-nasal Process in Velum

- nasal: when velum lowered

ex. m, n, ng

Articulatory Process

- lips / tongue tip / tongue body

Control of Constrictors(Articulators)

- Each constrictor needs to be more specific in geometry

constriction location(CL) / constriction degree(CD)

- Constriction location: Lips → bilabial / labiodental

Tongue body → palatal / velar

Tongue tip → dental / alveolar / retroflex / palate-alveolar

- Constriction degree: stops > fricatives > approximants (/r, l, w, j/) > vowels

How to Produce English Consonants and Vowels

- constrictors(lips, tongue tip, tongue body) / CD / CL / velum / larynx
 ex) /p/: lips / bilabial / stop / velum raised / larynx open
 /b/: lips / bilabial / stop / velum raised / larynx closed
 /d/: tongue tip / alveolar / stop / velum raised / larynx closed
 /z/: tongue tip / alveolar / fricative / velum raised / larynx closed
 /n/: tongue tip / alveolar / stop / velum lowered / larynx closed
 * 모든 모음은 constrictor로서 tongue body 만 사용(constrictor location 정의 X)
- Phonemes: individual sounds that form words
 a combination of speech organs' actions

Acoustics

- Praat: duration > select(click and drag on waveform or spectrogram) →
 read a value (sec.) on the top → zoom in (if not visible)
 intensity > show intensity → click on green → read a value (dB) on the right
 pitch > show pitch → pitch setting > pitch range > 65-200Hz male / 145-276Hz female
 → click on blue → read a value (Hz) on the right
 formant(모음 구별 수치) > show formants → place the cursor on one of the trajectories
 → read a value (Hz) on the left
- the number of occurrences of a repeating event per second (frequency, Hz)
 repeating event = vibration of vocal folds / repeating > sine wave = pure tone
 * sine wave: frequency + magnitude(amplitude) (x 축 시간 / y 축 value, voltage)
- 모든 신호는 단순한 sine wave 들의 합으로 표현된다. (synthesis)
 complex tone 이 반복하는 주기는 Fundamental Frequency 와 동일
 spectrum: x 축 frequency / y 축 magnitude(amplitude)
 spectrogram: spectrum 을 시간으로 visualize 한 것 (x 축 시간 / y 축 frequency)
 sine wave(time-value graph)→spectrum: spectral analysis
- pure tone→spectral analysis: frequency 가 같은 sine wave 한 개
 complex tone→spectral analysis: 일정한 간격의 sine wave 여러 개 (간격=pitch)
 (Praat: Spectrum > View Spectrum Slice)
- source: 성대에서 나는 소리 (measured by EGG)
 human voice source consists of harmonics
 a complex tone = sum of pure tones at integer multiples of the lowest pure tone
 the lowest pure tone = fundamental frequency(F0) = rate of vibration of the larynx
 = the number of opening-closing cycles of the larynx per second
 amplitude of pure tones gradually decreases
- filter: vocal tract 에 의해서 달라지는 소리
 filter 의 spectrum → jiggling with peaks and valleys (amplitude 의 패턴이 사라짐)
 peaks/mountains: frequencies VT likes (formants)
 valleys: frequencies VT does not like

행렬과 벡터

- 이미지, 소리, 텍스트 > 벡터
모든 데이터는 벡터로 나타낼 수 있음
- 흑백 이미지 > 2 차원 / 컬러 이미지 > 3 차원 / 영상 > 4 차원