Lecture-1: Course outline, background; vowels: articulation and transcription

[1]. course topics
  • internal structure of speech sounds and their distributions as a function of adjacent sounds and their position in a word or phrase
  • organization of sounds into prosodic units: syllable, foot (stress), phonological word

[2]. language as object of investigation
  • 19th century: language a product of historical cultural evolution: to understand a language in its current state is to know how it developed from an earlier state
  • reconstruction of Proto-Indo-European (PIE)
    systematic sound correspondences among Indo-European languages
    Grimm’s Law
    | PIE | *p | *t | *k | *kʷ | *bh |
    |-----|----|----|----|-----|-----|
    | Sanskrit | pāda | treta | ka | bhrater |
    | Latin | pēs | tres | canis | quod | frater |
    | English | foot | 0ree | hound | what | brother |

Crowning achievement of 19th century linguistics; linguistics regarded as “queen of social sciences”

• early 20th century Ferdinand de Saussure: proper object of study is current synchronic state; sounds of a language form a system where the interpretation of a given element depends on the other elements it is in contrast with; very influential in 20th century European thought (e.g. semiotics)

• Structuralism: isolation and analysis of the distribution of units at various levels of analysis in a corpus of data: phonetic, phonological, morphological, syntactic; distinction of phoneme and allophone; [pʰ]in, s[pʰ]in vs. Mandarin [pʰ]ai ‘row’ vs. [p]ai ‘white’; phonetically same sounds but in Mandarin they form a lexical contrast but not in English; emphasis on procedures of analysis of “objective” data

• Chomsky & Generative Grammar
  • language is tacit knowledge (cognition) of the individual speaker-hearer that has developed from a language faculty present at birth as a biological endowment
  • linguistic data are a reflection of this knowledge and of interest (only) to the extent they help to elucidate it
  • basic questions become: what is the form of this knowledge (Internal-language), how is it acquired, and used to speak and understand?
• a grammar is the linguist’s characterization of I-language and models the ability of speaker-hearer to assign a form and interpretation to a potentially infinite number of expressions
• a grammar is a computation over units of various types

[3]. grammar’s architecture:

[lexicon] → [syntax] ← [semantics]

[phonology] → [phonetics]

• lexicon: list of vocabulary items (morphemes)
  grammatical features: noun vs. verb; singular vs. plural, etc.
  semantic features: human, male vs. female, etc.
  phonological features: vowel, consonant, bilabial, etc.
  arbitrary association of sound and meaning:
  ‘dog’: [dɒg], [ʃə], [kalb], [inu], ....
  [tʰu]: ‘two’, ‘too’, ‘to’,
  [bo]: ‘bow’, Fr ‘beau’, Jp ‘stick’, ...

• syntax: items drawn from lexicon and organized into syntactic units which are combined and moved to form a sentence

  student bought the book
  the student has bought the expensive book
  the MIT student will have bought the expensive book written by the instructor

Which book, did the student buy [e,]?

• sentence is interpreted by two components
  • a semantic component specifies the grammatical aspects of interpretation
  • a phonological component that contains rules that enhance and change the sounds in the items (morphemes) inserted from the lexicon to yield a Surface Representation [SR]
  • a phonetic component that converts the sounds of the SR into articulatory gestures with measurable physical dimensions: e.g. 100 milliseconds duration for a vowel, 150 Hz for F0 (tone), etc.
  • in deaf individuals sentence may be realized alternatively in the manual/facial gestures of sign language
[4]. Phonology: basic research questions

- what is the nature of the phonological representations composing lexical items and the computations that realize them as articulatory gestures?
- phonological analysis of a language asks
  i. sound distinctions that encode the vocabulary of a language; language’s sound system (phonemic inventory)
     stress location: A’merica vs. Ala’bama vs. Tenne’ssee cf. Ameri’ca, Alaba’ma
- not all concatenations possible: phonotactic restrictions
  pray tray cray(fish)
  play *tl clay
- sounds altered on the basis of adjacent sounds and position in prosodic structure
  hat-s [t-s] feel hair ‘telegraph [ɛ, i, æ]
  kid-s [d-z] leaf hair-y te’legraph-y [ɪ, ɛ, ɪ]
  kiss-es [-ɪz]

[5]. phonetics

- mapping of phonological categories to articulatory gestures and their acoustic and perceptual correlates

Unit 1

[1]. goals

- first-order articulatory description of speech sounds
- transcription in the IPA

[2]. speech: moving body of air made audible by the vocal apparatus; sound source that is shaped/filtered by vocal tract

- air expelled from lungs into trachea (pulmonic egressive)
- larynx: a complex cartilage that contains vocal folds (cords) that sit across the glottis and can assume a variety of positions
  1. wide apart for normal breathing
  2. tightly closed for swallowing
  3. brought together (adducted) and set in vibration (phonation) by air passing through: s vs. z
- three supralaryngeal cavities (vocal tract) that modify/shape the airstream (PGG p. 142)
  1. pharynx/pharyngeal cavity; pharyngeal constriction: Arabic h, ʕ
nose/nasal passages; lowered velum: nasal consonant: ma vs. ba, nasal(ized) vowel: Fr. beau [bo] vs. bon [bɔ]

mouth/oral cavity: tongue and lips

[3]. vowels

- vowels produced with unobstructed, open vocal tract and lowered jaw
- major articulator is tongue body that can be arched and moved forward and back (horizontal dimension) and up and down (vertical); lips may be compressed and pursed (rounded), which lengthens the vocal tract
- vowel space is combination of articulatory and auditory factors
- widest at high vowels and tapered at lower: high-mid-low, front-central-back

\[\text{VOWELS}\]

\[
\begin{array}{cccc}
\text{Close} & \text{Front} & \text{Central} & \text{Back} \\
\text{\textbullet i} & \text{\textbullet y} & \text{\textbullet i} & \text{\textbullet u} \\
\text{Close-mid} & \text{\textbullet e} & \text{\textbullet ɛ} & \text{\textbullet ɔ} \\
\text{Open-mid} & \text{\textbullet e} & \text{\textbullet ɛ} & \text{\textbullet ɔ} \\
\text{Open} & \text{\textbullet a} & \text{\textbullet ɔ} & \text{\textbullet u} \\
\end{array}
\]

Where symbols appear in pairs, the one to the right represents a rounded vowel.

[4]. International Phonetic Association (IPA) http://www.langsci.ucl.ac.uk/ipa/

- founded in 1886 by leading phoneticians in France, England, Germany, and Denmark
- goal: uniform system of transcription system to represent phonemic contrasts in any language
- 2008: 107 letters, 52 diacritics

[5]. vocalic distinctions

- all languages have a height distinction (greater acoustic energy at F1)
- minimal vowel system: [i,u,a] Cl Arabic, Yupik Eskimo, Quechua (maximal dispersion)

Arabic 

\[\begin{align*}
\text{l[i]bs} & \quad \text{\textquotesingle clothes\textquotesingle} \\
\text{x[u]ms} & \quad \text{\textquotesingle one-fifth\textquotesingle} \\
\text{h[a]ms} & \quad \text{\textquotesingle whisper\textquotesingle}
\end{align*}\]
• proto-typical five-vowel system: [i,e,a,u,o] Spanish, Swahili, Hawaiian, Japanese (most common in Clements’ survey)

  Spanish  m[i]sa  ‘mass’  m[u]sa  ‘muse’
            m[e]sa  ‘table’  m[o]sca  ‘fly’
            m[a]sa  ‘dough’

  • proto-typical seven-vowel system: [i,e,ɛ,a,u,o,ɔ] Italian, Yoruba

  Italian  p[i]no  ‘pine’  p[u]ro  ‘pure’
           n[ɛ]ro  ‘black’  r[o]sso  ‘red’
           b[ɛ]ne  ‘well’  [ɔ]ro  ‘gold’
           [a]ma  ‘blade’

  Turkish [i,ɛ,γ,œ,α,υ,ɔ,ʊ]: most economical use of three articulatory dimensions: [± high], [± back], [± round]

  k[i]l  ‘clay’  k[y]l  ‘ashes’  k[w]l  ‘hair’  k[u]l  ‘slave’

  http://www.langsci.ucl.ac.uk/ipa/

• French [i,e,ɛ,y,œ,α,υ,ɔ,ʊ,ə,ə]

  l[i]t  ‘bed’  l[y]  ‘read’ past.prt’  l[u]  ‘wolf’
  l[ɛ]s  ‘the’ pl.  l[ʊ]  ‘the’ masc.sg.  l[ʊ]t  ‘prize’
  l[œ]d  ‘ugly’  l[œ]r  ‘their’  l[ʊ]r  ‘during’
  l[ɑ]  ‘there’  l[ɑ]s  ‘tired’
vowels of General American (GA) and RP English

Am Eng vowels:

RP Eng vowels:

Key words

- low vowels have front-back distinction
- high vowels have tense-lax distinction

beat [i] [u] boot
bit [i] [u] book
tense vowels are longer (marked by colon) and more peripheral in vowel space
at surface level quality is basic property: shortened [i] is still distinct from [i]; lengthened [i] is still distinct from [i]

• [e]-[ɛ] and [o]-[ɔ] sometimes treated as tense vs. lax as well but based partially on phonological distribution: [i, u, e] (but not [ɔ]) are barred from end of word
• according to L's chart, in AE [e] = [ɛ] and [ɔ] = [ou] start at same point as [ɛ] and [ɔ] but are distinguished by movement of tongue to periphery of space as a diphthong
• three central vowels: [ə] is unusual sound; effect of rhotic; [ə] of about, sofa only in unstressed position; wedge vowel of bud very similar to schwa except found in stressed position
• in Am E [e] and [o] are realized with offglide
• off-glide-diphthongs: [aɪ], [au], [ɔɪ]; on-glide diphthong [ju]

[7]. in sum:
• five front and back vowels: [i, i, e, ɛ, æ] vs. [u, ɔ, o, ɔ, ə]
• three central and three diphthongs
• English vowels are a challenge for learners coming from a more restricted inventory like Spanish or Japanese