Language & Mind
HONR 218L

Sounds - Introduction II

Quality of speech sounds that we produce is influenced by...

- Base rate at which vocal folds vibrate
- When your vocal folds vibrate
- Whether the sound wave is filtered
- Where it is filtered
- How it is filtered
- Shape of oral cavity

Sound Production

Features

- Ways of describing sounds
e.g., [t] = voiceless, alveolar, stop
- Stronger claim: features are the smallest building blocks of language, used to store sounds in the mind
- Atoms of Speech

Roman Jakobson, 1896-1982
Features

• Prediction: by combining a small number of atomic features, it should be possible to create a larger number of speech sounds

• Goal: a set of universal features should make it possible to describe the speech sounds of all of the languages of the world

• Different languages choose different feature combinations
Whorfian Influences?

- Speech sounds are continuous
- Yet we perceive them categorically

Timing - Voicing

Voice Onset Time (VOT)

Voice Onset Time (VOT)

60 msec
Speech Perception is Discontinuous

Whorfian Influences?

• Speech sounds are continuous
• Yet we perceive them categorically
• Words flow into one another often without any physical demarcation
• Yet we perceive sentences as strings of neatly packaged words
“To return to the main menu, press the star key.”

What’s the forint at?

What’s the foreign debt?

It's actually worse:
Blahblahblah Ginger blahblahblahblahblahblahblah blahblahblah
Boris is at school
Boris says it’s cool

**Whorfian Influences?**
- Speech sounds are continuous
- Yet we perceive them categorically
- Words flow into one another often without any physical demarcation
- Yet we perceive sentences as strings of neatly packaged words
- We may even mentally insert material that isn’t there at all in the physical stimulus

**What’s a syllable?**
- another phonological unit of words
- every vowel is at the center of a single syllable
- syllables have hierarchical structure

- American English pronunciation
  \[m\, a\, k\, d\, a\, n\, a\, l\, d\, z]\n- Japanese pronunciation
  \[m\, æ\, k\, u\, d\, o\, n\, a\, r\, u\, d\, o\]
Grunge [grʌnʤ]

In unstressed syllables, vowels often reduce to schwa [ə] (or delete):

<table>
<thead>
<tr>
<th>compete</th>
<th>competition</th>
<th>kampitiˈʃən</th>
</tr>
</thead>
<tbody>
<tr>
<td>medicinal</td>
<td>médicinˈal</td>
<td>medasˈmən</td>
</tr>
<tr>
<td>maintain</td>
<td>mentˈɛn</td>
<td>mentəˈnans</td>
</tr>
<tr>
<td>telegraph</td>
<td>təˈleɡræf</td>
<td>təˈleɡræfi</td>
</tr>
</tbody>
</table>

- Examples of unstressed vowels deleting:
- mystery, general, Barbara

Phonotactic Constraints:
Constraints on syllable structure

- Every language has constraints on what sequences of phonemes may occur (*ktleem)
- These constraints are language specific
  - English: *zleem, Polish: zlev ('sink')
- Illegal sequences are illegal within a single syllable
  - English: *[ksplɪt] (eksplit) ('explicit')

Stress and syllables

- Syllables may be either stressed or unstressed in a word
- Stressed syllables are perceived as more prominent than unstressed syllables
- In unstressed syllables, vowels often reduce to schwa, and sometimes delete entirely
Linguistics in the ‘real world’:
How do you say McDonald’s in Japanese?

- Amer. Eng. pronunciation
  \[ m \, \, a \, k \, d \, a \, n \, a \, l \, d \, z \]

- Japanese segmental structure
  /məkədənauld/

Japanese syllable structure: (C) V (C)

- Toyota [təˈjoʊtə]
Japanese syllable structure: (C) V (Č)

epenthesis
[u]

Japanese syllable structure: (C) V (Č)

epenthesis
[o]

[Image 214x449 to 264x487]
[Image 538x449 to 588x487]
[Image 214x214 to 264x252]
[Image 538x214 to 588x252]
Japanese syllable structure: (C) V (C)

Phonemic Level: /məkdoʊnəld/

Phonetic Level: [məkuðonəluðo]

A Speaker’s Goal

- In the brains of language users, sentences of language consist of many neatly packaged units — sounds, words, phrases etc. — each of which is clearly defined and independent of the next unit. A speaker has to somehow take his/her linguistic thought, which is packaged into neat linguistic units, and cause the same neatly packaged linguistic units to come to be activated in the brain of the listener.

An Unfortunate Complication

- However, speech is produced by the motion of various parts of the mouth, which in turn causes complex patterns of vibration in the air, which cause complex patterns of vibration on the listener's ear drum and patterns of nerve firings in the listener's auditory nerve ... and all of this is NOT neatly packaged into discrete linguistic units.

Basic Task of Speech Communication

- The speaker must translate discrete linguistic units into continuous patterns of mouth movement, and then the listener must decode continuous soundwaves in order to retrieve the discrete linguistic units.
Quality of speech sounds that we produce is influenced by...

- Base rate at which vocal folds vibrate
- When your vocal folds vibrate
- Whether the sound wave is filtered
- Where it is filtered
- How it is filtered
- Shape of oral cavity

What can you do to alter the shape of your vocal tract?
So. You can....

- Raise or lower your tongue
- Advance or retract your tongue
- Round or spread your lips
- Tense or not tense your mouth

So what vowels do you have?

- i

“sheep, sleep”
So what vowels do you have?

i  “sheep, sleep”
I  “ship, slip”

So what vowels do you have?

i  “laid, spade, trade”
e
So what vowels do you have?

“laid, spade, trade”

“led, sped, tread”
So what vowels do you have?

- i
- ë
- æ “bat, lad”

So what vowels do you have?

- i
- ë
- æ

“Luke, who’d, suit”

- i
- ë
- æ
So what vowels do you have?

- i
- I
- e ε
- æ

“Luke, who’d, suit”

- u

- æ

So what vowels do you have?

- i
- I
- e ε
- æ

“look, hood, soot”

- æ

So what vowels do you have?

- i
- I
- e ε
- æ

- u

So what vowels do you have?

- i
- I
- e ε
- æ

- o

- õ
So what vowels do you have?

- i
- e
- æ
- u

“coat, wrote, hoed”

- o

So what vowels do you have?

- i
- e
- æ
- u

“coat, wrote, hoed”

- o

So what vowels do you have?

- i
- e
- æ
- u

“caught, wrought, hawed”

- o

So what vowels do you have?

- i
- e
- æ
- u

“coat, wrote, hoed”

- o
So what vowels do you have?

- i
- e
- æ
- a
- u
- o
- ø

“bah, father, cot, Dan”

So what vowels do you have?

- i
- e
- æ
- a
- u
- o
- ø

So what vowels do you have?

- i
- e
- æ
- a
- u
- o
- ø

So what vowels do you have?

- i
- e
- æ
- a
- u
- o
- ø
So what vowels do you have?

- i
- \(\hat{e}\)
- e
- æ
- u
- u

“but, putt, rut”

So what vowels do you have?

- i
- \(\hat{e}\)
- e
- æ
- u
- u

So what vowels do you have?

- i
- \(\hat{e}\)
- e
- æ
- u
- u

“metallic, Texas”

So what vowels do you have?

- i
- \(\hat{e}\)
- e
- æ
- u
- u
Some dialectal differences

• caught/cot [Mid back lax vowel and mid back tense vowel]: many American speakers do not have both of these.
• pot/father: some British and (fewer) American dialects have different vowels in these words (“pot” has a low back rounded vowel [ɔ]).
Diphthongs:

- aj

- aw

- “side, my, kind”

- a
Diphthongs:

“loud, brow, hour”

Diphthongs:

Diphthongs:

“boy, annoy, toil”
More dialect differences

• [aj] in Standard US/UK English
  – --> long [a] in south eastern US
  – --> [æ] in central UK and Australia

• [aw] in Standard US/UK English
  – --> [aw] in Canada

Cross-language Differences

• Feature combinations
  – English: back vowels are rounded, others are not
  – German/French have high front rounded vowel [y]
  – Russian has high back unrounded vowel
  – Many languages don’t make the tense/lax distinction found in English (e.g., Italian [i])
  – Many languages distinguish short and long vowels, unlike English (e.g., Japanese)

Cross-language Differences

Speech Production - Summary

• Airflow set in vibration by vocal folds
• Airflow modified by vocal tract
• Vowels: shaping of oral cavity
• Consonants: narrowing or blocking of oral/nasal cavity
• Different languages choose different selections of articulatory gestures