**6.542J, 24.966J, HST.712J LABORATORY ON THE PHYSIOLOGY,
ACOUSTICS, AND PERCEPTION OF SPEECH
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Possible Prosody Projects   *10/18/01*

Possible Projects in Prosody

1) What representation guides the computation of syllable and segment duration in reiterant speech?

   A number of different factors influence durations in spoken utterances (Klatt 1976), including the intrinsic duration of a segment (e.g. tense vowels are longer than lax vowels), segmental context (such as the voicing value of a post-vocalic consonant) and phrasal prosodic context (as in preboundary lengthening). By measuring the durations of tense vs. lax vowels in reiterant speech, in which a speaker imitates an utterance using repetitions of a single syllable like /ma/, we can determine which of these factors play a role in the representation that governs duration computation in this task.

   A script has been generated, and some recordings have already been made, but additional utterances will need to be recorded, digitized and measured.

2) What constituents exhibit polysyllabic shortening?

   Lehiste (1976) has shown that when additional syllables are added to a monosyllabic root, as in stick, sticky, stickiness, the first syllable shortens in duration. This finding suggests that speakers may adjust durations to tend toward a consistent word duration, although this goal is not fully attained. Is this effect limited to within-word syllables, or does it also occur when syllables or words are added to a phrase?

   A script will need to be generated, utterances recorded, digitized and measured.

3) Does 'glottalization' occur at the onset of smaller constituent boundaries?

   Pierrehumbert and Talkin (1992) showed that 'glottalization' of a word-initial vowel tends to occur at the onset of full intonational phrase, and Dilley et al. (1996) showed that this occurs at the onset of an intermediate intonational phrase as well, at least for full vowels. Does this occur at the onset of smaller constituents?

A number of recordings for 6 speakers are available for analysis, to compare e.g. bake apples and bake an apple, where a constituent boundary might be expected between the verb and the noun phrase, with bake us apples and bake him apples, where the pronoun might form a clitic group with the verb. The utterances of a seventh subject remain to be digitized.

4) Is the onset f0 of an utterance affected by the nature of the first pitch accent?

Yi Xu's (1990's) work on Mandarin tones showed that certain tones are lower before a word with a following high tone and higher before a following low tone, as if to emphasize the contrast between them. Do English speakers do something similar with their onset f0, so that onset f0 before an initial L* is higher (to highlight the L) and f0 before a H* is lower (to highlight the H)?

A script has been written and two speakers have been recorded and digitized; results show that one speaker contrastively changes onset f0 while the other speaker actually changes onset f0 to match the level of the first pitch accent more closely. Several more subjects need to be recorded, digitized and measured.

5) Under what circumstances does a H*-related F0 peak align with a syllable other than the prominent syllable?

Some speakers of English produce delayed f0 peaks in certain utterances; this behavior is of interest when compared with alignment constraints found for Mandarin lexical tones (Yi Xu 1990s).

6) What is the phonological status of rhythm in English?

In this class we have not addressed the question of rhythmic patterns in spoken utterances; various researchers have attempted to develop systems for labeling which regions of utterances are perceived as regularly rhythmic and which are not. An ongoing project involves learning one such rhythmic labeling system developed in our lab, and analysing the resulting patterns.

7) Where does a stop become a fricated consonant?

A stop consonant like /k/ is sometimes produced without a measurable period of closure and a release, but instead with a period of relatively constant frication. In what circumstance is this 'weakening' most likely to occur?

Recordings of 9 /k/-final verbs in various prosodic contexts have been made for 6 speakers, and some of the utterances have been labeled for 'fricativization' of the /k/. Additional digitizing and labeling will provide more data. Consult with Lisa Lavoie (*lisa@speech.mit.edu*) or Stefanie (*stef@speech.mit.edu*) for more information.

8) Does the number of syllables or words in a sentence affect its prosodic phrasing?

Work by Gee and Grosjean (1982) showed that on some tasks, when speakers produce 2-phrase utterances they prefer to place the intonational phrase boundary near the middle (as calculated in terms of words or syllables) even when this location does not correspond to the major syntactic boundary, as in He gave the report to a room full of people. Does the number of words and syllables in a sentence influence the number of intonational phrases that the speaker decides to use, even when the syntax of the sentences is similar?

A script has been written and 4 speakers have been recorded; the utterances need to be labelled for intonational phrase boundary locations.