

6.551J/HST714J ACOUSTICS OF SPEECH AND HEARING

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Lecture 23

12/02/04

Some examples of variability in speech

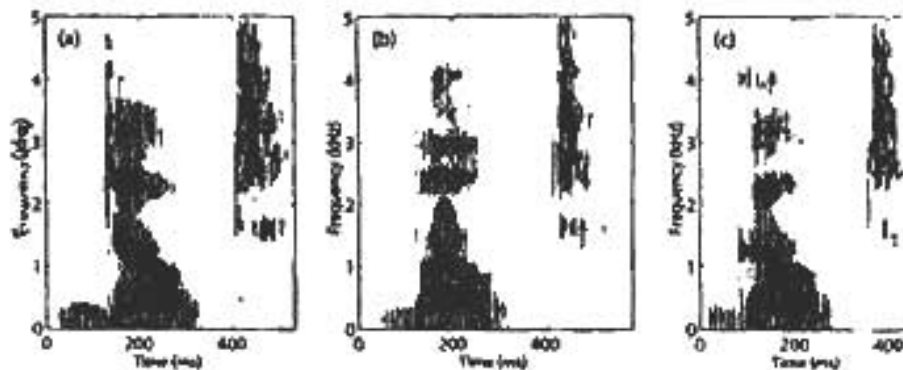


Figure 2. Spectrograms of the words (a) *dot*, (b) *boat*, and (c) *goal* produced by a male speaker. The relatively high frequency of P2 near the /d/ release in (a) is evidence for a fronted tongue body position for this alveolar consonant. This P2 transition enhances the distinction between the alveolar /d/ and the labial and velar in (b) and (c).

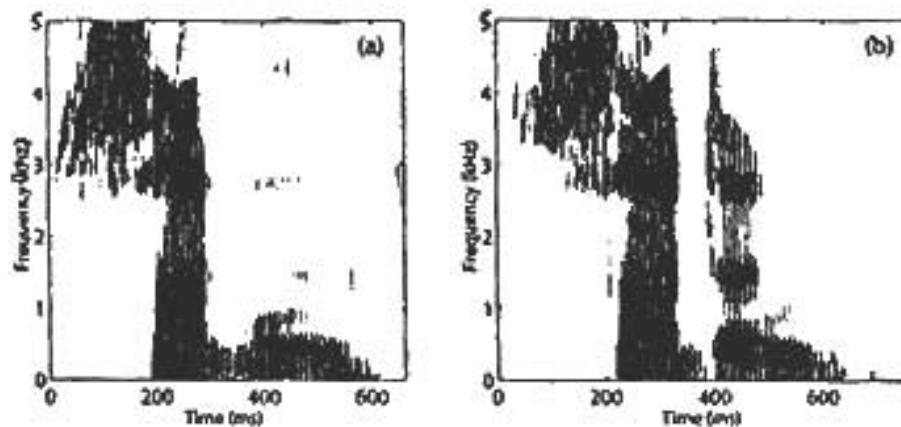


Figure 4. Spectrograms of the word *sudden* produced in a casual manner at the left and a clearer manner at the right, produced by a male speaker. (a) The /sn/ sequence is produced as syllabic nasal, whereas in (b) there is clear evidence for a vowel and a landmark at the time of /n/ closure, at about 450 milliseconds.

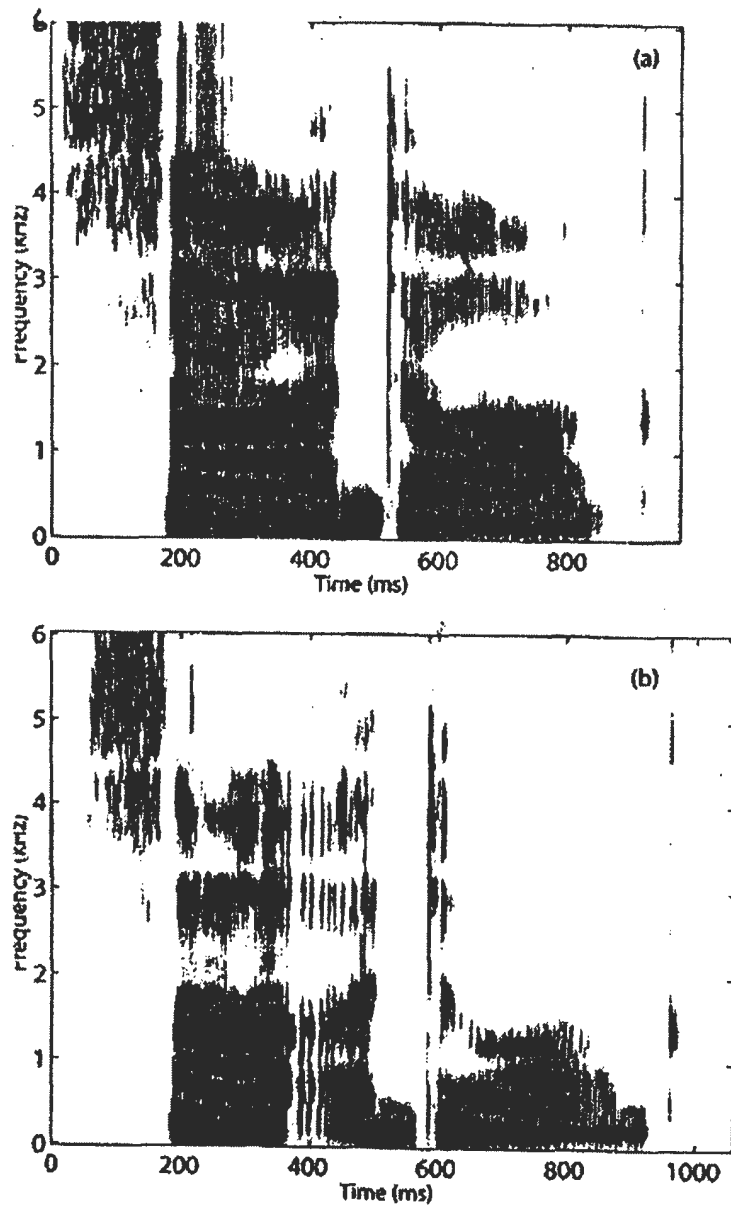


Figure 5. (a) Spectrogram of the utterance *saw a dog* produced in a casual manner.

There is no separate amplitude peak for the weak vowel /ə/. (b) Spectrogram of the same utterance produced in a more careful way. The vowel /ə/ is separated from /a/ with glottalization, indicating a word boundary. In both utterances, indirect evidence for /ə/ appears in the time course of the F2 transition immediately preceding the /d/ closure. Female speaker.

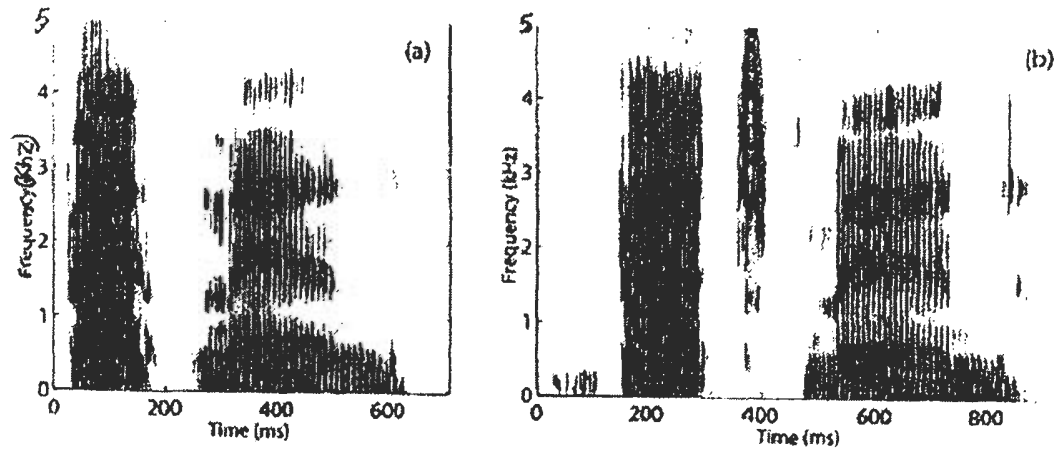


Figure 6. Spectrogram of two utterances of the word batman produced by a male speaker. The utterance (a) was produced more casually than the one on the right. The more carefully produced utterance (b) shows a noise burst for /t/ whereas for the more casually produced version the first vowel is terminated with glottalization and an apparent labial closure, as evidenced by a falling F2.

Problem

Figure 3.1 is a spectrogram of the sentence:

He took a small rabbit.

A number of arrows (identified by letters) are marked at particular times below the spectrogram. Which arrow or arrows (or none of them) apply to the following conditions?

- (i) The vocal folds are vibrating during a vowel.
- (ii) The vocal folds are vibrating and the lips are closed.
- (iii) There is an aspiration noise source (noise in the vicinity of the glottis).
- (iv) There is a frication noise source (noise near a constriction in the oral cavity).
- (v) This is a front vowel.
- (vi) The air pressure in the oral cavity is increased relative to atmospheric pressure.

(If you are unsure of an answer, explain your uncertainty.)

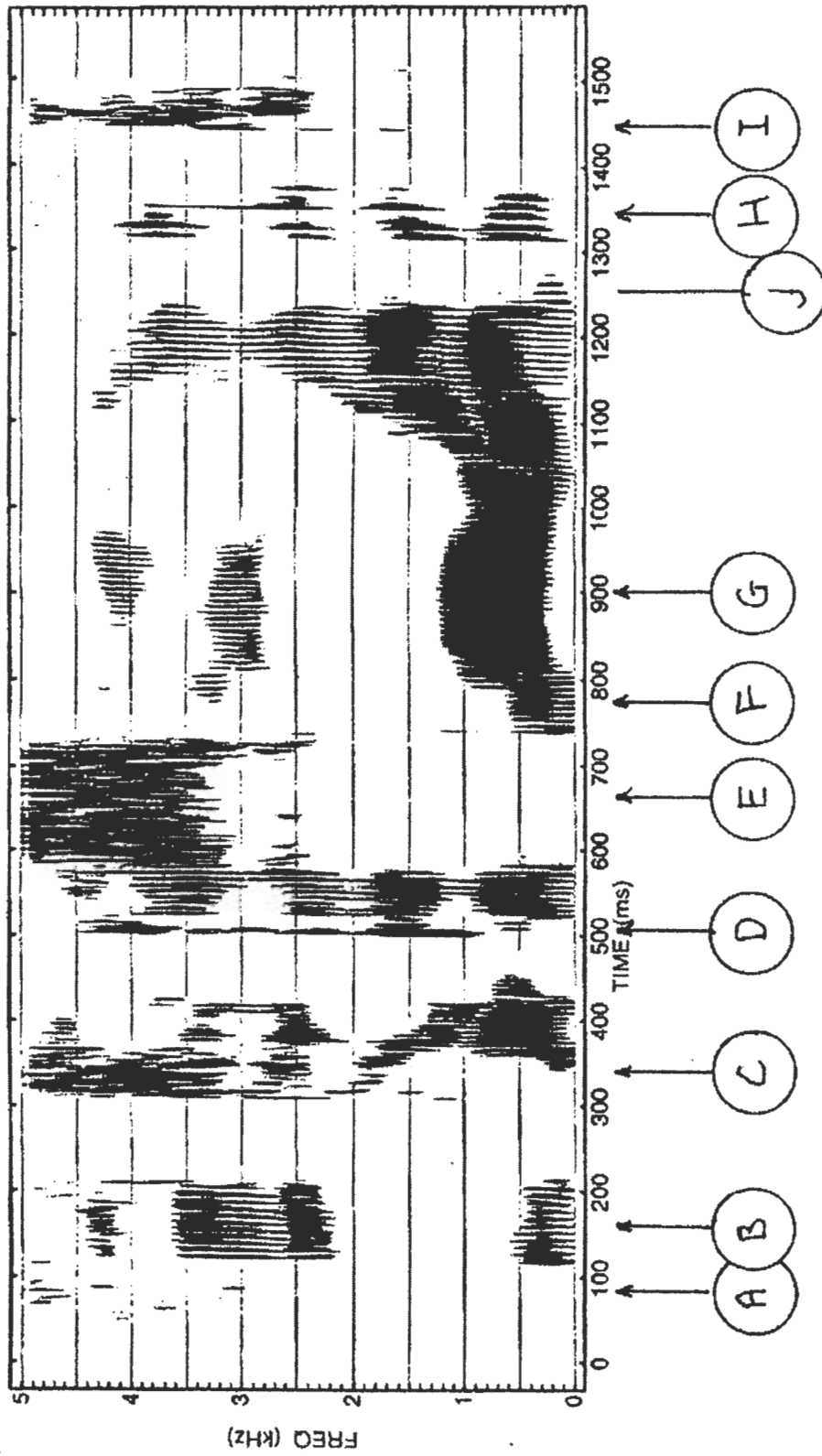


Fig. 3.1

Problem

Figure 4.1 shows a spectrogram of a sentence.

- (a) Inside this sentence there is a word that begins with an aspirated stop consonant, followed by a back vowel, followed by a fricative. Where is this sequence in the sentence?
- (b) Figures 4.2 and 4.3 show spectra sampled at two places in the utterance of Fig. 4.1. The time window for each spectrum is 26 ms. Approximately where in the utterance are these spectra obtained?

