MEETING 1 — OVERVIEW

- Introduction
- Overview of a ToBI transcription
- Categorical vs. non-categorical aspects of intonation
- “Reading” pitch tracks and waveforms
- Segmental perturbations

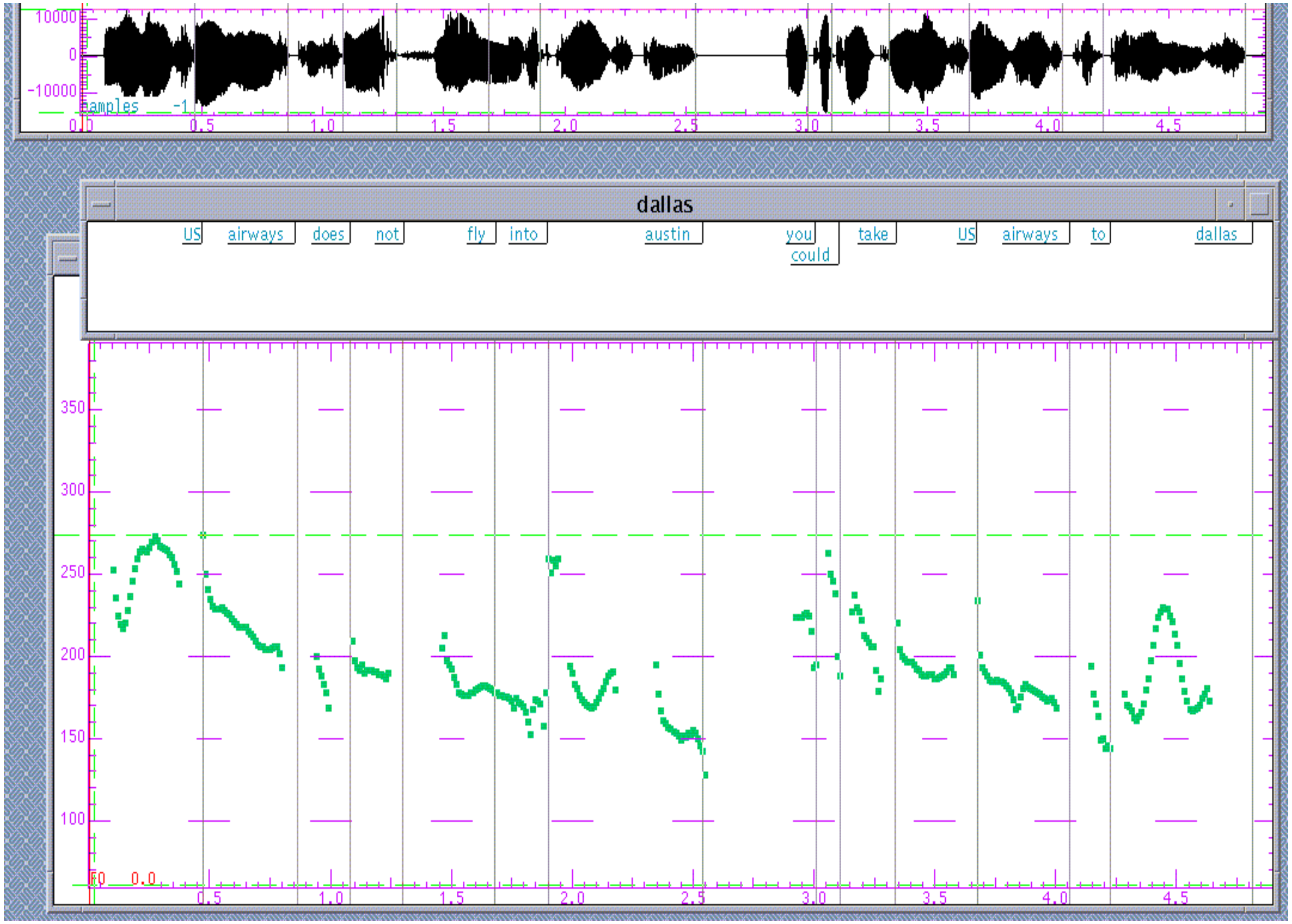

Figure 1: How can we characterize the difference in intonation on *Austin* vs. *Dallas*? — This is one of the goals of this tutorial.

INTRODUCTION: "READING" ToBI NOTATION

```
The class is cancelled.          The class is cancelled.
     H*      !H*     L- L%            L*               H- H%

The class is cancelled.          The class is cancelled.
     L*       H*     L- L%            H*               H- L%

The class is cancelled.          The class isn't cancelled.
     H*   H+!H*     L- L%      %H     L*           L*  L- H%
```

- READ MORE about intonational meaning:
  Pierrehumbert & Hirschberg (1990).

A ToBI (Tones and Break Indices) TRANSCRIPTION

- A ToBI transcription must include:
  - acoustic waveform (sound record)
  - fundamental frequency (F0) contour (pitch record)
  - label "tiers" containing symbolic tags:
    1. tones
    2. break indices
    3. orthography
    4. miscellaneous

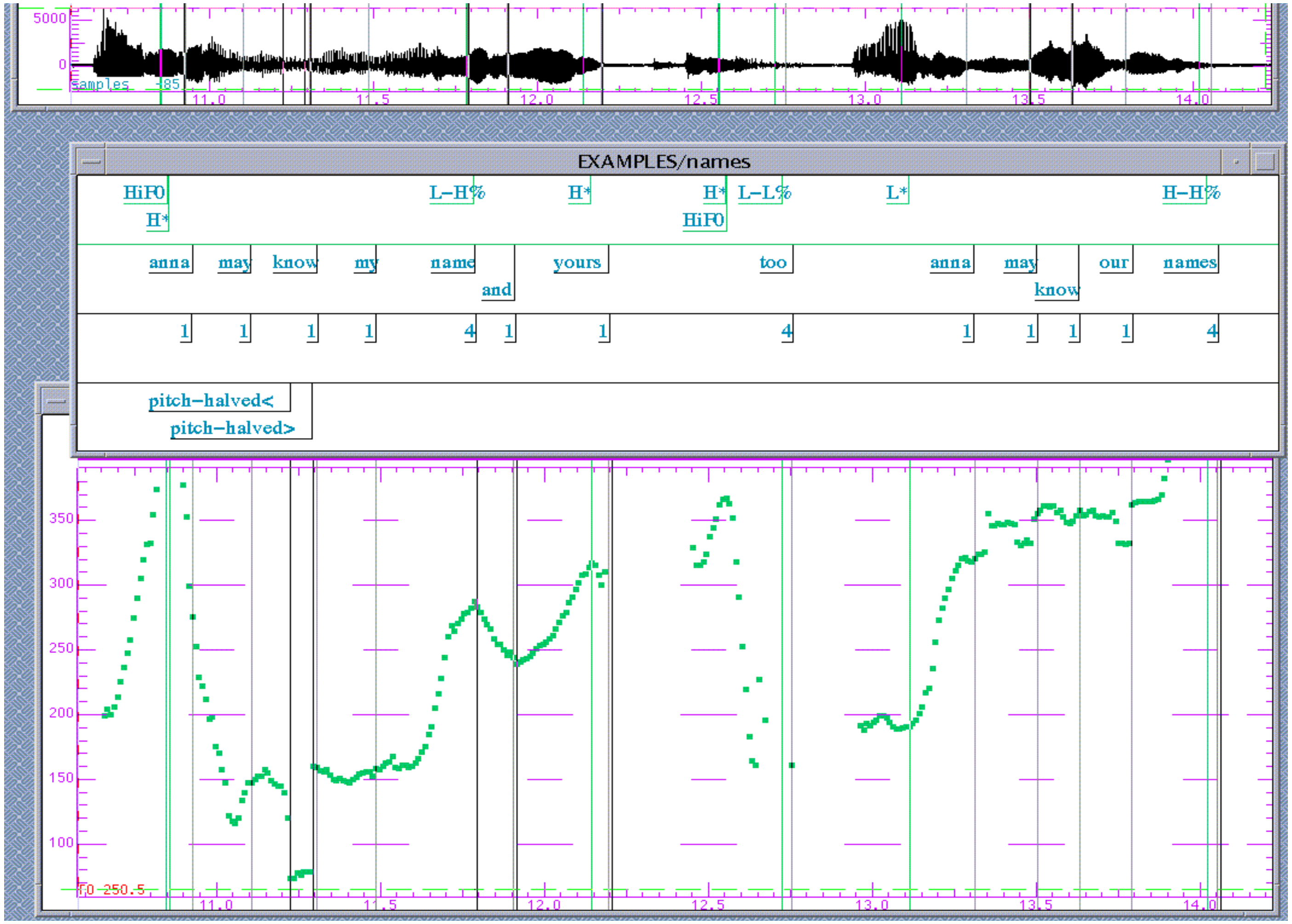

Figure 2: Example of a ToBI-transcribed utterance.

CORE ToBI TIERS: BREAKS AND TONES

- TONES: Symbolic labels representing a phonological analysis of the intonation pattern of an utterance. Labeled on this tier are: pitch accents marked on "prominent" words, phrase and boundary tones marked at prosodic phrase edges. [READ MORE: Pierrehumbert (1980), Liberman & Pierrehumbert (1984), Beckman & Pierrehumbert (1986)]
- BREAK INDICES (BI): Symbolic labels marking the degree of perceived disjuncture between adjacent words on the orthographic tier. Along with tones, break indices are indicators of prosodic grouping. [READ MORE: Price et al. (1991)]

WHAT ASPECTS OF THE INTONATION ARE DESCRIBED / TRANSCRIBED BY ToBI?

- Categorically distinct prosodic units and intonation patterns.

  PROSODIC STRUCTURE: The rhythm of more/less stressed words in an utterance and the grouping of these words into constituents.

  INTONATION PATTERN: The sequence of contrastive pitch accents, phrase tones, and boundary tones.

- Events not predictable from other tools or resources.

  (e.g. stressed/unstressed syllables in words can be easily determined by consulting the dictionary entry.)

- Aspects of intonation most amenable to quantitative description are not transcribed.

  (e.g. speech rate, pitch range, other acoustic variation.)

MULTILINGUAL ToBI ???

- English ToBI can describe the intonation of general American, standard Australian, and southern British English. Other varieties may require modification.

- English ToBI cannot be used directly to describe intonation of other languages, but the general framework can be adapted — German, Japanese, Serbo-Croatian, Cantonese, Korean, Mayali, Chickasaw, Greek, French, Swedish, Italian, Mandarin, Hindi, Spanish ...

  [READ MORE: Jun, ed. (forthcoming)]

SOME ACOUSTIC PHONETICS

WAVEFORM:

- The acoustic waveform is a phonetic record of the air pressure fluctuations hitting the microphone due to sound waves. The greater the airflow out of the mouth/nose while speaking, the larger the negative/positive fluctuations (amplitude) shown in the waveform.

F0 CONTOUR:

- Physically manipulating the frequency of vibration of the vocal cords (fundamental frequency = F0) results in the psychological percept of differences in PITCH.
- The computer-generated F0 contour, or "pitch track" used in a ToBI transcription is the phonetic record of such changes in frequency of vibration across the utterance.

SEGMENTAL PERTURBATIONS

- F0 is not defined in voiceless regions (voiceless stops, voiceless fricatives, voiceless vowels, etc.).
- In addition, all **obstruents** can cause perturbations in the F0 track observed immediately before/after the consonantal region:

  -voi obstruents: p, t, k, s, sh, h, glottal stop, etc.
  +voi obstruents: b, d, g, z, j, flap, etc.

- Note the ACTUAL voicing of the segment, as produced by the speaker. “Voiced” obstruents are often voiceless, /t/ is often realized as a flap in unstressed syllables, /h/ is often voiced intervocalically.
- As much as possible, use **sonorants** in experimental materials!
- READ MORE: ToBI Guide section 2.1, van Santen & Hirschberg (1994).

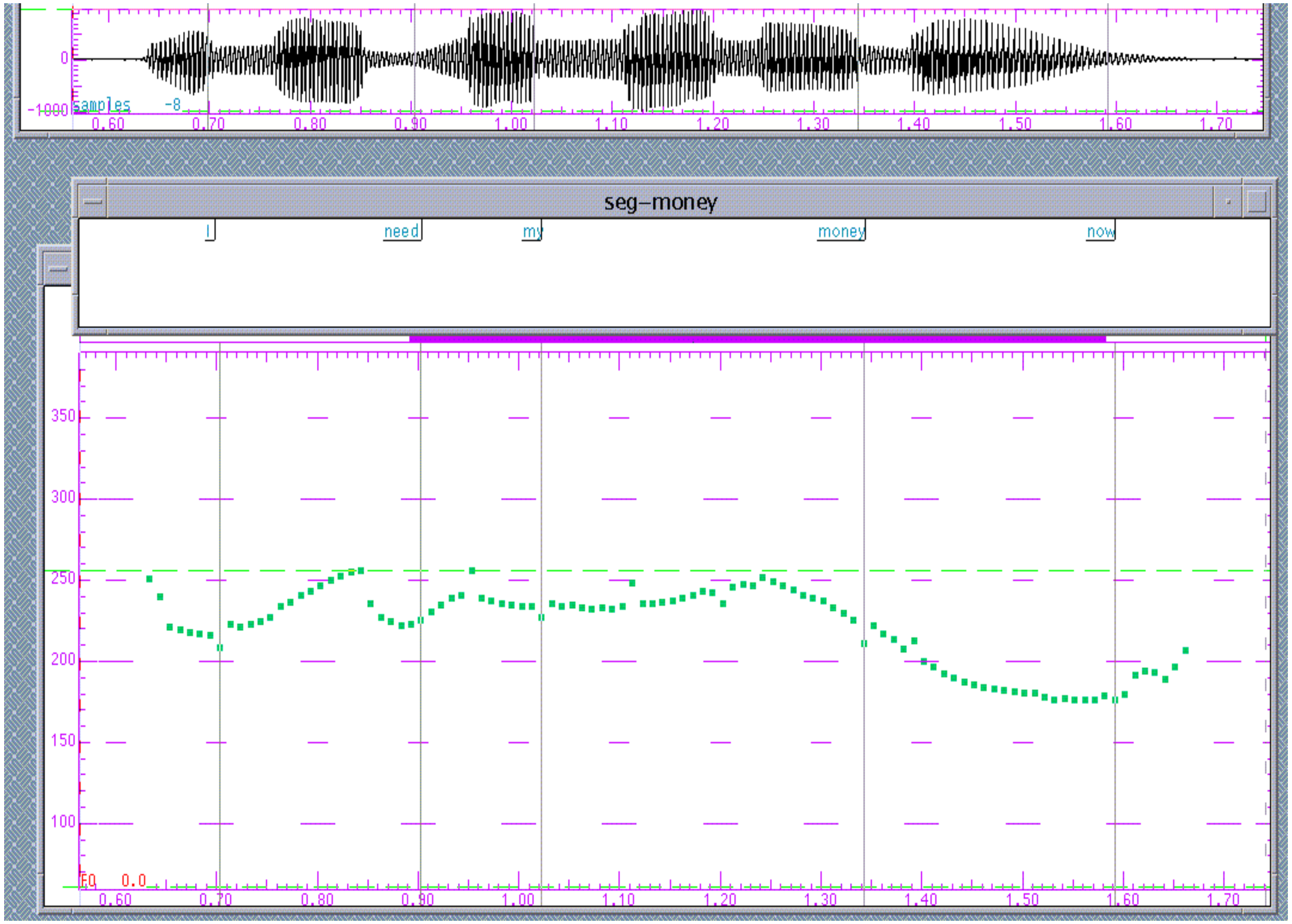

Figure 3: Segmental perturbation of /d/ in *need*, and no perturbations in *money*.

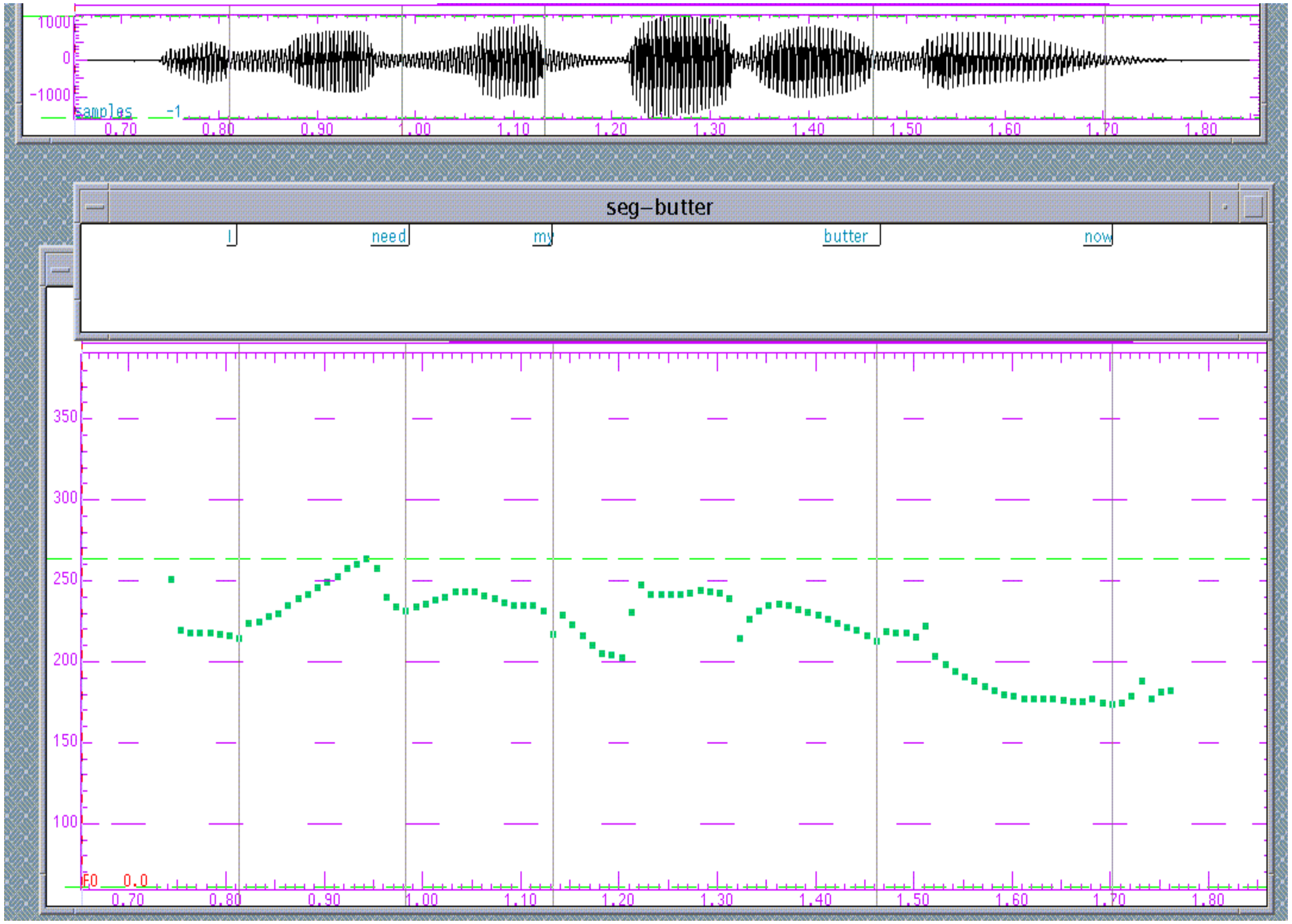

Figure 4: Segmental perturbations of /d/ in *need*, and /b/ and flap in *butter*.

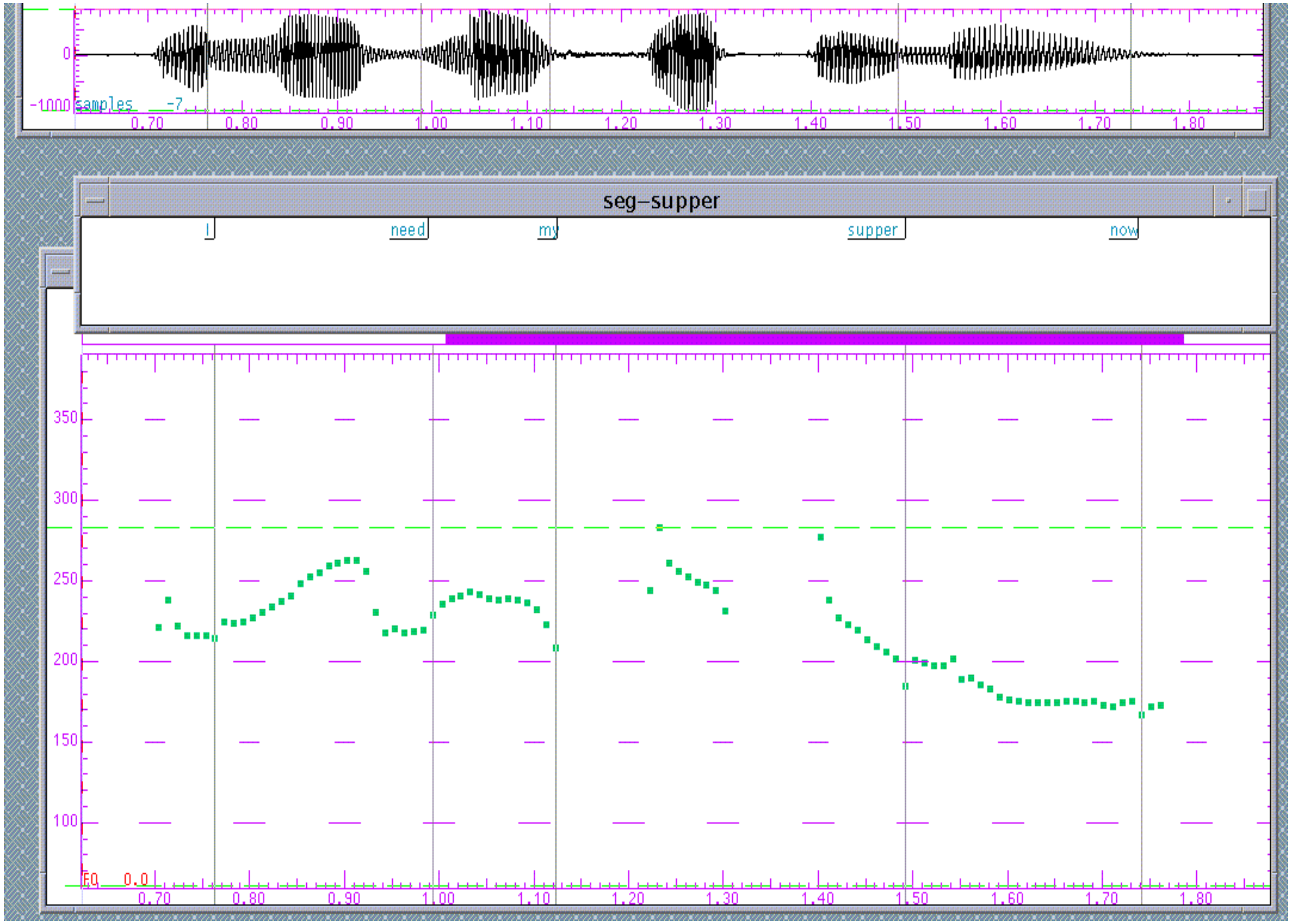

Figure 5: Segmental perturbations of /d/ in *need*, and /s/ and /p/ in *supper*.

F0 MISTRACKING

- Pitch tracking algorithms can fail. Breathy or creaky voice regions are notoriously difficult.
- It is common to break into creaky voice in regions of low F0 (e.g. utterance-finally). Also, glottalization (often found at the beginning of vowel-initial words) causes problems in F0 tracking.
- Inappropriate assumptions made by the pitch tracking algorithm can cause pitch-halving or pitch-doubling.
- The ultimate judge is your ear. Do you you hear a high/low pitch? Do you hear the pitch rising/falling?
- READ MORE: ToBI Guide section 2.1.