Issues and tools for creating and annotating a corpus of sociolinguistic field data

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Motivation

• Ad hoc system motivated by **sheer laziness**.
• Goal is to support a study is to characterize the phonology of a Regional Italian variety (Aquilano) under the influence of not only Standard Italian but also two local dialects.
• Focal Question: Is the phonological variation observed better modeled as a small number of varieties with inherent variation or a larger number of invariant varieties?
• **Overlap with this workshop**
  – empirical analysis of recorded interview data from
  – live informants speaking in a linguistic variety whose
  – underlying grammatical structure is not fully known &
  – need for infrastructure to support analysis and collaboration
Definitions

• Corpus - a body of (raw) data collected and annotated for a specific purpose
  – Raw Data - naturally occurring data resulting from some linguistic performance
  – Annotation - any process of adding value to a corpus
• For data originally written, the written text is the raw data. For speech, only the audio is raw data
• Annotation encodes either human judgement or automatic processing based on either raw data or on previous layers of annotation.
• Transcription and segmentation are special kinds of annotation
  – transcription encodes subtle human judgements about what was said
  – segmentation defines the granularity of future annotations
Components

- 80 subjects stratified for age, gender, socioeconomic background
- Interviewers both native and non-native; subjects typically interviewed in pairs
- Attempt to capture multiple “styles”; examine style as a function of time in the interview
- Objective and subjective analyses:
  - vowels system, intervocalic /v/, /c/ before high vowels
- Need for tools and formats to
  - collect and
  - annotate data
  - manage layers of analysis
  - summarize and
  - share results
Before

- Listen to tape for interesting tokens
- Digitize individual tokens
- Code tokens (using software where appropriate)
- Mark tokens on score sheet
- Reformat data for statistical analysis

- Problems
  - slow, labor intensive
  - high risk of missed tokens
  - tokens typically unbalanced, representation of styles poor
  - time measured poorly
  - effort for reanalysis nearly equal to effort for original
  - only limited opportunities for re-use
After

- Digitize entire interview & check audio quality.
- Transcribe, segment & check format.
- Query system for items of possible interest.
- Where appropriate, preprocess for segmental analysis.
- Label and analyze segments of interest.
- Summarize.

- Advantages
  - fewer misses
  - balanced coverage
  - time measured accurately
  - re-use & reanalysis profits from previous preparation
Digitization

• Interviews recorded on audio cassette using Sony Walkman Professional stereo recorder and a pair of lavalier microphones.
  – each subject on separate mike
  – interviewer typically off-mike

• Digitized as **two channel**, 16 bit, 32KHz files via a Sony DAT recorder; down-sampled to 16KHz and transferred to computer via a Townshend DAT Link (narecord) Saved in Entropic’s .sd format
  – .wav and .sph formats also possible

• Beginning & ending silence trimmed, files demuxed, empty channels removed.

• Need to incorporate automatic checking of signal quality (sample min/max & long periods of low energy)
Transcription & Segmentation

- Orthographic transcription with interesting items & features transcribed phonetically
- Time aligned to audio file via segmentation at the speaker turn level
- Segmentation defines/refines domain of analysis
  - utterance level, word level, segment level (for vowels)
- Initial Segmentation
  - at each speaker turn
  - within long turns at ~8 seconds
  - segmented into breath groups where possible -- though not guaranteed
- Format
  - start, stop, channel, speaker, situation, utterance
• **Strans**
  - Emacs with menus modified and macros added to support transcription talking to Xwaves through “send_xwaves”

• **Segment Helper**
  - Emacs running in server mode
  - Client writes all commands to stdout where Emacs either acts on them immediately or passes them onto Xwaves.

  - Segment Helper & all utilities hereafter written in PerlTK -- free, available on Unix and NT, merges the TK GUI capacity with Perl’s flexibility and flow control.
Create Segment polls Xwaves for left, right cursor positions and writes those as time stamps with channel marker in text.

Next Segment - shifts display so that 10% of last segment shows.

Find Segment finds position in waveform of segment defined in text.

Monoaural recording with subject on single mike; interviewer off mike.

Segment defined by start & stop times plus channel marker and written by software based on cursor positions.

Speaker ID written by human and later normalized. Situtation code written semiautomatically and checked by human.

Interesting feature transcribed phonetically.
Interaction

- Some transcription done initially on foot pedal controlled transcription machine
  - files subsequently segmented with Strans
- Many files segmented initially at speaker turn, pause or breath with the segments transcribed subsequently.
- As an experiment some files transcribed with help of ASR System
  - native speaker trained Dragon *Naturally Speaking* Italian
  - listened to tapes via foot-pedal controlled device
  - repeated each utterance to Naturally Speaking & corrected its mistakes

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<thead>
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<th></th>
<th>ASR</th>
<th>Manual</th>
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<tbody>
<tr>
<td>Experiment 1</td>
<td>13.1xRT</td>
<td>13.4xRT</td>
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<tr>
<td>Experiment 2</td>
<td>11xRT</td>
<td>7.8xRT</td>
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</tbody>
</table>
Quality Checking

• After Segmentation and Transcription, files are checked by a second transcriptionist for
  – bad segmentation
    » too much or too little included in the transcript
    » gap between segments too large
  – inaccurate transcription
  – inaccurate situation code
  – misspellings
  – inaccurate phonetic transcription

• and by automatic process for
  – segments too long
  – time stamps out of order or internally inconsistent
  – impossible channel marker, speaker ID or situation code

• QC catches human formatting errors.
• System controls all subsequent processing.
Word Selection

• FindWord searches reformatted transcript, identifies and numbers any words matching the query. Each hit word is presented to user in context as text and audio

• Software guesses location of word in utterance based on simple assumption that all syllables are of roughly equal length -- does surprisingly well

• Linguist adjusts word boundaries in waveform display, zooms and iterates until satisfied.

• Results saved in new file in SGML format.

  < hitnum=3 pattern=o/PP word=vent'otto uttnum=1 speaker=EC01 situation=3 channel=X ustart=76.85 ustop=79.39 utterance=nel vent'otto aprile [abrile] mille novecento [noveSento] sessanta >
GetSignal locates and plays utterance, guesses word position and sets cursors

SegmentWord writes segmentation to new file and marks hit as done.

Retaining times allows user to balance samples over corpus

Lexical Item matching search. May be more than one per utterance

Abstract Label for Search Pattern

Unique Hit Number
Time Aligned displays of waveform, WB and NB spectrogram and F0 characteristics

Software guesses position of segment within word.

User adjusts segmentation and saves to file.

Software estimates formant values automatically.

All sound files, spectrograms, and F0 files processed ahead of time in batch and saved for later redisplay.
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<tr>
<th>U1</th>
<th>U2</th>
<th>U3</th>
<th>U6</th>
<th>U7</th>
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<tbody>
<tr>
<td>U4: una donna bella</td>
<td>U5</td>
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<tr>
<td>H1: bella</td>
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<tr>
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<td>F123</td>
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## Relationships

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<tr>
<td>Utterance Pattern Segment</td>
<td>Utterance # Utterance # Lexicon</td>
<td>S Start Time F1</td>
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<td>U Stop Time W Start Time F2</td>
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