Closer Still to a Robust, All Digital, Empirical, Reproducible Sociolinguistic Methodology

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History

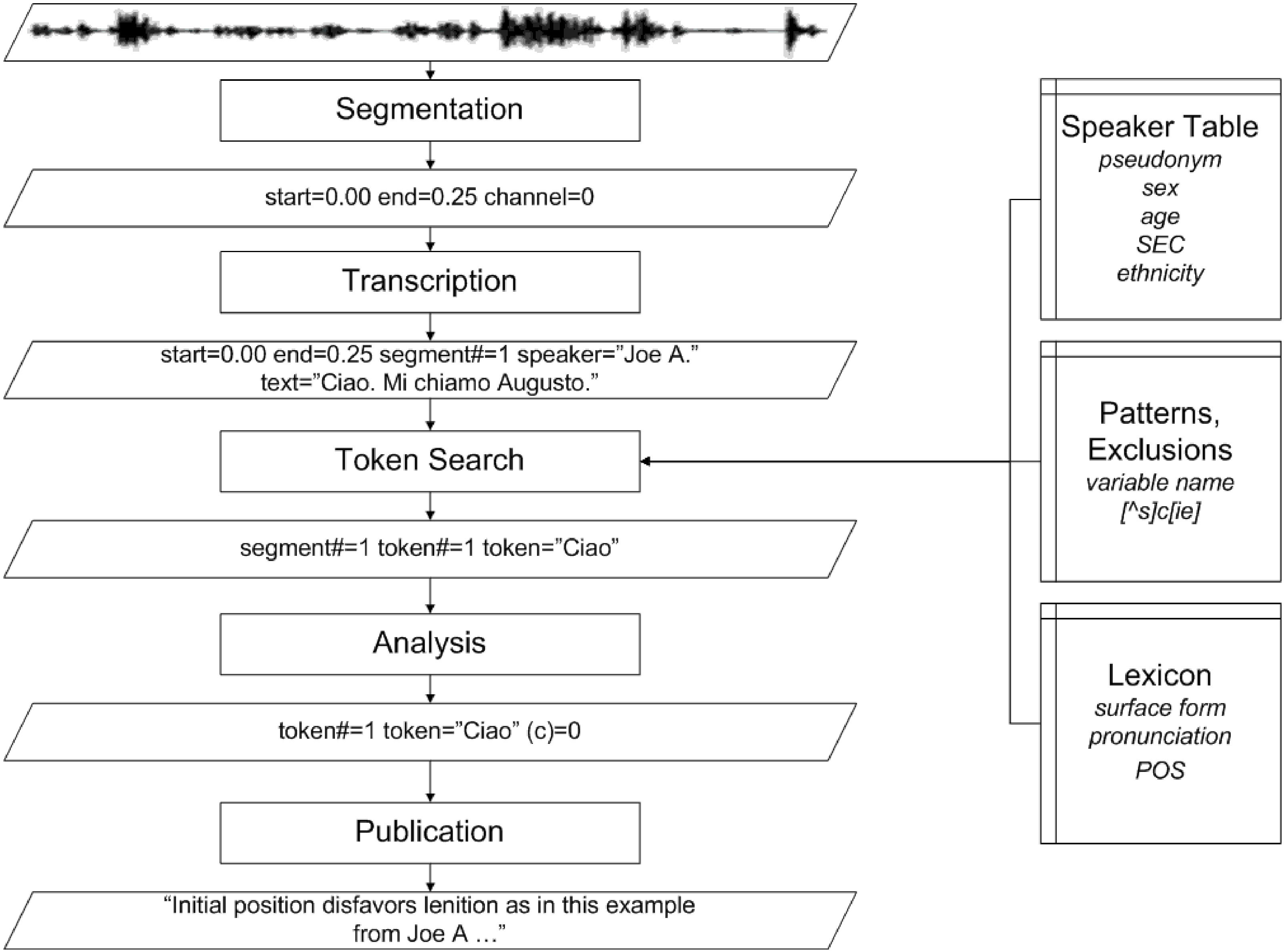
- 1963 Quantitative study of variation and change in the speech community has been intensively corpus based since inception
- 1971 Montreal Group began to create first computer based corpus for speech community study
- 1999 Gregory Guy convened a workshop on publicly available corpora, invited us to present on LDC corpora of potential use to sociolinguistics
- 2001 presented on corpus based sociolinguistics, our DASL project and the –t/d deletion study
- 2002 presented with William Labov on the SLx Corpus of classic sociolinguistic interviews and the DASLTrans
- 2003 organized Workshop at Penn of robust sociolinguistic methodology
- 2007 Malcah Yaeger-Dror convened workshop, invited Reva Schwartz, and MIT-LL and LDC to present on transcription practice and Phanotics project
- 2009 today we are very close to the realization of this ideal

Vision

- raw data – text, audio, video – is digital as are annotations, specifications
- transcripts other annotations are linked back to the original, raw data
  - time stamped for speech, linked via word offsets for text
- raw data or transcript proxy is computer searched for target variables
  - lexicons, speaker tables, other data external to recordings consulted as needed
- coding decisions are still made by humans
  - though the potential for partial automation exists
- variables, coding practice described to permit replication by others on the same or comparable data
- coding strings, examples in a paper, dots on a scatter plot or tracked backed to original recordings
- ideally data also publicly accessible.

Model

Model



Segmentation
start=0.00 end=0.25 channel=0
Transcription
start=0.00 end=0.25 segment#=1 speaker="Joe A."
text="Ciao. Mi chiamo Augusto."
Token Search
segment#=1 token#=1 token="Ciao"
Analysis
token#=1 token="Ciao" (c)=0
Publication
"Initial position disfavors lenition as in this example
from Joe A …"
Speaker Table
pseudonym
sex
age
SEC
ethnicity
Patterns, Exclusions
variable name
[^s]c[ie]
Lexicon
surface form
pronunciation
POS

Segmentation

- Virtually divide digital audio stream into manageable units
- Greatly facilitates downstream transcription, token retrieval, coding, analysis
- Can also indicate structural boundaries in recording
- Variable segment granularity to meet project needs
  - Maximum segment duration of 5-8 seconds makes downstream transcription and coding considerably more efficient
    - Sentence units (SU), breath/pause groups are convenient first-order units
    - Turns, discourse units, word, phones, etc. as optional second pass
- With right tools, SU or breath group segmentation can be performed in under 1.2x real time
  - Automatic segmentation, forced alignment with manual verification can also save time

Transcription

- Why a full transcription?
  - Index to speech, searchable
  - Provides stable basis for subsequent tasks
- Transcription specification to document conventions for orthographic representation
  - Use of standard orthography facilitates subsequent searching, retrieval of tokens, reanalysis
  - Specify treatment of common phenomena like disfluencies, non-standard forms, mispronunciations, transcriber uncertainty
- Transcription can be quite efficient given right tools combined with short audio segments

Comparison of Methods

	Quickest			Most Careful
Segmentation	Automatic	Auto w/ verification	Manual	Manual w/ verification
Completeness	Content words	Add partial words, disfluencies	Add partial words, disfluencies	Add verification pass
Filled Pauses	Optional	Incomplete	Exhaustive	Exhaustive w/ verification
Disfluencies	None	Incomplete	Exhaustive	Exhaustive w/ verification
Transcriber Uncertainty	Flag and skip	Flag and best guess	Flag and best guess	Flagged best guess w/ verification
Feature Marking	None	Minimal	Full	Accurate, complete w/ correction
Speaker, Backgrnd Noise	None	Minimal	Exhaustive	Exhaustive w/ verification
Manual Passes	1	1-2	2-3	4+
Approx. Cost (x Real Time)	5 x	15 x	25 x	50 x

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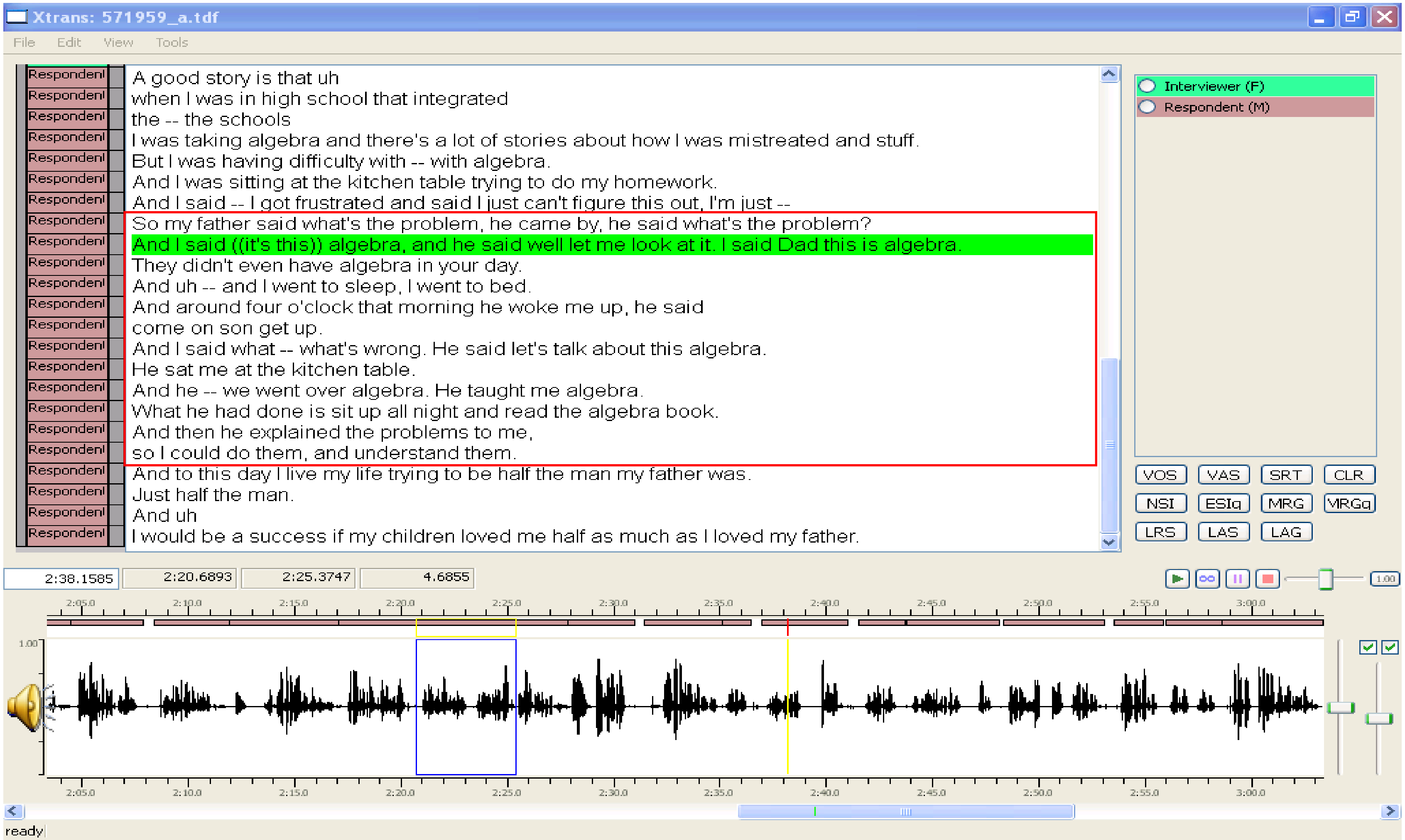
Approximately 10x including segmentation

Quick Transcription Example



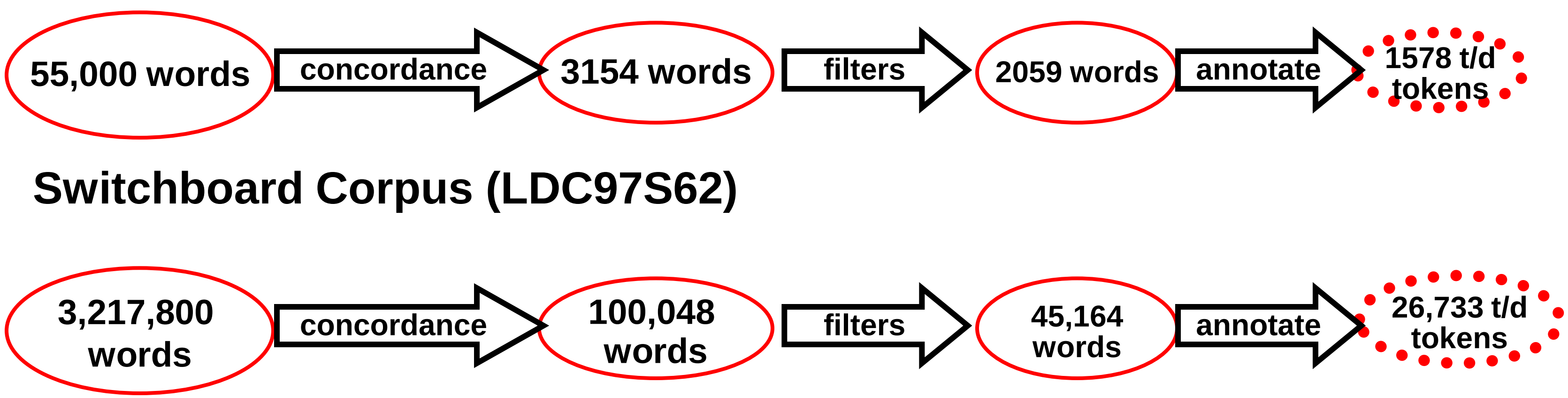
http://www.ldc.upenn.edu/XTrans

Token Selection

- Selection of tokens for analysis can be automated to large extent
  - Concordance to identify tokens of interest
    - Using string matching, regular expression queries
  - Filters to remove additional non-tokens
- More robust than manual selection, which might miss or overlook tokens
- Implemented in DASL t/d study

TIMIT Corpus (LDC93S1)

Switchboard Corpus (LDC97S62)



Coding Spec Challenges

- Difficulty of achieving perfectly explicit guidelines
  - Even when working on well-studied variable
- In DASL t/d deletion study, goal was to investigate comparability of corpus-based approaches with previous studies involving sociolinguistic interview data
- But previous t/d coding specs not typically published
  - Had to resort to personal communication with authors, detective work, reverse engineering from results
- Variation in coding for some factor groups inhibits direct comparison of results
  - Morphological factors, e.g. passives ("I was frightened")
- Some categories unmentioned - how were these coded?
    - Nasal flaps? Glottalized segments? What constitutes a pause?

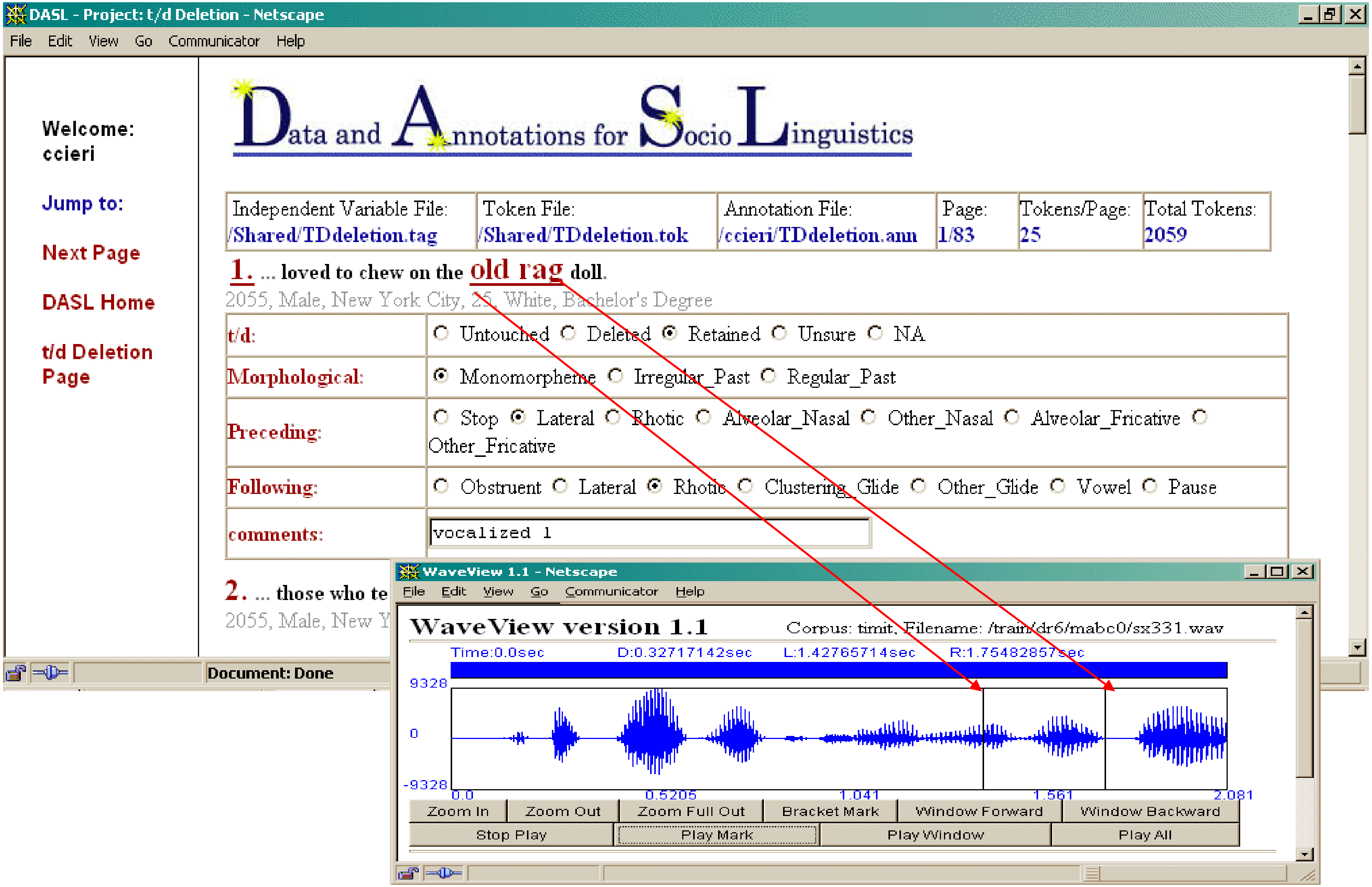
Coding Spec Best Practices

- Formal annotation/coding specifications promote coder reliability and direct comparison of results
- Developed iteratively over several rounds of pilot labeling including analysis of inter-coder reliability, via (double-blind) dual coding
  - Consider removal, merging of rules/categories with low consistency
- Written guidelines include
  - Title, date, version number
  - Introduction with framing/contextual info and general description of rule syntax
  - Screenshots of annotation/coding interface
  - Multiple examples for each rule
    - Including some difficult cases as well as counter-examples
  - Embedded sound files to illustrate application & non-application of rule
  - Appendix, glossary
  - Rules of thumb to promote consistent labeling
  - Can't tell, difficult decision flags
- (Link to) guidelines published along with results

Coding

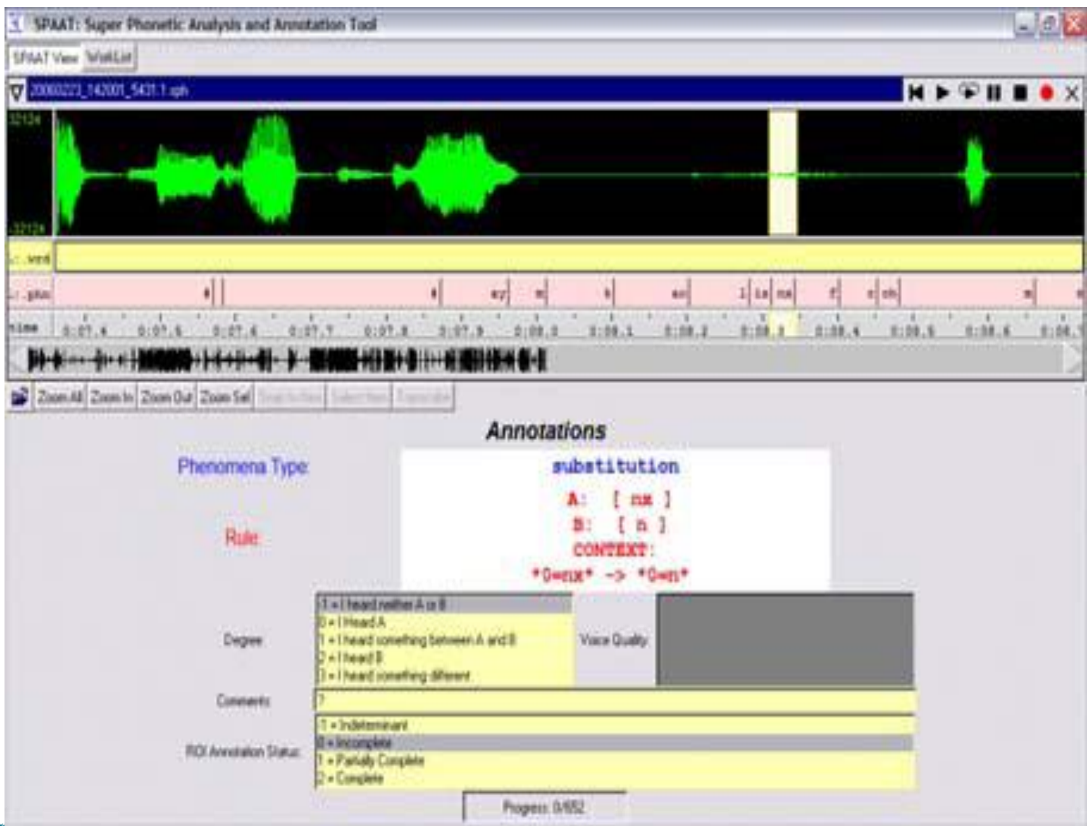
- Careful data preparation (segmentation, transcription) and pre-selection of all candidate tokens enables efficient coding
- "Regions of interest" already identified
- Attention directed at a single task: how is this variable realized in this batch of tokens
- Some customization of coding tools can increase efficiency further still

DASL t/d Coding Tool

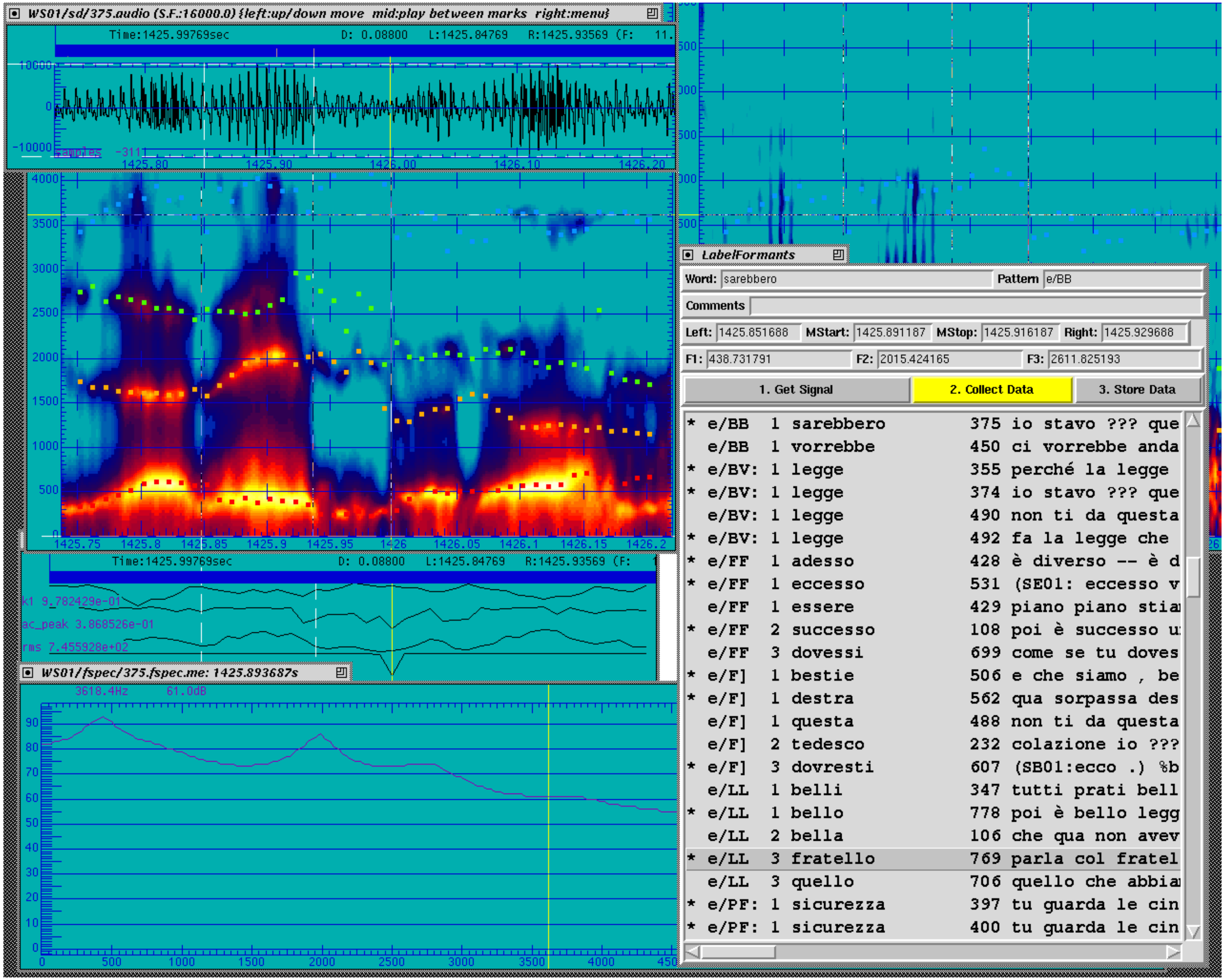


SPAAT (Super Phonetic Annotation & Analysis Tool)

- One variable, one ROI at a time
- Average of 250 judgments/hour, up to 400+ for experienced labelers



Formant Analysis



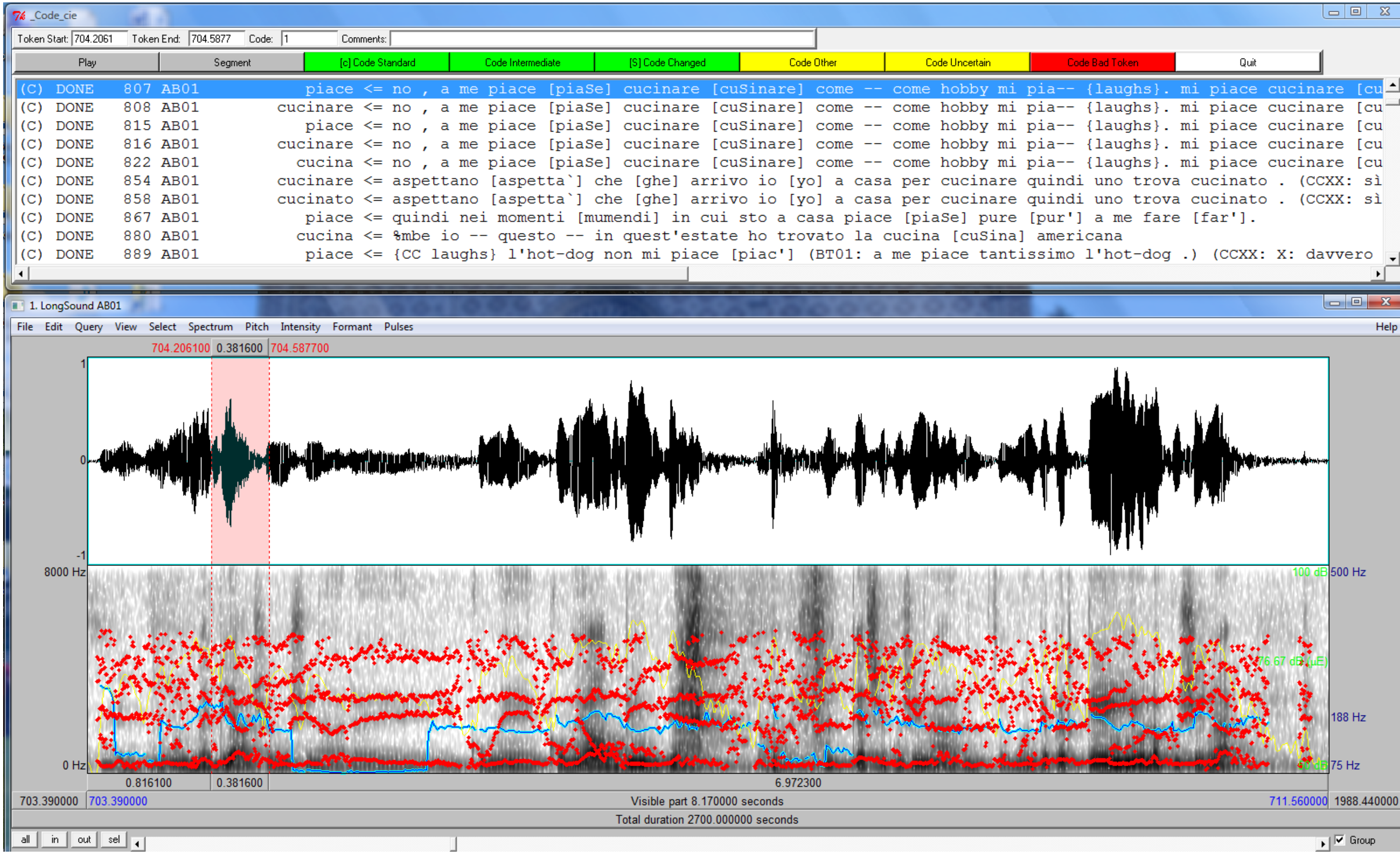
Token Selection

Vowel Segmentation

Identification of central tendency of word stressed vowel

Hand checking of formant tracker values for F1 and F2

Data Management



Vision

- ☑ raw data – text, audio, video – is digital as are annotations, specifications
- ☑ transcripts other annotations are linked back to the original, raw data
  - Xtrans, Praat, various Concordancers
- ☑ raw data or transcript proxy is computer searched for target variables
  - Ottawa Workshop, Montreal Project, SPAAT
- ☑ coding decisions are still made by humans
  - though the potential for partial automation exists
  - Yuan's Forced Aligner, Evanini's formant extractor
  - Other HLTs: ASR, Universal Phonetic Decoders, Energy Detectors, POS Taggers
- ☑ variables, coding practice described to permit replication by others on the same or comparable data
  - DASL Project, SLx,
- ☑ coding strings, examples, points on a graph tracked to original recordings
  - HTML <a> tags, Stefan Dollinger's Bank of Canadian English, Tom Veatch's 1993 dissertation
- ☑ ideally data also publicly accessible
  - Michelle Minnick-Fox, Nationwide Speech Project, NECTE Corpus

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