

**Feature detection experiments:
Preparation for NSF workshop**

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Agenda

- Landmark detection
- Place and voicing classification
- Knowledge based acoustic parameters
- Tools for WS04

1. Landmark detection in the event-based system (EBS)

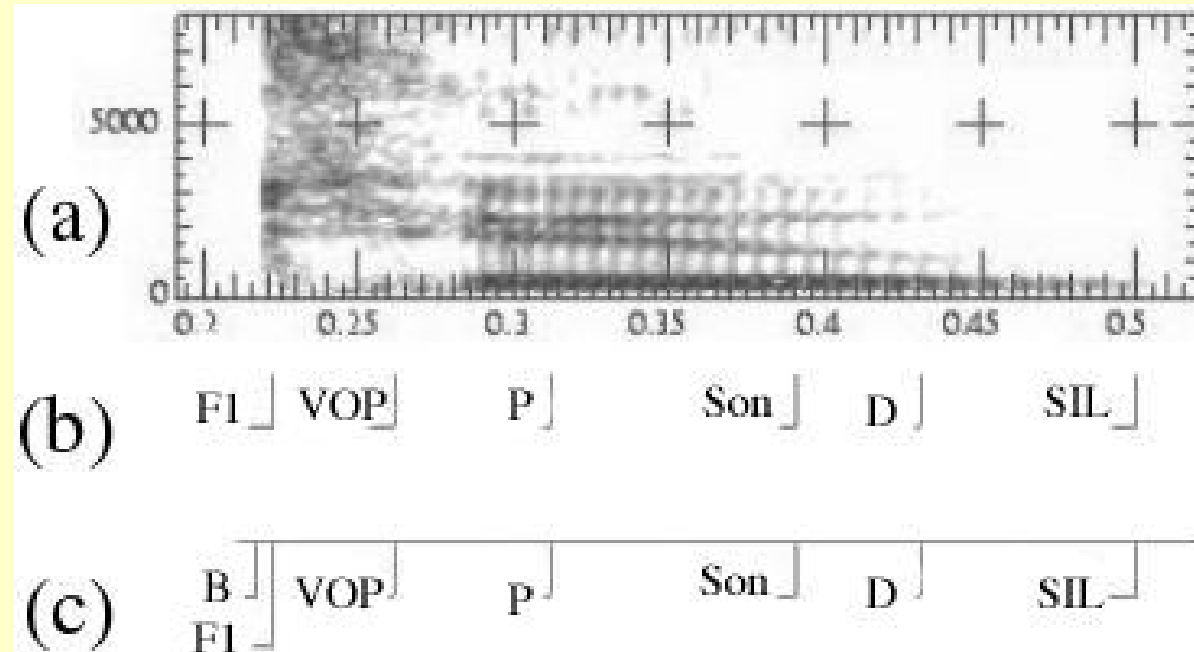
(Juneja and Espy-Wilson, 2004)

- Somewhat different from "SVM based landmark detection"
- SVM-based binary classifiers of phonetic features - *sonorant*, *syllabic*, *continuant* and *silence* - operate on each frame of speech
- Landmarks are obtained after converting SVM outputs to probabilities and applying a probabilistic segmentation algorithm (similar to Lee 1998)

Landmark output example

F1: fricative onset, Son: sonorant consonant onset, P: Vowel nucleus, D: syllabic dip, SIL: silence, B: stop burst

"two"



2. Place and voicing classification with MFCCs on NTIMIT

Results in prevocalic contexts (%) (good ones)

Feature	Accuracy
Stop Voicing	83
Stop Alveolar	84
Fric voicing	81
Fric Strident	84
Fric Anterior	87
Nasal	92
Nasal Alveolar	88
Rhotic	97

Features that need improvement

Feature	Accuracy
Prevocalic	
Lateral	76
Stop velar	78
Nasal Labial	78
Nasal Alveolar	73
Postvocalic	
Fric voicing	76
Stop velar	71
Stop labial	74

3. Knowledge based acoustic parameters (APs)

(Bitar 1997, Espy-Wilson 1994, Deshmukh et al 2002)

- Parameters extracted from speech on the basis of knowledge of speech production and acoustic phonetics
- Better speaker independence has been shown in HMM framework

	Train: Males, Females Test: Males, Females	Train: Males Test: Females	Train: Fe- males Testing: Males
Traditional (39 parame- ters)	99.88	70.27	68.29
APs (28 pa- rameters)	97.26	91.67	78.33

Improvements in feature detection with APs

Results in prevocalic contexts (%)

Feature	MFCCs	MFCC+APs
Fric Strident	84	88
Fric Anterior	87	91

4. Speech tools

- APFACT : Acoustic Phonetic Feature Analysis and Classification Toolkit
 - Carries out various frame-based and landmark-based classifications
 - No need to write a code, only need to write config files
 - Can be used with SVM Light, Libsvm and MATLAB
- Code for landmark generation from SVM outputs is not open-source