2012-04-26 J.-Y. Choi

**Representation of distinctive features in landmark labeling**

There are 6 articulator-free features and articulator-bound 18 features that can be used to represent speech sounds.

Articulator-free features:

[vowel], [glide], [consonant], [sonorant], [continuant], [strident]

Articulator-bound features:

[stiff], [slack], [spread], [constricted], [advanced tongue root], [constricted tongue root], [nasal], [body], [high], [low], [back], [blade], [anterior], [distributed], [lateral], [rhotic], [lips], [round]

<NB> These can be arranged in a hierarchical structure according to feature geometry theory.

These distinctive features can be used to represent phonemes in different languages. For English, a standard set is given below.





Every landmark can be associated with a set of corresponding articulator-free and articulator-bound features. Schematically, this can be represented as:

LM = [ [vowel], [glide], [consonant], … [lips], [round] ]

For acoustic manifestations of landmarks, a time may be associated with the landmark:

Acoustic LM = [ [time], [LM] ]

Not all landmarks will be marked for all distinctive features. For example, a labial consonant need not be marked for [advanced tongue root]. Some formats for specifying landmarks may be as follows:

1. Vowel landmark V = [ [vowel], ([stiff], [slack], [spread], [constricted]), [advanced tongue root], [constricted tongue root], ([nasal]), [body], ([blade]), [high], [low], [back], ([anterior], [distributed], [lateral], [rhotic]), ([lips]), [round] ]
2. [stiff], [slack], [spread], [constricted] may be used to specify voice quality such as glottalization
3. [advanced tongue root] and [constricted tongue root] are used to specify tense vowels
4. ([nasal]) may be used for nasalized vowels and syllabic nasals
5. [body], [high], [low], [back] are used to specify vowel place and for velar syllabic nasals (/eng/)
6. [blade], [anterior], [distributed], [lateral], [rhotic] are used for syllabic liquids and alveolar syllabic nasals (/en/)
7. [lips] is used for labial syllabic nasals (/em/)
8. [round] is used for labial syllabic nasals (/em/) and for rounded vowels such as /uw/
9. Glide landmark G= [ [glide], ([stiff], [slack], [spread], [constricted]), [advanced tongue root], [constricted tongue root], [high], [low], [back], [anterior], [distributed], [lateral], [rhotic], [round] ]
10. [stiff], [slack], [spread], [constricted] may be used to specify voice quality such as glottalization; they are also used to specify a glottal stop and the aspirant glide /h/
11. Semivowels are specified for [advanced tongue root] and [constricted] tongue root
12. Glide place is specified by [high], [low], [back], [anterior], [distributed], [lateral], [rhotic]
13. [round] is specified for the semivowel /w/
14. Nasal closure and release landmarks Nc, Nr = [ [consonantal], [sonorant], [continuant], [nasal], [body], [high], [low], [back], [blade], [anterior], [distributed], [lateral], [rhotic], [lips], [round] ]
15. Nasal place is specified by [body], [high], [low], [back], [blade], [anterior], [distributed], [lateral], [rhotic], [lips], and [round]
16. Fricative closure and release landmarks Fc, Fr = [ [consonantal], [sonorant], [continuant], ([strident]), [stiff], [slack], [body], [high], [low], [back], [blade], [anterior], [distributed], [lateral], [rhotic], [lips], [round] ]
17. Fricatives marked for stridency are specified using [strident]
18. Fricative voicing is specified by [stiff] and [slack]
19. Fricative place is specified by [blade], [anterior], [distributed], [lateral], [rhotic], [lips], and [round]
20. Stop closure and release landmarks Sc, Sr = [ [consonantal], [sonorant], [continuant], [stiff], [slack], [spread], [constricted], [body], [high], [low], [back], [blade], [anterior], [distributed], [lateral], [rhotic], [lips], [round] ]
21. Stop voicing is specified by [stiff] and [slack]; it is possible to include [spread] and [constricted] to specify 3-way or 4-way distinctions of stops
22. Stop place is specified by [body], [high], [low], [back], [blade], [anterior], [distributed], [lateral], [rhotic], [lips], [round]
23. Stridency onset and offset landmarks Tn, Tf = [ [consonantal], [sonorant], [continuant], [strident] ]
24. Stridency landmarks only specify onset/offset of stridency

These forms may be combined to represent complex sequences of sounds, such as affricates and diphthongs.

1. Affricates may be represented as a sequence of { Sc, Sr/Fc, Fr } landmarks, where each landmark is specified with its respective distinctive features
2. Diphthongs may be represented as a sequence of { V, G } landmarks, where the glide landmark is marked [-glide] to indicate that it is not a proper glide.

Other information may also be appended to each acoustic landmark for processing purposes. Examples are: associated phoneme, syllabic constituent, lexical stress, prosodic constituent, etc. These may be included as a list, or as a hierarchical structure.