More Practice with Features

This exercise is optional. Answers at the end.

To do the following problems, open FeaturePad and select the **English** phoneme inventory.

1. [u, ʊ, o, ɔ] are deleted in word-final position after [p, b, m] (modeled on Telugu).

2. [i, ɪ, e, ɛ, æ] become [y, ʏ, ø, œ, ɶ] after [w, ʍ] (modeled on a rule of Yana).

3. [n, t, d] become [ŋ, k, g] before [k, g] (place assimilation, found in many languages).

4. [ʃ, ʒ, t͡ʃ, d͡ʒ] become [s, z, t͡s, d͡z] when [s, z] follow later in the same word. (modeled on Navajo)

5. [θ, ð] become [f, v] in all contexts (found in the speech of many small children).

6. [f, θ, s, ʃ] become [v, ð, z, ʒ] when surrounded by vowels (modeled on Italian).

7. [ɛ, ɪ] become [e, i] before another vowel (modeled on British English).

8. [s, z] become [t͡s, d͡z] after [n] (English dialects: *dance*, *lens*)

9. [l, ɹ, w, j] become [l̩, ɻ̍, u, i] in word final position after a consonant. (modeled on Russian)

10. [t, d] become [ɾ] if preceded by a vowel or [ɹ] and followed by a vowel. To make the rule simple, you may assume that there are no underlying forms in which [t,d] are preceded by [w, ʍ, j, h]. (actual rule of American English)

11. [p, t, t͡ʃ, k] are aspirated word-initially.   (modeled on English)

12. [t, d, s, z] become [t͡ʃ, d͡ʒ, ʃ, ʒ] before [i, j] (modeled on Japanese)

13. [m] becomes [ɱ] before [f, v] (real rule of English)

Now go to the **Phoneme** menu (top of the screen) and switch to the phoneme inventory of Spanish. Do these rules:

14. [b, d̪, g] → [β, ð, ɣ] between vowels. (modeled on Spanish)

15. [l̩] → [n̩] before a nasal (modeled on Korean)

16. [u] → [y] / ___ [j, ɲ, ʎ] (modeled on Majorcan Catalan)

17. [w] → [β] / ___ [i, e] (modeled on Garifuna)

18. [k, g, x] → [t͡ʃ, d͡ʒ, ʃ] / [j, i, e] (modeled on Hausa)

19. [ɾ] → [r] at the end of a word, in emphatic speech (real rule of many Spanish dialects)

20. [ʎ] → [j] everywhere (optional rule of Spanish dialects a few centuries ago)

Answers

I've given the rules names, to help you learn the (rather unsystematic) art of rule-naming.

If you're curious about how all of these feature matrices were word-processed, see http://www.linguistics.ucla.edu/people/hayes/120a/Writeup.pdf.

1. Rounded Vowel Deletion

$$\begin{bmatrix} +\text{syllabic} \\ +\text{round} \end{bmatrix} \rightarrow \varnothing \ / \begin{bmatrix} +\text{LABIAL} \\ +\text{contin}_{\text{artic}} \end{bmatrix} \underline{\quad}$$

2. Post-glide Rounding Assimilation

$$\begin{bmatrix} +\text{syllabic} \\ +\text{front} \end{bmatrix} \rightarrow \begin{bmatrix} +\text{LABIAL} \\ +\text{round} \end{bmatrix} \ / \begin{bmatrix} -\text{syllabic} \\ +\text{round} \end{bmatrix} \underline{\quad}$$

3. Velar Place Assimilation

$$\begin{bmatrix} -\text{contin}_{\text{artic}} \\ +\text{anterior} \end{bmatrix} \rightarrow \begin{bmatrix} -\text{CORONAL} \\ 0\text{anterior} \\ 0\text{distributed} \\ 0\text{strident} \\ +\text{DORSAL} \\ +\text{high} \\ -\text{low} \end{bmatrix} \ / \ \underline{\quad} \begin{bmatrix} -\text{contin}_{\text{acoust}} \\ +\text{DORSAL} \end{bmatrix}$$

The rule is a bit complicated, for the reason that we want to guarantee that velars "don't care" about the details of the position of the tongue blade. Note that DORSAL appears on both side of the rule, indicating an assimilation.

4. Sibilant Harmony

$$[+\text{strident}] \rightarrow \begin{bmatrix} -\text{anterior} \\ -\text{distributed} \end{bmatrix} \ / \ \underline{\quad} X \begin{bmatrix} +\text{strident} \\ +\text{anterior} \end{bmatrix}$$

Note: left side needn't have [–anterior], if the rule is applied "like rain," converting [s,z] vacuously to [s, z]. FeaturePad insists on this point.

5. Dental Fricative Avoidance

$$
\begin{bmatrix} -\text{sonorant} \\ +\text{continuant}_{\text{acoustic}} \\ -\text{strident} \end{bmatrix} \rightarrow \begin{bmatrix} +\text{LABIAL} \\ +\text{labiodental} \\ -\text{CORONAL} \\ 0\text{anterior} \\ 0\text{distributed} \\ 0\text{strident} \end{bmatrix}
$$

[+continuant$_{\text{articulatory}}$] works equally well on the left side. The zeroes are needed on the right side under the assumption that labials are "don't care" for the tongue blade features.[1]

6. Intervocalic Fricative Voicing

$$
\begin{bmatrix} -\text{sonorant} \\ +\text{continuant}_{\text{acoustic}} \end{bmatrix} \rightarrow [+\text{voice}] \; / \; [+\text{syllabic}] \; \underline{\hspace{1em}} \; [+\text{syllabic}]
$$

The feature [+continuant$_{\text{articulatory}}$], instead of [+continuant$_{\text{acoustic}}$], also works. Note that [–voice] does not appear on the left side of the rule, since it's not needed (rule can safely apply to the voiced fricatives without changing them).

7. Prevocalic Tensing

$$
\begin{bmatrix} +\text{syllabic} \\ +\text{front} \\ -\text{low} \end{bmatrix} \rightarrow [+\text{tense}] \; / \; \underline{\hspace{1em}} \; [+\text{syllabic}]
$$

For the same reason as before, we need not specify [–tense] on the left side of the arrow.

8. Postnasal Fricative Hardening

$$
\begin{bmatrix} +\text{anterior} \\ +\text{strident} \end{bmatrix} \rightarrow \begin{bmatrix} -\text{continuant}_{\text{articulatory}} \\ -\text{continuant}_{\text{acoustic}} \end{bmatrix} \; / \; n \; \underline{\hspace{1em}}
$$

This is the answer FeaturePad will approve. I feel that a better answer would be to describe the [n] as (the one sound which is) [–continuant$_{\text{articulatory}}$, +nasal, +CORONAL]. Reason: it characterizes the rule as an assimilation.

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[1] As a test, try saying [ɪʃpʃə] and [ɪspsə], checking tongue blade position during the [p].

9. Glide Vocalization

$$\begin{bmatrix} +\text{sonorant} \\ +\text{continuant}_{\text{acoustic}} \end{bmatrix} \rightarrow [+\text{syllabic}] \: / \: [-\text{syllabic}] \underline{\quad} \:]_{\text{word}}$$

[–syllabic] not needed on left side of arrow, rule can apply harmlessly to sounds that are already [+syllabic].

10. Tapping

$$\begin{bmatrix} -\text{continuant}_{\text{acoustic}} \\ +\text{anterior} \end{bmatrix} \rightarrow \begin{bmatrix} +\text{sonorant} \\ +\text{continuant}_{\text{articulatory}} \\ +\text{continuant}_{\text{acoustic}} \\ +\text{delayed release} \\ +\text{approximant} \\ +\text{flap} \\ +\text{voice} \end{bmatrix} \: / \: [-\text{consonantal}] \underline{\quad} [+\text{syllabic}]$$

11. Initial Aspiration

$$\begin{bmatrix} -\text{contin}_{\text{artic}} \\ -\text{voice} \end{bmatrix} \rightarrow [+\text{spread glottis}] \: / \: [_{\text{word}} \underline{\quad}$$

12. Alveolar Palatalization

$$\begin{bmatrix} -\text{sonorant} \\ -\text{distributed} \end{bmatrix} \rightarrow \begin{bmatrix} +\text{delayed released} \\ -\text{anterior} \\ +\text{distributed} \\ +\text{strident} \end{bmatrix} \: / \: \underline{\quad} \begin{bmatrix} +\text{high} \\ +\text{front} \\ +\text{tense} \end{bmatrix}$$

[–distributed] suffices to single out the alveolars, since dentals and palato-alveolars are [+distributed], and all other sounds are "don't care".

13. Labiodental Assimilation

$$\begin{bmatrix} +\text{nasal} \\ +\text{LABIAL} \end{bmatrix} \rightarrow [+\text{labiodental}] \: / \: \underline{\quad} [+\text{labiodental}]$$

14. Intervocalic Spirantization

$$\begin{bmatrix} -\text{sonorant} \\ +\text{voice} \end{bmatrix} \rightarrow \begin{bmatrix} +\text{continuant}_{\text{artic}} \\ +\text{continuant}_{\text{acoust}} \\ +\text{delayed release} \end{bmatrix} \: / \: [+\text{syllabic}] \underline{\quad} [+\text{syllabic}]$$

15. Nasality Assimilation

$$\begin{bmatrix} +\text{anterior} \\ +\text{lateral} \end{bmatrix} \rightarrow \begin{bmatrix} -\text{continuant}_{\text{artic}} \\ -\text{delayed release} \\ -\text{approximant} \\ +\text{nasal} \\ -\text{lateral} \end{bmatrix} / \underline{} \; [+\text{nasal}]$$

16. Prepalatal Fronting

$$\begin{bmatrix} +\text{syllabic} \\ +\text{round} \\ +\text{high} \end{bmatrix} \rightarrow \begin{bmatrix} +\text{front} \\ -\text{back} \end{bmatrix} / \underline{} \begin{bmatrix} -\text{syllabic} \\ +\text{front} \end{bmatrix}$$

17. /w/ Hardening

$$\begin{bmatrix} -\text{syllabic} \\ +\text{round} \end{bmatrix} \rightarrow \begin{bmatrix} +\text{consonantal} \\ -\text{sonorant} \\ -\text{approximant} \\ -\text{round} \\ -\text{DORSAL} \\ 0\text{high} \\ 0\text{low} \\ 0\text{front} \\ 0\text{back} \end{bmatrix} / \underline{} \begin{bmatrix} +\text{syllabic} \\ +\text{front} \end{bmatrix}$$

     I suspect that in real Garifuna, the [β] derived from /w/ is actually [+front, +high]; that is, the rule is partly an assimilation. If so, we wouldn't have to change the last five features.

18. Velar Palatalization

$$\begin{bmatrix} -\text{sonorant} \\ +\text{DORSAL} \end{bmatrix} \rightarrow \begin{bmatrix} +\text{delayed released} \\ +\text{CORONAL} \\ -\text{anterior} \\ +\text{distributed} \\ +\text{strident} \\ -\text{DORSAL} \\ 0\text{high} \\ 0\text{low} \end{bmatrix} / \underline{} \begin{bmatrix} -\text{cons} \\ +\text{front} \end{bmatrix}$$

19. Tap Fortition

$$[+\text{flap}] \rightarrow \begin{bmatrix} -\text{flap} \\ +\text{trill} \end{bmatrix} / \underline{} \;]_{\text{word}}$$

     Note version 2.0 of FeaturePad, if it is ever produced, will rename the feature [flap] to the IPA-official form [tap].

20. Delateralization

$$
\begin{bmatrix} -\text{anterior} \\ +\text{lateral} \end{bmatrix} \rightarrow
\begin{bmatrix}
-\text{consonantal} \\
-\text{CORONAL} \\
0\text{anterior} \\
0\text{distributed} \\
0\text{strident} \\
-\text{lateral} \\
+\text{tense}
\end{bmatrix}
$$

     This rule is pretty ugly; it would be simpler if we recognize that most [j] in Spanish are close close to being fricatives, and thus might be [+consonantal]. Also, if [j] counts as coronal, as in Ewe, then we wouldn't have to make all the coronal features "don't care".