

Typological consequences of candidate omission for weighted and ranked constraints in the $\{C,V\}$ syllable structure model

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Abstract

This technical report presents a case study of the generative consequences of candidate omission in grammar formalisms based on optimization over weighted or ranked constraints. Using a set of constraints on the syllabification of vowel and consonant sequences, we show that the omission of certain candidates has effects that go well beyond the simple failure to generate the omitted forms. Specifically, the omission of some candidates can, in some cases, introduce spurious distinctions that interact with actual distinctions (and other spurious ones) to yield a system that significantly diverges from the set of patterns generated when all candidates are considered.

1 Introduction

In this paper, we present a case study of the generative consequences of candidate omission using a small optimality-theoretic grammar for syllabification. In principle, the candidate set for an input form i is the range of $Gen(i)$ for a given generating function Gen (see Prince and Smolensky 1993:17). In practice, however, analyses often cover just a few candidates that are deemed relevant. Here, we examine the consequences of this practice of omitting candidates, using a grammar for the syllabification of strings of consonants and vowels based on the CV-syllable theory of Prince and Smolensky (1993:ch 6).

2 Constraints, Gen , and input forms

2.1 Constraints

Our constraint set has five members: ONSET, *CODA, DEPV, DEPC and MAX. The first two constraints respectively penalize syllables that lack onsets and syllables that have codas, the next two penalize epenthesis of vowels and consonants and the last penalizes deletion.

- DEPC, pyPhon regex= $-:C$
penalizes input-output (i/o) mapping $\emptyset \rightarrow C$
- DEPV, pyPhon regex= $-:V$
penalizes i/o mapping $\emptyset \rightarrow V$
- MAX, pyPhon regex= $(C:-) | (V:-)$
penalizes i/o mappings $C \rightarrow \emptyset, V \rightarrow \emptyset$

- NOCODA, pyPhon regex= $C\backslash.$
penalizes the sequence [C.]
- ONSET, pyPhon regex= $\backslash.V$
penalizes the sequence [.V]

2.2 *Gen*

Following further in the spirit of the CV-syllable theory of Prince and Smolensky (1993:ch 6), we assume that *Gen* freely allows deletion and insertion of C, V, and ‘.’ (the syllable boundary symbol), but excludes clusters and excludes syllables without exactly one V (e.g., no output contains CC, VV, .C., or VCV). In other words, the candidate generating function produces all possible sequences input-output mappings, subject to the following two *filters*, i.e., inviolable constraints, on output forms.

- STRUCTURECVC, pyPhon regex= $\backslash. ((V | CV | VC | CVC) \backslash.)^*$
all candidate outputs consist of zero or more of the above separated by "."s
- NOSUBSTITUTION, pyPhon regex= $(C:C | V:V | x:x | @:- | -:@)^*$
all candidates are generated by zero or more insertions and deletions of V,C, "."

We used the software package PyPhon (Bane and Riggle 2010) to generate the candidates, tableaux, and typologies in this report. The base model of *Gen* in PyPhon assumes that the inventory consists of every symbol mentioned in a constraint or filter (in this case C, V, and ".") and that candidates are generated from input forms by zero or more insertions, deletions, and substitutions of symbols in the inventory. This behavior is changed with filters like the NOSUBSTITUTION filter we used here to restrict *Gen* to insertion and deletion.

2.3 Input Forms

- In Sections 2 and 3 we will consider only two input forms: /VC/ and /CCVC/
- In Section 4 we will consider the 14 input forms in $\{V,C\}^3$
 $\{V,C,VV,VC,CV,CC,VVV,VVC,VCV,VCC,CVV,CVC,CCV,CCC\}$.

Here the notation Σ^n denotes the set of all strings of length 1 through n of symbols in the alphabet Σ .

3 OT Typology over two inputs

3.1 Tableaux

The following pair of tableaux contains complete sets of *contenders* (i.e., non-harmonically-bounded candidates) for the input forms /CCVC/ and /VC/, respectively. They were generated by PyPhon using the constraints and filters described in the previous section.

(1)

CCVC	DEPC	DEPV	MAX	NOCODA	ONSET
<i>a.</i> CVC	0	0	1	1	0
<i>b.</i> CV.CVC	0	1	0	1	0
<i>c.</i> CV.CV.CV	0	2	0	0	0
<i>d.</i> CV	0	0	2	0	0

(2)

VC	DEPC	DEPV	MAX	NOCODA	ONSET
<i>a.</i> CVC	1	0	0	1	0
<i>b.</i> V	0	0	1	0	1
<i>c.</i> \emptyset	0	0	2	0	0
<i>d.</i> CV	0	1	1	0	0
<i>e.</i> CV.CV	1	1	0	0	0
<i>f.</i> VC	0	0	0	1	1
<i>g.</i> V.CV	0	1	0	0	1
<i>h.</i> CV	1	0	1	0	0

These tableaux have respectively 4 and 8 candidates, but of the $8 \times 4 = 32$ candidate pairs, only 12 are actually generated by rankings of the constraints. These twelve pairs are the *typology* generated by this constraint set over these two input forms.

Below in §3.2, we give the twelve languages (i.e., candidate pairs) in the typology of these two tableaux and annotate each one with the number of rankings under which it is generated (its *ranking volume*, or r-volume). We also give, for each candidate in each pair, the set of Elementary Ranking Conditions (ERCs; Prince (2002)) that describes the rankings under which it is optimal in its tableau.

After enumerating this “true” typology—true in the sense that no candidates were omitted from either tableau in its computation—we spend the remainder of the section (§3.3–3.12) examining the pseudo-typologies that would have been generated if one candidate had been omitted from one of the tableaux. Each candidate occurs in at least one of the pairs in the true typology, so each of the possible omissions corresponds to a distinct pseudo-typology.

3.2 True 12-language typology (no omitted candidates)

Language 3.2.01 Generated by 7 (out of 5!) rankings, its r-volume is 0.058

/CCVC/ \rightarrow [CVC], (0,0,1,1,0) yields ERC set {ewlle, eewle}

/VC/ \rightarrow [CVC], (1,0,0,1,0) yields ERC set {lewle, leeew, ewele, lwelw}

Language 3.2.02 Generated by 9 (out of 5!) rankings, its r-volume is 0.075

/CCVC/ \rightarrow [CV.CVC], (0,1,0,1,0) yields ERC set {ewele, elwle}

/VC/ \rightarrow [CVC], (1,0,0,1,0) yields ERC set {lewle, leeew, ewele, lwelw}

Language 3.2.03 Generated by 8 (out of 5!) rankings, its r-volume is 0.066

/CCVC/ \rightarrow [CV], (0,0,1,1,0) yields ERC set {ewlle, eewle}

/VC/ \rightarrow [V], (0,0,2,0,0) yields ERC set {eewel, welwl, ewlee, eweel, wwlel, weeel, eelwe}

Language 3.2.04 Generated by 6 (out of 5!) rankings, its r-volume is 0.050

/CCVC/ \rightarrow [CVC], (0,0,1,1,0) yields ERC set {ewlle, eewle}

/VC/ \rightarrow \emptyset , (0,0,2,0,0) yields ERC set {ewlee, welee, eelwe}

Language 3.2.05 Generated by 24 (out of 5!) rankings, its r-volume is 0.2

/CCVC/ \rightarrow [CV], (0,0,2,0,0) yields ERC set {ewlee, eelwe}

/VC/ \rightarrow \emptyset , (0,0,2,0,0) yields ERC set {ewlee, welee, eelwe}

Language 3.2.06 Generated by 2 (out of 5!) rankings, its r-volume is 0.016

/CCVC/ \rightarrow [CV.CVC], (0,1,0,1,0) yields ERC set {ewele, elwle}

/VC/ \rightarrow [CV], (0,1,1,0,0) yields ERC set {elwee, eelwe, welee, wllwe, wleee, eleew, ellww}

Language 3.2.07 Generated by 8 (out of 5!) rankings, its r-volume is 0.066

/CCVC/ \rightarrow [CV.CV.CV], (0,2,0,0,0) yields ERC set {elwee, elewe}

/VC/ \rightarrow [CV], (0,1,1,0,0) yields ERC set {elwee, eelwe, welee, wllwe, wleee, eleew, ellww}

Language 3.2.08 Generated by 16 (out of 5!) rankings, its r-volume is 0.133

/CCVC/ \rightarrow [CV.CV.CV], (0,2,0,0,0) yields ERC set {elwee, elewe}

/VC/ \rightarrow [CV.CV], (1,1,0,0,0) yields ERC set {elewe, leeew, llwee, lleww}

Language 3.2.09 Generated by 7 (out of 5!) rankings, its r-volume is 0.058

/CCVC/ \rightarrow [CVC], (0,0,1,1,0) yields ERC set {ewlle, eewle}

/VC/ \rightarrow [VC], (0,0,0,1,1) yields ERC set {wwell, ewele, eewll, weeel}

Language 3.2.10 Generated by 9 (out of 5!) rankings, its r-volume is 0.075

/CCVC/ \rightarrow [CV.CVC], (0,1,0,1,0) yields ERC set {ewele, elwle}

/VC/ \rightarrow [VC], (0,0,0,1,1) yields ERC set {wwell, ewele, eewll, weeel}

Language 3.2.11 Generated by 16 (out of 5!) rankings, its r-volume is 0.133

/CCVC/ \rightarrow [CV.CV.CV], (0,2,0,0,0) yields ERC set {elwee, elewe}

/VC/ \rightarrow [V.CV], (0,1,0,0,1) yields ERC set {elewe, wlwll, elwel, weeel}

Language 3.2.12 Generated by 8 (out of 5!) rankings, its r-volume is 0.066

/CCVC/ \rightarrow [CV], (0,0,2,0,0) yields ERC set {ewlee, eelwe}

/VC/ \rightarrow [CV], (1,0,1,0,0) yields ERC set {lewee, ewlee, lwlew, lweee, leeew, lelww, eelwe}

3.3 Omission of $\langle /VC/ \rightarrow [CVC], (1,0,0,1,0) \rangle$, 11-lg. pseudo typology

Language 3.3.01 Generated by 7 (out of 5!) rankings, its r-volume is 0.058

$/CCVC/ \rightarrow [CVC]$, (0,0,1,1,0) yields ERC set {ewlle, eewle}

$/VC/ \rightarrow [CVC]$, (1,0,0,1,0) yields ERC set {lewle, leeew, ewele, lwelw}

Language 3.3.02 Generated by 9 (out of 5!) rankings, its r-volume is 0.075

$/CCVC/ \rightarrow [CV.CVC]$, (0,1,0,1,0) yields ERC set {ewele, elwle}

$/VC/ \rightarrow [CVC]$, (1,0,0,1,0) yields ERC set {lewle, leeew, ewele, lwelw}

Language 3.3.03 Generated by 6 (out of 5!) rankings, its r-volume is 0.050

$/CCVC/ \rightarrow [CVC]$, (0,0,1,1,0) yields ERC set {ewlle, eewle}

$/VC/ \rightarrow \emptyset$, (0,0,2,0,0) yields ERC set {welee, eelww, ewlee}

Language 3.3.04 Generated by 30 (out of 5!) rankings, its r-volume is 0.250

$/CCVC/ \rightarrow [CV]$, (0,0,2,0,0) yields ERC set {ewlee, eelwe}

$/VC/ \rightarrow \emptyset$, (0,0,2,0,0) yields ERC set {welee, eelww, ewlee}

Language 3.3.05 Generated by 2 (out of 5!) rankings, its r-volume is 0.016

$/CCVC/ \rightarrow [CV.CVC]$, (0,1,0,1,0) yields ERC set {ewele, elwle}

$/VC/ \rightarrow [CV]$, (0,1,1,0,0) yields ERC set {wllwe, elwee, welee, wleee, eelw, ellww}

Language 3.3.06 Generated by 8 (out of 5!) rankings, its r-volume is 0.066

$/CCVC/ \rightarrow [CV.CV.CV]$, (0,2,0,0,0) yields ERC set {elwee, elewe}

$/VC/ \rightarrow [CV]$, (0,1,1,0,0) yields ERC set {wllwe, elwee, welee, wleee, eelw, ellww}

Language 3.3.07 Generated by 16 (out of 5!) rankings, its r-volume is 0.133

$/CCVC/ \rightarrow [CV.CV.CV]$, (0,2,0,0,0) yields ERC set {elwee, elewe}

$/VC/ \rightarrow [CV.CV]$, (1,1,0,0,0) yields ERC set {lleww, leeew, llwee, elewe}

Language 3.3.08 Generated by 7 (out of 5!) rankings, its r-volume is 0.058

$/CCVC/ \rightarrow [CVC]$, (0,0,1,1,0) yields ERC set {ewlle, eewle}

$/VC/ \rightarrow [VC]$, (0,0,0,1,1) yields ERC set {wwell, ewele, eewll, weeel}

Language 3.3.09 Generated by 9 (out of 5!) rankings, its r-volume is 0.075

$/CCVC/ \rightarrow [CV.CVC]$, (0,1,0,1,0) yields ERC set {ewele, elwle}

$/VC/ \rightarrow [VC]$, (0,0,0,1,1) yields ERC set {wwell, ewele, eewll, weeel}

Language 3.3.10 Generated by 16 (out of 5!) rankings, its r-volume is 0.133

$/CCVC/ \rightarrow [CV.CV.CV]$, (0,2,0,0,0) yields ERC set {elwee, elewe}

$/VC/ \rightarrow [V.CV]$, (0,1,0,0,1) yields ERC set {elewe, wlewl, elwel, weeel}

Language 3.3.11 Generated by 10 (out of 5!) rankings, its r-volume is 0.083

$/CCVC/ \rightarrow [CV]$, (0,0,2,0,0) yields ERC set {ewlee, eelwe}

$/VC/ \rightarrow [CV]$, (1,0,1,0,0) yields ERC set {lewee, ewlee, lwlew, lweee, lelww, eelwe}

3.4 Omission of $\langle /VC/ \rightarrow [V], (0,0,1,0,1) \rangle$, 12-1g. pseudo typology

Language 3.4.01 Generated by 9 (out of 5!) rankings, its r-volume is 0.075

$/CCVC/ \rightarrow [CVC]$, (0,0,1,1,0) yields ERC set {ewlle, eewle}

$/VC/ \rightarrow [CVC]$, (1,0,0,1,0) yields ERC set {lwelw, eewle, lwwle, leeew, lewllw, ewele}

Language 3.4.02 Generated by 9 (out of 5!) rankings, its r-volume is 0.075

$/CCVC/ \rightarrow [CV.CVC]$, (0,1,0,1,0) yields ERC set {ewele, elwle}

$/VC/ \rightarrow [CVC]$, (1,0,0,1,0) yields ERC set {lwelw, eewle, lwwle, leeew, lewllw, ewele}

Language 3.4.03 Generated by 16 (out of 5!) rankings, its r-volume is 0.133

$/CCVC/ \rightarrow [CV]$, (0,0,2,0,0) yields ERC set {ewlee, eelwe}

$/VC/ \rightarrow [V]$, (0,0,1,0,1) yields ERC set {welwl, ewlee, eweel, wwlel, weeel, eelwe}

Language 3.4.04 Generated by 2 (out of 5!) rankings, its r-volume is 0.016

$/CCVC/ \rightarrow [CVC]$, (0,0,1,1,0) yields ERC set {ewlle, eewle}

$/VC/ \rightarrow [CV]$, (0,1,1,0,0) yields ERC set {wllwe, welee, eeew, wleee, eleew, ellww}

Language 3.4.05 Generated by 2 (out of 5!) rankings, its r-volume is 0.016

$/CCVC/ \rightarrow [CV.CVC]$, (0,1,0,1,0) yields ERC set {ewele, elwle}

$/VC/ \rightarrow [CV]$, (0,1,1,0,0) yields ERC set {wllwe, welee, eeew, wleee, eleew, ellww}

Language 3.4.06 Generated by 8 (out of 5!) rankings, its r-volume is 0.066

$/CCVC/ \rightarrow [CV.CV.CV]$, (0,2,0,0,0) yields ERC set {elwee, elewe}

$/VC/ \rightarrow [CV]$, (0,1,1,0,0) yields ERC set {wllwe, welee, eeew, wleee, eleew, ellww}

Language 3.4.07 Generated by 8 (out of 5!) rankings, its r-volume is 0.066

$/CCVC/ \rightarrow [CV]$, (0,0,2,0,0) yields ERC set {ewlee, eelwe}

$/VC/ \rightarrow [CV]$, (0,1,1,0,0) yields ERC set {wllwe, welee, eeew, wleee, eleew, ellww}

Language 3.4.08 Generated by 16 (out of 5!) rankings, its r-volume is 0.133

$/CCVC/ \rightarrow [CV.CV.CV]$, (0,2,0,0,0) yields ERC set {elwee, elewe}

$/VC/ \rightarrow [CV.CV]$, (1,1,0,0,0) yields ERC set {elwee, lleww, elewe, lewee, llwew, leeew}

Language 3.4.09 Generated by 9 (out of 5!) rankings, its r-volume is 0.075

$/CCVC/ \rightarrow [CVC]$, (0,0,1,1,0) yields ERC set {ewlle, eewle}

$/VC/ \rightarrow [VC]$, (0,0,0,1,1) yields ERC set {eewle, ewlll, wwell, weeel, ewele, ewell}

Language 3.4.10 Generated by 9 (out of 5!) rankings, its r-volume is 0.075

$/CCVC/ \rightarrow [CV.CVC]$, (0,1,0,1,0) yields ERC set {ewele, elwle}

$/VC/ \rightarrow [VC]$, (0,0,0,1,1) yields ERC set {eewle, ewlll, wwell, weeel, ewele, ewell}

Language 3.4.11 Generated by 16 (out of 5!) rankings, its r-volume is 0.133

$/CCVC/ \rightarrow [CV.CV.CV]$, (0,2,0,0,0) yields ERC set {elwee, elewe}

$/VC/ \rightarrow [V.CV]$, (0,1,0,0,1) yields ERC set {elwee, eewel, weeel, elewe, wlwel, wlewl}

Language 3.4.12 Generated by 16 (out of 5!) rankings, its r-volume is 0.133

$/CCVC/ \rightarrow [CV]$, (0,0,2,0,0) yields ERC set {ewlee, eelwe}

$/VC/ \rightarrow [CV]$, (1,0,1,0,0) yields ERC set {ewlee, lwlew, lweee, leeew, lelww, eelwe}

3.5 Omission of $\langle /VC/ \rightarrow \square, (0,0,2,0,0) \rangle$, 12-lg. pseudo typology

Language 3.5.01 Generated by 7 (out of 5!) rankings, its r-volume is 0.058

$/CCVC/ \rightarrow [CVC]$, (0,0,1,1,0) yields ERC set {ewlle, eewle}

$/VC/ \rightarrow [CVC]$, (1,0,0,1,0) yields ERC set {lewle, leeew, ewele, lwelw}

Language 3.5.02 Generated by 9 (out of 5!) rankings, its r-volume is 0.075

$/CCVC/ \rightarrow [CV.CVC]$, (0,1,0,1,0) yields ERC set {ewele, elwle}

$/VC/ \rightarrow [CVC]$, (1,0,0,1,0) yields ERC set {lewle, leeew, ewele, lwelw}

Language 3.5.03 Generated by 8 (out of 5!) rankings, its r-volume is 0.066

$/CCVC/ \rightarrow [CV]$, (0,0,2,0,0) yields ERC set {ewlee, eelwe}

$/VC/ \rightarrow [V]$, (0,0,1,0,1) yields ERC set {eewel, welwl, ewlee, wwlel, weeel, eelwe}

Language 3.5.04 Generated by 6 (out of 5!) rankings, its r-volume is 0.050

$/CCVC/ \rightarrow [CVC]$, (0,0,1,1,0) yields ERC set {ewlle, eewle}

$/VC/ \rightarrow \emptyset$, (0,0,2,0,0) yields ERC set {welee, eelew}

Language 3.5.05 Generated by 2 (out of 5!) rankings, its r-volume is 0.016

$/CCVC/ \rightarrow [CV.CVC]$, (0,1,0,1,0) yields ERC set {ewele, elwle}

$/VC/ \rightarrow \emptyset$, (0,0,2,0,0) yields ERC set {welee, eelew}

Language 3.5.06 Generated by 8 (out of 5!) rankings, its r-volume is 0.066

$/CCVC/ \rightarrow [CV.CV.CV]$, (0,2,0,0,0) yields ERC set {elwee, elewe}

$/VC/ \rightarrow \emptyset$, (0,0,2,0,0) yields ERC set {welee, eelew}

Language 3.5.07 Generated by 24 (out of 5!) rankings, its r-volume is 0.200

$/CCVC/ \rightarrow [CV]$, (0,0,2,0,0) yields ERC set {ewlee, eelwe}

$/VC/ \rightarrow \emptyset$, (0,0,2,0,0) yields ERC set {welee, eelew}

Language 3.5.08 Generated by 16 (out of 5!) rankings, its r-volume is 0.133

$/CCVC/ \rightarrow [CV.CV.CV]$, (0,2,0,0,0) yields ERC set {elwee, elewe}

$/VC/ \rightarrow [CV.CV]$, (1,1,0,0,0) yields ERC set {lleww, leeew, llwee, elewe}

Language 3.5.09 Generated by 7 (out of 5!) rankings, its r-volume is 0.058

$/CCVC/ \rightarrow [CVC]$, (0,0,1,1,0) yields ERC set {ewlle, eewle}

$/VC/ \rightarrow [VC]$, (0,0,0,1,1) yields ERC set {eewll, ewele, wwell, weeel}

Language 3.5.10 Generated by 9 (out of 5!) rankings, its r-volume is 0.075

$/CCVC/ \rightarrow [CV.CVC]$, (0,1,0,1,0) yields ERC set {ewele, elwle}

$/VC/ \rightarrow [VC]$, (0,0,0,1,1) yields ERC set {eewll, ewele, wwell, weeel}

Language 3.5.11 Generated by 16 (out of 5!) rankings, its r-volume is 0.133

$/CCVC/ \rightarrow [CV.CV.CV]$, (0,2,0,0,0) yields ERC set {elwee, elewe}

$/VC/ \rightarrow [V.CV]$, (0,1,0,0,1) yields ERC set {elewe, wlwlel, elwel, weeel}

Language 3.5.12 Generated by 8 (out of 5!) rankings, its r-volume is 0.066

$/CCVC/ \rightarrow [CV]$, (0,0,2,0,0) yields ERC set {ewlee, eelwe}

$/VC/ \rightarrow [CV]$, (1,0,1,0,0) yields ERC set {lewee, ewlee, lwlew, leeew, lelww, eelwe}

3.6 Omission of $\langle /VC/ \rightarrow [CV], (0,1,1,0,0) \rangle$, 13-lg. pseudo typology

Language 3.6.01 Generated by 7 (out of 5!) rankings, its r-volume is 0.058
/CCVC/ \rightarrow [CVC], (0,0,1,1,0) yields ERC set {ewlle, eewle}

/VC/ \rightarrow [CVC], (1,0,0,1,0) yields ERC set {lewle, leeew, lwelw}

Language 3.6.02 Generated by 9 (out of 5!) rankings, its r-volume is 0.075
/CCVC/ \rightarrow [CV.CVC], (0,1,0,1,0) yields ERC set {ewele, elwle}

/VC/ \rightarrow [CVC], (1,0,0,1,0) yields ERC set {lewle, leeew, lwelw}

Language 3.6.03 Generated by 6 (out of 5!) rankings, its r-volume is 0.050
/CCVC/ \rightarrow [CV.CV.CV], (0,2,0,0,0) yields ERC set {elwee, elewe}

/VC/ \rightarrow [CVC], (1,0,0,1,0) yields ERC set {lewle, leeew, lwelw}

Language 3.6.04 Generated by 8 (out of 5!) rankings, its r-volume is 0.066
/CCVC/ \rightarrow [CV], (0,0,2,0,0) yields ERC set {ewlee, eelwe}

/VC/ \rightarrow [V], (0,0,1,0,1) yields ERC set {eewel, welwl, ewlee, eweel, weeel, eelwe}

Language 3.6.05 Generated by 6 (out of 5!) rankings, its r-volume is 0.050
/CCVC/ \rightarrow [CVC], (0,0,1,1,0) yields ERC set {ewlle, eewle}

/VC/ \rightarrow \emptyset , (0,0,2,0,0) yields ERC set {welee, eelew, ewlee}

Language 3.6.06 Generated by 24 (out of 5!) rankings, its r-volume is 0.200
/CCVC/ \rightarrow [CV], (0,0,2,0,0) yields ERC set {ewlee, eelwe}

/VC/ \rightarrow \emptyset , (0,0,2,0,0) yields ERC set {welee, eelew, ewlee}

Language 3.6.07 Generated by 2 (out of 5!) rankings, its r-volume is 0.016
/CCVC/ \rightarrow [CV.CVC], (0,1,0,1,0) yields ERC set {ewele, elwle}

/VC/ \rightarrow [CV], (0,1,1,0,0) yields ERC set {wllwe, elwee, eelew, wleee, eleew, ellww}

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/CCVC/ \rightarrow [CV.CV.CV], (0,2,0,0,0) yields ERC set {elwee, elewe}

/VC/ \rightarrow [CV], (0,1,1,0,0) yields ERC set {wllwe, elwee, eelew, wleee, eleew, ellww}

Language 3.6.09 Generated by 7 (out of 5!) rankings, its r-volume is 0.058
/CCVC/ \rightarrow [CVC], (0,0,1,1,0) yields ERC set {ewlle, eewle}

/VC/ \rightarrow [VC], (0,0,0,1,1) yields ERC set {ewele, eewll, weeel}

Language 3.6.10 Generated by 9 (out of 5!) rankings, its r-volume is 0.075
/CCVC/ \rightarrow [CV.CVC], (0,1,0,1,0) yields ERC set {ewele, elwle}

/VC/ \rightarrow [VC], (0,0,0,1,1) yields ERC set {ewele, eewll, weeel}

Language 3.6.11 Generated by 22 (out of 5!) rankings, its r-volume is 0.183
/CCVC/ \rightarrow [CV.CV.CV], (0,2,0,0,0) yields ERC set {elwee, elewe}

/VC/ \rightarrow [V.CV], (0,1,0,0,1) yields ERC set {elewe, elwel, wlewl}

Language 3.6.12 Generated by 2 (out of 5!) rankings, its r-volume is 0.016
/CCVC/ \rightarrow [CV.CV.CV], (0,2,0,0,0) yields ERC set {elwee, elewe}

/VC/ \rightarrow [CV], (1,0,1,0,0) yields ERC set {lewee, lwlew, lweee, leeew, lelww, eelwe}

Language 3.6.13 Generated by 8 (out of 5!) rankings, its r-volume is 0.066
/CCVC/ \rightarrow [CV], (0,0,2,0,0) yields ERC set {ewlee, eelwe}

/VC/ \rightarrow [CV], (1,0,1,0,0) yields ERC set {lewee, lwlew, lweee, leeew, lelww, eelwe}

3.7 Omission of $\langle /VC/ \rightarrow [CV.CV], (1,1,0,0,0) \rangle$, 12-lg. pseudo typology

Language 3.7.01 Generated by 10 (out of 5!) rankings, its r-volume is 0.083

$/CCVC/ \rightarrow [CVC]$, (0,0,1,1,0) yields ERC set {ewlle, eewle}

$/VC/ \rightarrow [CVC]$, (1,0,0,1,0) yields ERC set {lewle, ewele, lwelw}

Language 3.7.02 Generated by 12 (out of 5!) rankings, its r-volume is 0.100

$/CCVC/ \rightarrow [CV.CVC]$, (0,1,0,1,0) yields ERC set {ewele, elwle}

$/VC/ \rightarrow [CVC]$, (1,0,0,1,0) yields ERC set {lewle, ewele, lwelw}

Language 3.7.03 Generated by 4 (out of 5!) rankings, its r-volume is 0.033

$/CCVC/ \rightarrow [CVC]$, (0,0,1,1,0) yields ERC set {ewlle, eewle}

$/VC/ \rightarrow [V]$, (0,0,1,0,1) yields ERC set {eewel, welwl, ewlee, eweel, wwlel, weeel}

Language 3.7.04 Generated by 8 (out of 5!) rankings, its r-volume is 0.066

$/CCVC/ \rightarrow [CV]$, (0,0,2,0,0) yields ERC set {ewlee, eelwe}

$/VC/ \rightarrow [V]$, (0,0,1,0,1) yields ERC set {eewel, welwl, ewlee, eweel, wwlel, weeel}

Language 3.7.05 Generated by 6 (out of 5!) rankings, its r-volume is 0.050

$/CCVC/ \rightarrow [CVC]$, (0,0,1,1,0) yields ERC set {ewlle, eewle}

$/VC/ \rightarrow \emptyset$, (0,0,2,0,0) yields ERC set {welee, eelew, ewlee}

Language 3.7.06 Generated by 24 (out of 5!) rankings, its r-volume is 0.200

$/CCVC/ \rightarrow [CV]$, (0,0,2,0,0) yields ERC set {ewlee, eelwe}

$/VC/ \rightarrow \emptyset$, (0,0,2,0,0) yields ERC set {welee, eelew, ewlee}

Language 3.7.07 Generated by 2 (out of 5!) rankings, its r-volume is 0.016

$/CCVC/ \rightarrow [CV.CVC]$, (0,1,0,1,0) yields ERC set {ewele, elwle}

$/VC/ \rightarrow [CV]$, (0,1,1,0,0) yields ERC set {wllwe, elwee, welee, eleew, eelew, wlee}

Language 3.7.08 Generated by 8 (out of 5!) rankings, its r-volume is 0.066

$/CCVC/ \rightarrow [CV.CV.CV]$, (0,2,0,0,0) yields ERC set {elwee, elewe}

$/VC/ \rightarrow [CV]$, (0,1,1,0,0) yields ERC set {wllwe, elwee, welee, eleew, eelew, wlee}

Language 3.7.09 Generated by 16 (out of 5!) rankings, its r-volume is 0.133

$/CCVC/ \rightarrow [CV.CV.CV]$, (0,2,0,0,0) yields ERC set {elwee, elewe}

$/VC/ \rightarrow [CV.CV]$, (1,1,0,0,0) yields ERC set {leeew, llwee, elewe}

Language 3.7.10 Generated by 6 (out of 5!) rankings, its r-volume is 0.050

$/CCVC/ \rightarrow [CV.CVC]$, (0,1,0,1,0) yields ERC set {ewele, elwle}

$/VC/ \rightarrow [V.CV]$, (0,1,0,0,1) yields ERC set {wlewl, elwel, weel}

Language 3.7.11 Generated by 16 (out of 5!) rankings, its r-volume is 0.133

$/CCVC/ \rightarrow [CV.CV.CV]$, (0,2,0,0,0) yields ERC set {elwee, elewe}

$/VC/ \rightarrow [V.CV]$, (0,1,0,0,1) yields ERC set {wlewl, elwel, weel}

Language 3.7.12 Generated by 8 (out of 5!) rankings, its r-volume is 0.066

$/CCVC/ \rightarrow [CV]$, (0,0,2,0,0) yields ERC set {ewlee, eelwe}

$/VC/ \rightarrow [CV]$, (1,0,1,0,0) yields ERC set {leewe, ewlee, lwlew, lweee, leeew, eelwe}

3.8 Omission of $\langle /VC/ \rightarrow [VC], (0,0,0,1,1) \rangle$, 13-lg. pseudo typology

Language 3.8.01 Generated by 7 (out of 5!) rankings, its r-volume is 0.058

$/CCVC/ \rightarrow [CVC]$, (0,0,1,1,0) yields ERC set {ewlle, eewle}

$/VC/ \rightarrow [CVC]$, (1,0,0,1,0) yields ERC set {lewle, leeew, ewele}

Language 3.8.02 Generated by 9 (out of 5!) rankings, its r-volume is 0.075

$/CCVC/ \rightarrow [CV.CVC]$, (0,1,0,1,0) yields ERC set {ewele, elwle}

$/VC/ \rightarrow [CVC]$, (1,0,0,1,0) yields ERC set {lewle, leeew, ewele}

Language 3.8.03 Generated by 2 (out of 5!) rankings, its r-volume is 0.016

$/CCVC/ \rightarrow [CV.CV.CV]$, (0,2,0,0,0) yields ERC set {elwee, elewe}

$/VC/ \rightarrow [V]$, (0,0,1,0,1) yields ERC set {eewel, welwl, eweel, wwlel, weeel, eelwe}

Language 3.8.04 Generated by 8 (out of 5!) rankings, its r-volume is 0.066

$/CCVC/ \rightarrow [CV]$, (0,0,2,0,0) yields ERC set {ewlee, eelwe}

$/VC/ \rightarrow [V]$, (0,0,1,0,1) yields ERC set {eewel, welwl, eweel, wwlel, weeel, eelwe}

Language 3.8.05 Generated by 6 (out of 5!) rankings, its r-volume is 0.050

$/CCVC/ \rightarrow [CVC]$, (0,0,1,1,0) yields ERC set {ewlle, eewle}

$/VC/ \rightarrow \emptyset$, (0,0,2,0,0) yields ERC set {welee, eeew, ewlee}

Language 3.8.06 Generated by 24 (out of 5!) rankings, its r-volume is 0.200

$/CCVC/ \rightarrow [CV]$, (0,0,2,0,0) yields ERC set {ewlee, eelwe}

$/VC/ \rightarrow \emptyset$, (0,0,2,0,0) yields ERC set {welee, eeew, ewlee}

Language 3.8.07 Generated by 2 (out of 5!) rankings, its r-volume is 0.016

$/CCVC/ \rightarrow [CV.CVC]$, (0,1,0,1,0) yields ERC set {ewele, elwle}

$/VC/ \rightarrow [CV]$, (0,1,1,0,0) yields ERC set {wllwe, elwee, eleew, wleee, welee, ellww}

Language 3.8.08 Generated by 10 (out of 5!) rankings, its r-volume is 0.083

$/CCVC/ \rightarrow [CV.CV.CV]$, (0,2,0,0,0) yields ERC set {elwee, elewe}

$/VC/ \rightarrow [CV]$, (0,1,1,0,0) yields ERC set {wllwe, elwee, eleew, wleee, welee, ellww}

Language 3.8.09 Generated by 22 (out of 5!) rankings, its r-volume is 0.183

$/CCVC/ \rightarrow [CV.CV.CV]$, (0,2,0,0,0) yields ERC set {elwee, elewe}

$/VC/ \rightarrow [CV.CV]$, (1,1,0,0,0) yields ERC set {elewe, llwee, lleww}

Language 3.8.10 Generated by 7 (out of 5!) rankings, its r-volume is 0.058

$/CCVC/ \rightarrow [CVC]$, (0,0,1,1,0) yields ERC set {ewlle, eewle}

$/VC/ \rightarrow [VC]$, (0,0,0,1,1) yields ERC set {wwell, eewll, weeel}

Language 3.8.11 Generated by 9 (out of 5!) rankings, its r-volume is 0.075

$/CCVC/ \rightarrow [CV.CVC]$, (0,1,0,1,0) yields ERC set {ewele, elwle}

$/VC/ \rightarrow [VC]$, (0,0,0,1,1) yields ERC set {wwell, eewll, weeel}

Language 3.8.12 Generated by 6 (out of 5!) rankings, its r-volume is 0.050

$/CCVC/ \rightarrow [CV.CV.CV]$, (0,2,0,0,0) yields ERC set {elwee, elewe}

$/VC/ \rightarrow [VC]$, (0,0,0,1,1) yields ERC set {wwell, eewll, weeel}

Language 3.8.13 Generated by 8 (out of 5!) rankings, its r-volume is 0.066

$/CCVC/ \rightarrow [CV]$, (0,0,2,0,0) yields ERC set {ewlee, eelwe}

$/VC/ \rightarrow [CV]$, (1,0,1,0,0) yields ERC set {lewee, ewlee, lweee, leeew, lelww, eelwe}

3.9 Omission of $\langle /VC/ \rightarrow [V.CV], (0,1,0,0,1) \rangle$, 11-lg. pseudo typology

Language 3.9.01 Generated by 7 (out of 5!) rankings, its r-volume is 0.058

$/CCVC/ \rightarrow [CVC]$, (0,0,1,1,0) yields ERC set {ewlle, eewle}

$/VC/ \rightarrow [CVC]$, (1,0,0,1,0) yields ERC set {lewle, leeew, ewele, lwelw}

Language 3.9.02 Generated by 9 (out of 5!) rankings, its r-volume is 0.075

$/CCVC/ \rightarrow [CV.CVC]$, (0,1,0,1,0) yields ERC set {ewele, elwle}

$/VC/ \rightarrow [CVC]$, (1,0,0,1,0) yields ERC set {lewle, leeew, ewele, lwelw}

Language 3.9.03 Generated by 10 (out of 5!) rankings, its r-volume is 0.083

$/CCVC/ \rightarrow [CV]$, (0,0,2,0,0) yields ERC set {ewlee, eelwe}

$/VC/ \rightarrow [V]$, (0,0,1,0,1) yields ERC set {eewel, welwl, ewlee, eweel, wwlel, eelwe}

Language 3.9.04 Generated by 6 (out of 5!) rankings, its r-volume is 0.050

$/CCVC/ \rightarrow [CVC]$, (0,0,1,1,0) yields ERC set {ewlle, eewle}

$/VC/ \rightarrow \emptyset$, (0,0,2,0,0) yields ERC set {ewlee, eeew, welwe}

Language 3.9.05 Generated by 30 (out of 5!) rankings, its r-volume is 0.250

$/CCVC/ \rightarrow [CV]$, (0,0,2,0,0) yields ERC set {ewlee, eelwe}

$/VC/ \rightarrow \emptyset$, (0,0,2,0,0) yields ERC set {ewlee, eeew, welwe}

Language 3.9.06 Generated by 2 (out of 5!) rankings, its r-volume is 0.016

$/CCVC/ \rightarrow [CV.CVC]$, (0,1,0,1,0) yields ERC set {ewele, elwle}

$/VC/ \rightarrow [CV]$, (0,1,1,0,0) yields ERC set {wllwe, eeew, elwee, eleew, welee, ellww}

Language 3.9.07 Generated by 8 (out of 5!) rankings, its r-volume is 0.066

$/CCVC/ \rightarrow [CV.CV.CV]$, (0,2,0,0,0) yields ERC set {elwee, elewe}

$/VC/ \rightarrow [CV]$, (0,1,1,0,0) yields ERC set {wllwe, eeew, elwee, eleew, welee, ellww}

Language 3.9.08 Generated by 16 (out of 5!) rankings, its r-volume is 0.133

$/CCVC/ \rightarrow [CV.CV.CV]$, (0,2,0,0,0) yields ERC set {elwee, elewe}

$/VC/ \rightarrow [CV.CV]$, (1,1,0,0,0) yields ERC set {elewe, leeew, llwee, lleww}

Language 3.9.09 Generated by 7 (out of 5!) rankings, its r-volume is 0.058

$/CCVC/ \rightarrow [CVC]$, (0,0,1,1,0) yields ERC set {ewlle, eewle}

$/VC/ \rightarrow [VC]$, (0,0,0,1,1) yields ERC set {wwell, ewele, eewll, weeel}

Language 3.9.10 Generated by 9 (out of 5!) rankings, its r-volume is 0.075

$/CCVC/ \rightarrow [CV.CVC]$, (0,1,0,1,0) yields ERC set {ewele, elwle}

$/VC/ \rightarrow [VC]$, (0,0,0,1,1) yields ERC set {wwell, ewele, eewll, weeel}

Language 3.9.11 Generated by 16 (out of 5!) rankings, its r-volume is 0.133

$/CCVC/ \rightarrow [CV.CV.CV]$, (0,2,0,0,0) yields ERC set {elwee, elewe}

$/VC/ \rightarrow [V.CV]$, (0,1,0,0,1) yields ERC set {elewe, wlewl, elwel, weeel}

3.10 Omission of $\langle /CCVC/ \rightarrow [CVC], (0,0,1,1,0) \rangle$, 11-lg. pseudo typology

Language 3.10.01 Generated by 7 (out of 5!) rankings, its r-volume is 0.058

$/CCVC/ \rightarrow [CVC]$, (0,0,1,1,0) yields ERC set {ewlle, eewle}

$/VC/ \rightarrow [CVC]$, (1,0,0,1,0) yields ERC set {lewle, leeew, ewele, lwelw}

Language 3.10.02 Generated by 9 (out of 5!) rankings, its r-volume is 0.075

$/CCVC/ \rightarrow [CV.CV.CV]$, (0,2,0,0,0) yields ERC set {elwee}

$/VC/ \rightarrow [CVC]$, (1,0,0,1,0) yields ERC set {lewle, leeew, ewele, lwelw}

Language 3.10.03 Generated by 8 (out of 5!) rankings, its r-volume is 0.066

$/CCVC/ \rightarrow [CV]$, (0,0,2,0,0) yields ERC set {ewlee, eelwe}

$/VC/ \rightarrow [V]$, (0,0,1,0,1) yields ERC set {ewel, welwl, ewlee, eweel, wwlel, weeel, eelwe}

Language 3.10.04 Generated by 6 (out of 5!) rankings, its r-volume is 0.050

$/CCVC/ \rightarrow [CVC]$, (0,0,1,1,0) yields ERC set {ewlle, eewle}

$/VC/ \rightarrow \emptyset$, (0,0,2,0,0) yields ERC set {ewlee, welee, eeew}

Language 3.10.05 Generated by 24 (out of 5!) rankings, its r-volume is 0.200

$/CCVC/ \rightarrow [CV]$, (0,0,2,0,0) yields ERC set {ewlee, eelwe}

$/VC/ \rightarrow \emptyset$, (0,0,2,0,0) yields ERC set {ewlee, welee, eeew}

Language 3.10.06 Generated by 10 (out of 5!) rankings, its r-volume is 0.083

$/CCVC/ \rightarrow [CV.CV.CV]$, (0,2,0,0,0) yields ERC set {elwee}

$/VC/ \rightarrow [CV]$, (0,1,1,0,0) yields ERC set {elwee, eeew, welee, wllwe, wleee, eleew, ellww}

Language 3.10.07 Generated by 16 (out of 5!) rankings, its r-volume is 0.133

$/CCVC/ \rightarrow [CV.CV.CV]$, (0,2,0,0,0) yields ERC set {elwee}

$/VC/ \rightarrow [CV.CV]$, (1,1,0,0,0) yields ERC set {elewe, leeew, llwee, lleww}

Language 3.10.08 Generated by 7 (out of 5!) rankings, its r-volume is 0.058

$/CCVC/ \rightarrow [CVC]$, (0,0,1,1,0) yields ERC set {ewlle, eewle}

$/VC/ \rightarrow [VC]$, (0,0,0,1,1) yields ERC set {wwell, ewele, eewll, weeel}

Language 3.10.09 Generated by 9 (out of 5!) rankings, its r-volume is 0.075

$/CCVC/ \rightarrow [CV.CV.CV]$, (0,2,0,0,0) yields ERC set {elwee}

$/VC/ \rightarrow [VC]$, (0,0,0,1,1) yields ERC set {wwell, ewele, eewll, weeel}

Language 3.10.10 Generated by 16 (out of 5!) rankings, its r-volume is 0.133

$/CCVC/ \rightarrow [CV.CV.CV]$, (0,2,0,0,0) yields ERC set {elwee}

$/VC/ \rightarrow [V.CV]$, (0,1,0,0,1) yields ERC set {elewe, wlewl, elwel, weeel}

Language 3.10.11 Generated by 8 (out of 5!) rankings, its r-volume is 0.066

$/CCVC/ \rightarrow [CV]$, (0,0,2,0,0) yields ERC set {ewlee, eelwe}

$/VC/ \rightarrow [CV]$, (1,0,1,0,0) yields ERC set {lewee, ewlee, lwlew, lweee, leeew, lelww, eelwe}

3.11 Omission of $\langle /CCVC/ \rightarrow [CV.CVC], (0,1,0,1,0) \rangle$, 14-lg. pseudo typology

Language 3.11.01 Generated by 7 (out of 5!) rankings, its r-volume is 0.058

$/CCVC/ \rightarrow [CVC]$, (0,0,1,1,0) yields ERC set {ewlee, eewle}

$/VC/ \rightarrow [CVC]$, (1,0,0,1,0) yields ERC set {lewle, leeew, ewele, lwelw}

Language 3.11.02 Generated by 9 (out of 5!) rankings, its r-volume is 0.075

$/CCVC/ \rightarrow [CV.CVC]$, (0,1,0,1,0) yields ERC set {elwle}

$/VC/ \rightarrow [CVC]$, (1,0,0,1,0) yields ERC set {lewle, leeew, ewele, lwelw}

Language 3.11.03 Generated by 8 (out of 5!) rankings, its r-volume is 0.066

$/CCVC/ \rightarrow [CV]$, (0,0,2,0,0) yields ERC set {eelwe}

$/VC/ \rightarrow [V]$, (0,0,1,0,1) yields ERC set {eewel, welwl, ewlee, eweel, wwlel, weeel, eelwe}

Language 3.11.04 Generated by 6 (out of 5!) rankings, its r-volume is 0.050

$/CCVC/ \rightarrow [CVC]$, (0,0,1,1,0) yields ERC set {ewlee, eewle}

$/VC/ \rightarrow \emptyset$, (0,0,2,0,0) yields ERC set {ewlee, welee, eeew}

Language 3.11.05 Generated by 24 (out of 5!) rankings, its r-volume is 0.200

$/CCVC/ \rightarrow [CV]$, (0,0,2,0,0) yields ERC set {eelwe}

$/VC/ \rightarrow \emptyset$, (0,0,2,0,0) yields ERC set {ewlee, welee, eeew}

Language 3.11.06 Generated by 4 (out of 5!) rankings, its r-volume is 0.033

$/CCVC/ \rightarrow [CV.CVC]$, (0,1,0,1,0) yields ERC set {elwle}

$/VC/ \rightarrow [CV]$, (0,1,1,0,0) yields ERC set {elwee, eeew, welee, wllwe, wleee, eleew, ellww}

Language 3.11.07 Generated by 6 (out of 5!) rankings, its r-volume is 0.050

$/CCVC/ \rightarrow [CV]$, (0,0,2,0,0) yields ERC set {eelwe}

$/VC/ \rightarrow [CV]$, (0,1,1,0,0) yields ERC set {elwee, eeew, welee, wllwe, wleee, eleew, ellww}

Language 3.11.08 Generated by 9 (out of 5!) rankings, its r-volume is 0.075

$/CCVC/ \rightarrow [CV.CVC]$, (0,1,0,1,0) yields ERC set {elwle}

$/VC/ \rightarrow [CV.CV]$, (1,1,0,0,0) yields ERC set {elewe, leeew, llwee, lleww}

Language 3.11.09 Generated by 7 (out of 5!) rankings, its r-volume is 0.058

$/CCVC/ \rightarrow [CV]$, (0,0,2,0,0) yields ERC set {eelwe}

$/VC/ \rightarrow [CV.CV]$, (1,1,0,0,0) yields ERC set {elewe, leeew, llwee, lleww}

Language 3.11.10 Generated by 7 (out of 5!) rankings, its r-volume is 0.058

$/CCVC/ \rightarrow [CVC]$, (0,0,1,1,0) yields ERC set {ewlee, eewle}

$/VC/ \rightarrow [VC]$, (0,0,0,1,1) yields ERC set {wwell, ewele, eewll, weeel}

Language 3.11.11 Generated by 9 (out of 5!) rankings, its r-volume is 0.075

$/CCVC/ \rightarrow [CV.CVC]$, (0,1,0,1,0) yields ERC set {elwle}

$/VC/ \rightarrow [VC]$, (0,0,0,1,1) yields ERC set {wwell, ewele, eewll, weeel}

Language 3.11.12 Generated by 9 (out of 5!) rankings, its r-volume is 0.075

$/CCVC/ \rightarrow [CV.CVC]$, (0,1,0,1,0) yields ERC set {elwle}

$/VC/ \rightarrow [V.CV]$, (0,1,0,0,1) yields ERC set {elewe, wlewl, elwel, weeel}

Language 3.11.13 Generated by 7 (out of 5!) rankings, its r-volume is 0.058

/CCVC/ → [CV], (0,0,2,0,0) yields ERC set {eelwe}

/VC/ → [V.CV], (0,1,0,0,1) yields ERC set {elewe, wlewl, elwel, weeel}

Language 3.11.14 Generated by 8 (out of 5!) rankings, its r-volume is 0.066

/CCVC/ → [CV], (0,0,2,0,0) yields ERC set {eelwe}

/VC/ → [CV], (1,0,1,0,0) yields ERC set {lewee, ewlee, lwlew, lweee, leeew, lelww, eelwe}

3.12 Omission of $\langle /CCVC/ \rightarrow [CV.CV.CV], (0,2,0,0,0) \rangle$, 14-**lg. pseudo typology**

Language 3.12.01 Generated by 7 (out of 5!) rankings, its r-volume is 0.058

/CCVC/ → [CVC], (0,0,1,1,0) yields ERC set {ewlle}

/VC/ → [CVC], (1,0,0,1,0) yields ERC set {lewle, leeew, ewele, lwelw}

Language 3.12.02 Generated by 9 (out of 5!) rankings, its r-volume is 0.075

/CCVC/ → [CV.CVC], (0,1,0,1,0) yields ERC set {elwee, ewele}

/VC/ → [CVC], (1,0,0,1,0) yields ERC set {lewle, leeew, ewele, lwelw}

Language 3.12.03 Generated by 4 (out of 5!) rankings, its r-volume is 0.033

/CCVC/ → [CVC], (0,0,1,1,0) yields ERC set {ewlle}

/VC/ → [V], (0,0,1,0,1) yields ERC set {eewel, welwl, ewlee, eweel, wwlel, weeel, eelwe}

Language 3.12.04 Generated by 4 (out of 5!) rankings, its r-volume is 0.033

/CCVC/ → [CV.CV.CV], (0,2,0,0,0) yields ERC set {elewe}

/VC/ → [V], (0,0,1,0,1) yields ERC set {eewel, welwl, ewlee, eweel, wwlel, weeel, eelwe}

Language 3.12.05 Generated by 18 (out of 5!) rankings, its r-volume is 0.150

/CCVC/ → [CVC], (0,0,1,1,0) yields ERC set {ewlle}

/VC/ → \emptyset , (0,0,2,0,0) yields ERC set {ewlee, welee, eeew}

Language 3.12.06 Generated by 12 (out of 5!) rankings, its r-volume is 0.100

/CCVC/ → [CV.CV.CV], (0,2,0,0,0) yields ERC set {elewe}

/VC/ → \emptyset , (0,0,2,0,0) yields ERC set {ewlee, welee, eeew}

Language 3.12.07 Generated by 2 (out of 5!) rankings, its r-volume is 0.016

/CCVC/ → [CV.CVC], (0,1,0,1,0) yields ERC set {elwee, ewele}

/VC/ → [CV], (0,1,1,0,0) yields ERC set {elwee, eeew, welee, wllwe, wleee, eleew, ellww}

Language 3.12.08 Generated by 8 (out of 5!) rankings, its r-volume is 0.066

/CCVC/ → [CV.CV.CV], (0,2,0,0,0) yields ERC set {elewe}

/VC/ → [CV], (0,1,1,0,0) yields ERC set {elwee, eeew, welee, wllwe, wleee, eleew, ellww}

Language 3.12.09 Generated by 16 (out of 5!) rankings, its r-volume is 0.133

/CCVC/ → [CV.CV.CV], (0,2,0,0,0) yields ERC set {elewe}

/VC/ → [CV.CV], (1,1,0,0,0) yields ERC set {elewe, leeew, llwee, lleww}

Language 3.12.10 Generated by 7 (out of 5!) rankings, its r-volume is 0.058

/CCVC/ → [CVC], (0,0,1,1,0) yields ERC set {ewlle}

/VC/ → [VC], (0,0,0,1,1) yields ERC set {wwell, ewele, eeew, weeel}

Language 3.12.11 Generated by 9 (out of 5!) rankings, its r-volume is 0.075

/CCVC/ \rightarrow [CV.CVC], (0,1,0,1,0) yields ERC set {elwee, ewele}

/VC/ \rightarrow [VC], (0,0,0,1,1) yields ERC set {wweel, ewele, eewll, weeel}

Language 3.12.12 Generated by 16 (out of 5!) rankings, its r-volume is 0.133

/CCVC/ \rightarrow [CV.CV.CV], (0,2,0,0,0) yields ERC set {elewe}

/VC/ \rightarrow [V.CV], (0,1,0,0,1) yields ERC set {elewe, wlewl, elwel, weeel}

Language 3.12.13 Generated by 4 (out of 5!) rankings, its r-volume is 0.033

/CCVC/ \rightarrow [CVC], (0,0,1,1,0) yields ERC set {ewlle}

/VC/ \rightarrow [CV], (1,0,1,0,0) yields ERC set {lewee, ewlee, lwlew, lweee, leeew, lelww, eelwe}

Language 3.12.14 Generated by 4 (out of 5!) rankings, its r-volume is 0.033

/CCVC/ \rightarrow [CV.CV.CV], (0,2,0,0,0) yields ERC set {elewe}

/VC/ \rightarrow [CV], (1,0,1,0,0) yields ERC set {lewee, ewlee, lwlew, lweee, leeew, lelww, eelwe}

4 Typology over $\{C,V\}^3$ for OT, HG, and HG_{OT}

In this section, we expand the set of tableaux to include all input forms in $\{C,V\}^3$ (i.e., all sequences of C and V up to length 3). Using the same constraints and candidate generating function as in the previous section, we compute the typology generated over the 14 input forms in $\{C,V\}^3$. We generate typologies for the ranked constraints of Optimality Theory and for the weighted constraints of Harmonic Grammar.

In order to examine the typological consequences of candidate omission, we also compute the typology that would be generated by weighted constraints if the candidates in each tableau were restricted to include only those that can be optimal under some ranking of the constraints. We refer to this odd hybrid as HG_{OT} because it does HG-style optimization restricted to OT-style candidates.

Though the omitted candidates admit a simple description—those harmonically bounded under ranking—their exclusion introduces structure very different from a normal constraint. This last example might seem slightly absurd. No one has suggested that HG typologies should be constructed in this way, nor does it seem reasonable to expect the results of such an enterprise to be sound. Our intent, however, is merely to show that the results of omission can be unpredictable and that patterns of omission guided by a fairly simple principle can nonetheless fail to correspond in any obvious way to an undominated constraint or restriction on the candidate generating function.

4.1 Tableaux for $\{C,V\}^3$

In the tableaux that follow there are three candidates that can be generated by optimization with weighted constraints but cannot be generated by optimization with ranked constraints. These three candidates occur in (9) and (15) and are marked as ‘HG only’ and colored blue.

(3)

C	DEPC	DEPV	MAX	NOCODA	ONSET
<i>a.</i> CV	0	1	0	0	0
<i>b.</i> \emptyset	0	0	1	0	0

(4)

V	DEPC	DEPV	MAX	NOCODA	ONSET
<i>a.</i> \emptyset	0	0	1	0	0
<i>b.</i> V	0	0	0	0	1
<i>c.</i> CV	1	0	0	0	0

(5)

CC	DEPC	DEPV	MAX	NOCODA	ONSET
<i>a.</i> \emptyset	0	0	2	0	0
<i>b.</i> CV.CV	0	2	0	0	0
<i>c.</i> CVC	0	1	0	1	0

(6)

CV	DEPC	DEPV	MAX	NOCODA	ONSET
<i>a.</i> CV	0	0	0	0	0

(7)

VC	DEPC	DEPV	MAX	NOCODA	ONSET
<i>a.</i> CVC	1	0	0	1	0
<i>b.</i> V	0	0	1	0	1
<i>c.</i> \emptyset	0	0	2	0	0
<i>d.</i> CV	0	1	1	0	0
<i>e.</i> CV.CV	1	1	0	0	0
<i>f.</i> VC	0	0	0	1	1
<i>g.</i> V.CV	0	1	0	0	1
<i>h.</i> CV	1	0	1	0	0

(8)

VV	DEPC	DEPV	MAX	NOCODA	ONSET
<i>a.</i> CV.CV	2	0	0	0	0
<i>b.</i> V.V	0	0	0	0	2
<i>c.</i> \emptyset	0	0	2	0	0

(9)

CCC	DEPC	DEPV	MAX	NOCODA	ONSET
<i>a.</i> \emptyset	0	0	3	0	0
<i>b.</i> CV.CV.CV	0	3	0	0	0
<i>c.</i> HG only: CVC	0	1	1	1	0
<i>d.</i> CV.CVC CVC.CV	0	2	0	1	0

In Optimality Theory, candidate *c* is collectively harmonically bounded (see, ?) by the other three candidates. That is, *c* cannot win under any constraint ranking because, for each constraint *c*

violates, one of the other candidates has fewer violations. There is, however, a weighting of the constraints under which the weighted sum of the violations in candidate *c* is minimal.

(10)

CCV	DEPC	DEPV	MAX	NOCODA	ONSET
<i>a.</i> CV.CV	0	1	0	0	0
<i>b.</i> CV	0	0	1	0	0

(11)

CVC	DEPC	DEPV	MAX	NOCODA	ONSET
<i>a.</i> CV.CV	0	1	0	0	0
<i>b.</i> CVC	0	0	0	1	0
<i>c.</i> CV	0	0	1	0	0

(12)

CVV	DEPC	DEPV	MAX	NOCODA	ONSET
<i>a.</i> CV.V	0	0	0	0	1
<i>b.</i> CV	0	0	1	0	0
<i>c.</i> CV.CV	1	0	0	0	0

(13)

VCC	DEPC	DEPV	MAX	NOCODA	ONSET
<i>a.</i> CV.CVC CVC.CV	1	1	0	1	0
<i>b.</i> CVC	1	0	1	1	0
<i>c.</i> V.CV.CV	0	2	0	0	1
<i>d.</i> CV.CV.CV	1	2	0	0	0
<i>e.</i> VC.CV V.CVC	0	1	0	1	1
<i>f.</i> V	0	0	2	0	1
<i>g.</i> VC	0	0	1	1	1
<i>h.</i> CV.CV	0	2	1	0	0
<i>i.</i> \emptyset	0	0	3	0	0
<i>j.</i> CVC	0	1	1	1	0
<i>k.</i> CV	1	0	2	0	0

(14)

VCV	DEPC	DEPV	MAX	NOCODA	ONSET
<i>a.</i> V.CV	0	0	0	0	1
<i>b.</i> CV	0	0	1	0	0
<i>c.</i> CV.CV	1	0	0	0	0

(15)

VVC	DEPC	DEPV	MAX	NOCODA	ONSET
<i>a.</i> CV.CV.CV	2	1	0	0	0
<i>b.</i> CV.CV	2	0	1	0	0
<i>c.</i> V.VC	0	0	0	1	2
<i>d.</i> HG only: CVC	1	0	1	1	0
<i>e.</i> HG only: VC	0	0	1	1	1
<i>f.</i> V.V	0	0	1	0	2
<i>g.</i> \emptyset	0	0	3	0	0
<i>h.</i> CV	0	1	2	0	0
<i>i.</i> CV.CVC	2	0	0	1	0
<i>j.</i> V.V.CV	0	1	0	0	2

(16)

VVV	DEPC	DEPV	MAX	NOCODA	ONSET
<i>a.</i> \emptyset	0	0	3	0	0
<i>b.</i> V.V.V	0	0	0	0	3
<i>c.</i> CV.CV.CV	3	0	0	0	0

4.2 Typology over $\{C,V\}^3$

In this section, we give the languages that are generated over the input forms in $\{C,V\}^3$ by the syllabification constraints. First, we give the 12 languages that are generated by optimization with ranked constraints and weighted constraints. Next in §4.3, we give 11 more languages that are can be generated by weighted constraints (this gives us a total of 23 languages generated by weighted constraints). In §4.3, each language includes at least one input-output pair that cannot be generated under ranking and these are colored blue. Finally, in §4.4 we give another 25 languages that are generated under weighted optimization if the three ‘HG only’ candidates are omitted (i.e., HG-style optimization restricted to OT-style candidates).

Language 01 Occurs in the typology of: OT_{OT} , HG_{HG} , and HG_{OT}

- /C/ $\rightarrow \emptyset$, (0,0,1,0,0) ERCs: {ewlee}
- /CC/ $\rightarrow \emptyset$, (0,0,2,0,0) ERCs: {ewlee}
- /CCC/ $\rightarrow \emptyset$, (0,0,3,0,0) ERCs: {ewlee}
- /CCV/ $\rightarrow [CV]$, (0,0,1,0,0) ERCs: {ewlee}
- /CV/ $\rightarrow [CV]$, (0,0,0,0,0) ERCs: {}
- /CVC/ $\rightarrow [CVC]$, (0,0,0,1,0) ERCs: {ewelee, eewlee}
- /CVV/ $\rightarrow [CV]$, (0,0,1,0,0) ERCs: {eeleew, welee}
- /V/ $\rightarrow \emptyset$, (0,0,1,0,0) ERCs: {eeleew, welee}
- /VC/ $\rightarrow \emptyset$, (0,0,2,0,0) ERCs: {ewlee, welee, eelee}
- /VCC/ $\rightarrow \emptyset$, (0,0,3,0,0) ERCs: {eeleew, welee, ewlee}
- /VCV/ $\rightarrow [CV]$, (0,0,1,0,0) ERCs: {eeleew, welee}
- /VV/ $\rightarrow \emptyset$, (0,0,2,0,0) ERCs: {eeleew, welee}
- /VVC/ $\rightarrow \emptyset$, (0,0,3,0,0) ERCs: {eeleew, welee, ewlee}
- /VVV/ $\rightarrow \emptyset$, (0,0,3,0,0) ERCs: {welee, eelee}

Language 02 Occurs in the typology of: OT_{OT} , HG_{HG} , and HG_{OT}

/C/ $\rightarrow \emptyset$, (0,0,1,0,0) ERCs: {ewlee}
/CC/ $\rightarrow \emptyset$, (0,0,2,0,0) ERCs: {ewlee}
/CCC/ $\rightarrow \emptyset$, (0,0,3,0,0) ERCs: {ewlee}
/CCV/ $\rightarrow [CV]$, (0,0,1,0,0) ERCs: {ewlee}
/CV/ $\rightarrow [CV]$, (0,0,0,0,0) ERCs: {}
/CVC/ $\rightarrow [CV]$, (0,0,1,0,0) ERCs: {eelwe, ewlee}
/CVV/ $\rightarrow [CV]$, (0,0,1,0,0) ERCs: {eelew, welee}
/V/ $\rightarrow \emptyset$, (0,0,1,0,0) ERCs: {eelew, welee}
/VC/ $\rightarrow \emptyset$, (0,0,2,0,0) ERCs: {ewlee, welee, eelew}
/VCC/ $\rightarrow \emptyset$, (0,0,3,0,0) ERCs: {eelew, welee, ewlee}
/VCV/ $\rightarrow [CV]$, (0,0,1,0,0) ERCs: {eelew, welee}
/VV/ $\rightarrow \emptyset$, (0,0,2,0,0) ERCs: {eelew, welee}
/VVC/ $\rightarrow \emptyset$, (0,0,3,0,0) ERCs: {eelew, welee, ewlee}
/VVV/ $\rightarrow \emptyset$, (0,0,3,0,0) ERCs: {welee, eelew}

Language 03 Occurs in the typology of: OT_{OT} , HG_{HG} , and HG_{OT}

/C/ $\rightarrow [CV]$, (0,1,0,0,0) ERCs: {elwee}
/CC/ $\rightarrow [CVC]$, (0,1,0,1,0) ERCs: {ewelee, elwle}
/CCC/ $\rightarrow [CV.CVC] \mid [CVC.CV]$, (0,2,0,1,0) ERCs: {ewelee, elwle}
/CCV/ $\rightarrow [CV.CV]$, (0,1,0,0,0) ERCs: {elwee}
/CV/ $\rightarrow [CV]$, (0,0,0,0,0) ERCs: {}
/CVC/ $\rightarrow [CVC]$, (0,0,0,1,0) ERCs: {ewelee, eelee}
/CVV/ $\rightarrow [CV]$, (0,0,1,0,0) ERCs: {eelew, welee}
/V/ $\rightarrow \emptyset$, (0,0,1,0,0) ERCs: {eelew, welee}
/VC/ $\rightarrow [CV]$, (0,1,1,0,0) ERCs: {elwee, eelee, welee, wllwe, wleee, eleew, ellww}
/VCC/ $\rightarrow [CVC]$, (0,1,1,1,0) ERCs: {wwlle, elwle, welee, wleee, ewllw, eleew, eelee, ewlee}
/VCV/ $\rightarrow [CV]$, (0,0,1,0,0) ERCs: {eelew, welee}
/VV/ $\rightarrow \emptyset$, (0,0,2,0,0) ERCs: {eelew, welee}
/VVC/ $\rightarrow [CV]$, (0,1,2,0,0) ERCs: {ellew, elwee, wllwe}
/VVV/ $\rightarrow \emptyset$, (0,0,3,0,0) ERCs: {welee, eelee}

Language 04 Occurs in the typology of: OT_{OT} , HG_{HG} , and HG_{OT}

/C/ $\rightarrow [CV]$, (0,1,0,0,0) ERCs: {elwee}
/CC/ $\rightarrow [CV.CV]$, (0,2,0,0,0) ERCs: {elwee, elewe}
/CCC/ $\rightarrow [CV.CV.CV]$, (0,3,0,0,0) ERCs: {elewe, elwee}
/CCV/ $\rightarrow [CV.CV]$, (0,1,0,0,0) ERCs: {elwee}
/CV/ $\rightarrow [CV]$, (0,0,0,0,0) ERCs: {}
/CVC/ $\rightarrow [CV.CV]$, (0,1,0,0,0) ERCs: {elwee, elewe}
/CVV/ $\rightarrow [CV]$, (0,0,1,0,0) ERCs: {eelew, welee}
/V/ $\rightarrow \emptyset$, (0,0,1,0,0) ERCs: {eelew, welee}
/VC/ $\rightarrow [CV]$, (0,1,1,0,0) ERCs: {elwee, eelee, welee, wllwe, wleee, eleew, ellww}
/VCC/ $\rightarrow [CV.CV]$, (0,2,1,0,0) ERCs: {elwee, wllwe, welee, eelee, ellww, elewe}
/VCV/ $\rightarrow [CV]$, (0,0,1,0,0) ERCs: {eelew, welee}
/VV/ $\rightarrow \emptyset$, (0,0,2,0,0) ERCs: {eelew, welee}
/VVC/ $\rightarrow [CV]$, (0,1,2,0,0) ERCs: {ellew, elwee, wllwe}
/VVV/ $\rightarrow \emptyset$, (0,0,3,0,0) ERCs: {welee, eelee}

Language 05 Occurs in the typology of: OT_{OT} , HG_{HG} , and HG_{OT}

/C/ → ∅, (0,0,1,0,0) ERCs: {ewlee}
 /CC/ → ∅, (0,0,2,0,0) ERCs: {ewlee}
 /CCC/ → ∅, (0,0,3,0,0) ERCs: {ewlee}
 /CCV/ → [CV], (0,0,1,0,0) ERCs: {ewlee}
 /CV/ → [CV], (0,0,0,0,0) ERCs: {}
 /CVC/ → [CV], (0,0,1,0,0) ERCs: {eelwe, ewlee}
 /CVV/ → [CV.V], (0,0,0,0,1) ERCs: {eewel, weeel}
 /V/ → [V], (0,0,0,0,1) ERCs: {eewel, weeel}
 /VC/ → [V], (0,0,1,0,1) ERCs: {eewel, welwl, ewlee, eweel, wwlel, weeel, eelwe}
 /VCC/ → [V], (0,0,2,0,1) ERCs: {eelwe, ewlel, eewel, welwl, weeel}
 /VCV/ → [V.CV], (0,0,0,0,1) ERCs: {eewel, weeel}
 /VV/ → [V.V], (0,0,0,0,2) ERCs: {eewel, weeel}
 /VVC/ → [V.V], (0,0,1,0,2) ERCs: {eewel, welwl, ewlee, wwlel, weeel, eelwe}
 /VVV/ → [V.V.V], (0,0,0,0,3) ERCs: {eewel, weeel}

Language 06 Occurs in the typology of: OT_{OT}, HG_{HG}, and HG_{OT}

/C/ → [CV], (0,1,0,0,0) ERCs: {elwee}
 /CC/ → [CVC], (0,1,0,1,0) ERCs: {ewele, elwle}
 /CCC/ → [CV.CVC] | [CVC.CV], (0,2,0,1,0) ERCs: {ewele, elwle}
 /CCV/ → [CV.CV], (0,1,0,0,0) ERCs: {elwee}
 /CV/ → [CV], (0,0,0,0,0) ERCs: {}
 /CVC/ → [CVC], (0,0,0,1,0) ERCs: {ewele, eewle}
 /CVV/ → [CV.V], (0,0,0,0,1) ERCs: {eewel, weeel}
 /V/ → [V], (0,0,0,0,1) ERCs: {eewel, weeel}
 /VC/ → [VC], (0,0,0,1,1) ERCs: {wwell, ewele, eewll, weeel}
 /VCC/ → [VC.CV] | [V.CVC], (0,1,0,1,1) ERCs: {elwll, ewele, wwll, weeel}
 /VCV/ → [V.CV], (0,0,0,0,1) ERCs: {eewel, weeel}
 /VV/ → [V.V], (0,0,0,0,2) ERCs: {eewel, weeel}
 /VVC/ → [V.VC], (0,0,0,1,2) ERCs: {eewll, ewele, wwll, weeel}
 /VVV/ → [V.V.V], (0,0,0,0,3) ERCs: {eewel, weeel}

Language 07 Occurs in the typology of: OT_{OT}, HG_{HG}, and HG_{OT}

/C/ → ∅, (0,0,1,0,0) ERCs: {ewlee}
 /CC/ → ∅, (0,0,2,0,0) ERCs: {ewlee}
 /CCC/ → ∅, (0,0,3,0,0) ERCs: {ewlee}
 /CCV/ → [CV], (0,0,1,0,0) ERCs: {ewlee}
 /CV/ → [CV], (0,0,0,0,0) ERCs: {}
 /CVC/ → [CVC], (0,0,0,1,0) ERCs: {ewele, eewle}
 /CVV/ → [CV.V], (0,0,0,0,1) ERCs: {eewel, weeel}
 /V/ → [V], (0,0,0,0,1) ERCs: {eewel, weeel}
 /VC/ → [VC], (0,0,0,1,1) ERCs: {wwell, ewele, eewll, weeel}
 /VCC/ → [VC], (0,0,1,1,1) ERCs: {eewll, ewlle, wwlll, ewell, weeel}
 /VCV/ → [V.CV], (0,0,0,0,1) ERCs: {eewel, weeel}
 /VV/ → [V.V], (0,0,0,0,2) ERCs: {eewel, weeel}
 /VVC/ → [V.VC], (0,0,0,1,2) ERCs: {eewll, ewele, wwll, weeel}
 /VVV/ → [V.V.V], (0,0,0,0,3) ERCs: {eewel, weeel}

Language 08 Occurs in the typology of: OT_{OT}, HG_{HG}, and HG_{OT}

/C/ → [CV], (0,1,0,0,0) ERCs: {elwee}

/CC/ → [CV.CV], (0,2,0,0,0) ERCs: {elwee, elewe}
 /CCC/ → [CV.CV.CV], (0,3,0,0,0) ERCs: {elewe, elwee}
 /CCV/ → [CV.CV], (0,1,0,0,0) ERCs: {elwee}
 /CV/ → [CV], (0,0,0,0,0) ERCs: {}
 /CVC/ → [CV.CV], (0,1,0,0,0) ERCs: {elwee, elewe}
 /CVV/ → [CV.V], (0,0,0,0,1) ERCs: {eewel, weeel}
 /V/ → [V], (0,0,0,0,1) ERCs: {eewel, weeel}
 /VC/ → [V.CV], (0,1,0,0,1) ERCs: {elewe, wlewl, elwel, weeel}
 /VCC/ → [V.CV.CV], (0,2,0,0,1) ERCs: {elewe, elwel, wlewl, weeel}
 /VCV/ → [V.CV], (0,0,0,0,1) ERCs: {eewel, weeel}
 /VV/ → [V.V], (0,0,0,0,2) ERCs: {eewel, weeel}
 /VVC/ → [V.V.CV], (0,1,0,0,2) ERCs: {weeel, elewe, elwel, wlewl}
 /VVV/ → [V.V.V], (0,0,0,0,3) ERCs: {eewel, weeel}

Language 09 Occurs in the typology of: OT_{OT}, HG_{HG}, and HG_{OT}

/C/ → [CV], (0,1,0,0,0) ERCs: {elwee}
 /CC/ → [CV.CV], (0,2,0,0,0) ERCs: {elwee, elewe}
 /CCC/ → [CV.CV.CV], (0,3,0,0,0) ERCs: {elewe, elwee}
 /CCV/ → [CV.CV], (0,1,0,0,0) ERCs: {elwee}
 /CV/ → [CV], (0,0,0,0,0) ERCs: {}
 /CVC/ → [CV.CV], (0,1,0,0,0) ERCs: {elwee, elewe}
 /CVV/ → [CV.CV], (1,0,0,0,0) ERCs: {leeew, leewe}
 /V/ → [CV], (1,0,0,0,0) ERCs: {leeew, leewe}
 /VC/ → [CV.CV], (1,1,0,0,0) ERCs: {elewe, leeew, llwee, lleww}
 /VCC/ → [CV.CV.CV], (1,2,0,0,0) ERCs: {leeew, llwee, elewe, lleww}
 /VCV/ → [CV.CV], (1,0,0,0,0) ERCs: {leeew, leewe}
 /VV/ → [CV.CV], (2,0,0,0,0) ERCs: {leeew, leewe}
 /VVC/ → [CV.CV.CV], (2,1,0,0,0) ERCs: {lleww, leeew, llwee, elewe}
 /VVV/ → [CV.CV.CV], (3,0,0,0,0) ERCs: {leeew, leewe}

Language 10 Occurs in the typology of: OT_{OT}, HG_{HG}, and HG_{OT}

/C/ → ∅, (0,0,1,0,0) ERCs: {ewlee}
 /CC/ → ∅, (0,0,2,0,0) ERCs: {ewlee}
 /CCC/ → ∅, (0,0,3,0,0) ERCs: {ewlee}
 /CCV/ → [CV], (0,0,1,0,0) ERCs: {ewlee}
 /CV/ → [CV], (0,0,0,0,0) ERCs: {}
 /CVC/ → [CV], (0,0,1,0,0) ERCs: {eelwe, ewlee}
 /CVV/ → [CV.CV], (1,0,0,0,0) ERCs: {leeew, leewe}
 /V/ → [CV], (1,0,0,0,0) ERCs: {leeew, leewe}
 /VC/ → [CV], (1,0,1,0,0) ERCs: {leewe, ewlee, lwlew, lweee, leeew, lelww, eelwe}
 /VCC/ → [CV], (1,0,2,0,0) ERCs: {eelwe, leeew, lwlee, leewe, lelww}
 /VCV/ → [CV.CV], (1,0,0,0,0) ERCs: {leeew, leewe}
 /VV/ → [CV.CV], (2,0,0,0,0) ERCs: {leeew, leewe}
 /VVC/ → [CV.CV], (2,0,1,0,0) ERCs: {leewe, ewlee, lwlew, leeew, lelww, eelwe}
 /VVV/ → [CV.CV.CV], (3,0,0,0,0) ERCs: {leeew, leewe}

Language 11 Occurs in the typology of: OT_{OT}, HG_{HG}, and HG_{OT}

/C/ → [CV], (0,1,0,0,0) ERCs: {elwee}
 /CC/ → [CVC], (0,1,0,1,0) ERCs: {ewelee, elwle}

/CCC/ → [CV.CVC] | [CVC.CV], (0,2,0,1,0) ERCs: {ewele, elwle}
 /CCV/ → [CV.CV], (0,1,0,0,0) ERCs: {elwee}
 /CV/ → [CV], (0,0,0,0,0) ERCs: {}
 /CVC/ → [CVC], (0,0,0,1,0) ERCs: {ewele, eewle}
 /CVV/ → [CV.CV], (1,0,0,0,0) ERCs: {leeew, leewe}
 /V/ → [CV], (1,0,0,0,0) ERCs: {leeew, leewe}
 /VC/ → [CVC], (1,0,0,1,0) ERCs: {lewle, leeew, ewele, lwelw}
 /VCC/ → [CV.CVC] | [CVC.CV], (1,1,0,1,0) ERCs: {llwle, leeew, ewele, lwelw}
 /VCV/ → [CV.CV], (1,0,0,0,0) ERCs: {leeew, leewe}
 /VV/ → [CV.CV], (2,0,0,0,0) ERCs: {leeew, leewe}
 /VVC/ → [CV.CVC], (2,0,0,1,0) ERCs: {lewle, leeew, ewele, lwelw}
 /VVV/ → [CV.CV.CV], (3,0,0,0,0) ERCs: {leeew, leewe}

Language 12 Occurs in the typology of: OT_{OT}, HG_{HG}, and HG_{OT}

/C/ → ∅, (0,0,1,0,0) ERCs: {ewlee}
 /CC/ → ∅, (0,0,2,0,0) ERCs: {ewlee}
 /CCC/ → ∅, (0,0,3,0,0) ERCs: {ewlee}
 /CCV/ → [CV], (0,0,1,0,0) ERCs: {ewlee}
 /CV/ → [CV], (0,0,0,0,0) ERCs: {}
 /CVC/ → [CVC], (0,0,0,1,0) ERCs: {ewele, eewle}
 /CVV/ → [CV.CV], (1,0,0,0,0) ERCs: {leeew, leewe}
 /V/ → [CV], (1,0,0,0,0) ERCs: {leeew, leewe}
 /VC/ → [CVC], (1,0,0,1,0) ERCs: {lewle, leeew, ewele, lwelw}
 /VCC/ → [CVC], (1,0,1,1,0) ERCs: {ewlle, lewle, leeew, lwele, lwllw}
 /VCV/ → [CV.CV], (1,0,0,0,0) ERCs: {leeew, leewe}
 /VV/ → [CV.CV], (2,0,0,0,0) ERCs: {leeew, leewe}
 /VVC/ → [CV.CVC], (2,0,0,1,0) ERCs: {lewle, leeew, ewele, lwelw}
 /VVV/ → [CV.CV.CV], (3,0,0,0,0) ERCs: {leeew, leewe}

4.3 HG_{HG} only languages

Language 13 Occurs in the typology of: HG_{HG}

/C/ → [CV], (0,1,0,0,0)
 /CC/ → [CVC], (0,1,0,1,0)
 /CCC/ → [CV.CVC] | [CVC.CV], (0,2,0,1,0)
 /CCV/ → [CV.CV], (0,1,0,0,0)
 /CV/ → [CV], (0,0,0,0,0)
 /CVC/ → [CVC], (0,0,0,1,0)
 /CVV/ → [CV], (0,0,1,0,0)
 /V/ → ∅, (0,0,1,0,0)
 /VC/ → [VC], (0,0,0,1,1)
 /VCC/ → [CVC], (0,1,1,1,0)
 /VCV/ → [CV], (0,0,1,0,0)
 /VV/ → ∅, (0,0,2,0,0)
 /VVC/ → [VC], (0,0,1,1,1)
 /VVV/ → ∅, (0,0,3,0,0)

Language 14 Occurs in the typology of: HG_{HG}

/C/ → ∅, (0,0,1,0,0)

/CC/ → [CVC], (0,1,0,1,0)
 /CCC/ → [CVC], (0,1,1,1,0)
 /CCV/ → [CV], (0,0,1,0,0)
 /CV/ → [CV], (0,0,0,0,0)
 /CVC/ → [CVC], (0,0,0,1,0)
 /CVV/ → [CV], (0,0,1,0,0)
 /V/ → ∅, (0,0,1,0,0)
 /VC/ → [VC], (0,0,0,1,1)
 /VCC/ → [VC], (0,0,1,1,1)
 /VCV/ → [CV], (0,0,1,0,0)
 /VV/ → ∅, (0,0,2,0,0)
 /VVC/ → [VC], (0,0,1,1,1)
 /VVV/ → ∅, (0,0,3,0,0)

Language 15 Occurs in the typology of: HG_{HG}

/C/ → ∅, (0,0,1,0,0)
 /CC/ → [CVC], (0,1,0,1,0)
 /CCC/ → [CVC], (0,1,1,1,0)
 /CCV/ → [CV], (0,0,1,0,0)
 /CV/ → [CV], (0,0,0,0,0)
 /CVC/ → [CVC], (0,0,0,1,0)
 /CVV/ → [CV], (0,0,1,0,0)
 /V/ → ∅, (0,0,1,0,0)
 /VC/ → [VC], (0,0,0,1,1)
 /VCC/ → [CVC], (0,1,1,1,0)
 /VCV/ → [CV], (0,0,1,0,0)
 /VV/ → ∅, (0,0,2,0,0)
 /VVC/ → [VC], (0,0,1,1,1)
 /VVV/ → ∅, (0,0,3,0,0)

Language 16 Occurs in the typology of: HG_{HG}

/C/ → ∅, (0,0,1,0,0)
 /CC/ → ∅, (0,0,2,0,0)
 /CCC/ → ∅, (0,0,3,0,0)
 /CCV/ → [CV], (0,0,1,0,0)
 /CV/ → [CV], (0,0,0,0,0)
 /CVC/ → [CVC], (0,0,0,1,0)
 /CVV/ → [CV], (0,0,1,0,0)
 /V/ → ∅, (0,0,1,0,0)
 /VC/ → [VC], (0,0,0,1,1)
 /VCC/ → [VC], (0,0,1,1,1)
 /VCV/ → [CV], (0,0,1,0,0)
 /VV/ → ∅, (0,0,2,0,0)
 /VVC/ → [VC], (0,0,1,1,1)
 /VVV/ → ∅, (0,0,3,0,0)

Language 17 Occurs in the typology of: HG_{HG}

/C/ → ∅, (0,0,1,0,0)
 /CC/ → [CVC], (0,1,0,1,0)
 /CCC/ → [CVC], (0,1,1,1,0)
 /CCV/ → [CV], (0,0,1,0,0)

/CV/ → [CV], (0,0,0,0,0)
 /CVC/ → [CVC], (0,0,0,1,0)
 /CVV/ → [CV], (0,0,1,0,0)
 /V/ → ∅, (0,0,1,0,0)
 /VC/ → [CVC], (1,0,0,1,0)
 /VCC/ → [CVC], (0,1,1,1,0)
 /VCV/ → [CV], (0,0,1,0,0)
 /VV/ → ∅, (0,0,2,0,0)
 /VVC/ → [CVC], (1,0,1,1,0)
 /VVV/ → ∅, (0,0,3,0,0)

Language 18 Occurs in the typology of: HG_{HG}

/C/ → ∅, (0,0,1,0,0)
 /CC/ → [CVC], (0,1,0,1,0)
 /CCC/ → [CVC], (0,1,1,1,0)
 /CCV/ → [CV], (0,0,1,0,0)
 /CV/ → [CV], (0,0,0,0,0)
 /CVC/ → [CVC], (0,0,0,1,0)
 /CVV/ → [CV.V], (0,0,0,0,1)
 /V/ → [V], (0,0,0,0,1)
 /VC/ → [VC], (0,0,0,1,1)
 /VCC/ → [VC], (0,0,1,1,1)
 /VCV/ → [V.CV], (0,0,0,0,1)
 /VV/ → [V.V], (0,0,0,0,2)
 /VVC/ → [V.VC], (0,0,0,1,2)
 /VVV/ → [V.V.V], (0,0,0,0,3)

Language 19 Occurs in the typology of: HG_{HG}

/C/ → [CV], (0,1,0,0,0)
 /CC/ → [CVC], (0,1,0,1,0)
 /CCC/ → [CV.CVC] | [CVC.CV], (0,2,0,1,0)
 /CCV/ → [CV.CV], (0,1,0,0,0)
 /CV/ → [CV], (0,0,0,0,0)
 /CVC/ → [CVC], (0,0,0,1,0)
 /CVV/ → [CV], (0,0,1,0,0)
 /V/ → ∅, (0,0,1,0,0)
 /VC/ → [CVC], (1,0,0,1,0)
 /VCC/ → [CVC], (0,1,1,1,0)
 /VCV/ → [CV], (0,0,1,0,0)
 /VV/ → ∅, (0,0,2,0,0)
 /VVC/ → [CVC], (1,0,1,1,0)
 /VVV/ → ∅, (0,0,3,0,0)

Language 20 Occurs in the typology of: HG_{HG}

/C/ → ∅, (0,0,1,0,0)
 /CC/ → [CVC], (0,1,0,1,0)
 /CCC/ → [CVC], (0,1,1,1,0)
 /CCV/ → [CV], (0,0,1,0,0)
 /CV/ → [CV], (0,0,0,0,0)
 /CVC/ → [CVC], (0,0,0,1,0)
 /CVV/ → [CV.CV], (1,0,0,0,0)

/V/ → [CV], (1,0,0,0,0)
 /VC/ → [CVC], (1,0,0,1,0)
 /VCC/ → [CVC], (1,0,1,1,0)
 /VCV/ → [CV.CV], (1,0,0,0,0)
 /VV/ → [CV.CV], (2,0,0,0,0)
 /VVC/ → [CV.CVC], (2,0,0,1,0)
 /VVV/ → [CV.CV.CV], (3,0,0,0,0)

Language 21 Occurs in the typology of: HG_{HG}

/C/ → ∅, (0,0,1,0,0)
 /CC/ → [CVC], (0,1,0,1,0)
 /CCC/ → [CVC], (0,1,1,1,0)
 /CCV/ → [CV], (0,0,1,0,0)
 /CV/ → [CV], (0,0,0,0,0)
 /CVC/ → [CVC], (0,0,0,1,0)
 /CVV/ → [CV], (0,0,1,0,0)
 /V/ → ∅, (0,0,1,0,0)
 /VC/ → ∅, (0,0,2,0,0)
 /VCC/ → [CVC], (0,1,1,1,0)
 /VCV/ → [CV], (0,0,1,0,0)
 /VV/ → ∅, (0,0,2,0,0)
 /VVC/ → ∅, (0,0,3,0,0)
 /VVV/ → ∅, (0,0,3,0,0)

Language 22 Occurs in the typology of: HG_{HG}

/C/ → ∅, (0,0,1,0,0)
 /CC/ → ∅, (0,0,2,0,0)
 /CCC/ → ∅, (0,0,3,0,0)
 /CCV/ → [CV], (0,0,1,0,0)
 /CV/ → [CV], (0,0,0,0,0)
 /CVC/ → [CVC], (0,0,0,1,0)
 /CVV/ → [CV], (0,0,1,0,0)
 /V/ → ∅, (0,0,1,0,0)
 /VC/ → [CVC], (1,0,0,1,0)
 /VCC/ → [CVC], (1,0,1,1,0)
 /VCV/ → [CV], (0,0,1,0,0)
 /VV/ → ∅, (0,0,2,0,0)
 /VVC/ → [CVC], (1,0,1,1,0)
 /VVV/ → ∅, (0,0,3,0,0)

Language 23 Occurs in the typology of: HG_{HG}

/C/ → ∅, (0,0,1,0,0)
 /CC/ → [CVC], (0,1,0,1,0)
 /CCC/ → [CVC], (0,1,1,1,0)
 /CCV/ → [CV], (0,0,1,0,0)
 /CV/ → [CV], (0,0,0,0,0)
 /CVC/ → [CVC], (0,0,0,1,0)
 /CVV/ → [CV], (0,0,1,0,0)
 /V/ → ∅, (0,0,1,0,0)
 /VC/ → [CVC], (1,0,0,1,0)
 /VCC/ → [CVC], (1,0,1,1,0)

$/VCV/ \rightarrow [CV], (0,0,1,0,0)$
 $/VV/ \rightarrow \emptyset, (0,0,2,0,0)$
 $/VVC/ \rightarrow [CVC], (1,0,1,1,0)$
 $/VVV/ \rightarrow \emptyset, (0,0,3,0,0)$

4.4 HG_{OT} only languages

Language 24 Occurs in the typology of: HG_{OT}

$/C/ \rightarrow \emptyset, (0,0,1,0,0)$
 $/CC/ \rightarrow \emptyset, (0,0,2,0,0)$
 $/CCC/ \rightarrow \emptyset, (0,0,3,0,0)$
 $/CCV/ \rightarrow [CV], (0,0,1,0,0)$
 $/CV/ \rightarrow [CV], (0,0,0,0,0)$
 $/CVC/ \rightarrow [CVC], (0,0,0,1,0)$
 $/CVV/ \rightarrow [CV], (0,0,1,0,0)$
 $/V/ \rightarrow \emptyset, (0,0,1,0,0)$
 $/VC/ \rightarrow [CVC], (1,0,0,1,0)$
 $/VCC/ \rightarrow [CVC], (1,0,1,1,0)$
 $/VCV/ \rightarrow [CV], (0,0,1,0,0)$
 $/VV/ \rightarrow \emptyset, (0,0,2,0,0)$
 $/VVC/ \rightarrow [CV.CVC], (2,0,0,1,0)$
 $/VVV/ \rightarrow \emptyset, (0,0,3,0,0)$

Language 25 Occurs in the typology of: HG_{OT}

$/C/ \rightarrow \emptyset, (0,0,1,0,0)$
 $/CC/ \rightarrow [CVC], (0,1,0,1,0)$
 $/CCC/ \rightarrow [CV.CVC] \mid [CVC.CV], (0,2,0,1,0)$
 $/CCV/ \rightarrow [CV], (0,0,1,0,0)$
 $/CV/ \rightarrow [CV], (0,0,0,0,0)$
 $/CVC/ \rightarrow [CVC], (0,0,0,1,0)$
 $/CVV/ \rightarrow [CV], (0,0,1,0,0)$
 $/V/ \rightarrow \emptyset, (0,0,1,0,0)$
 $/VC/ \rightarrow [VC], (0,0,0,1,1)$
 $/VCC/ \rightarrow [CVC], (0,1,1,1,0)$
 $/VCV/ \rightarrow [CV], (0,0,1,0,0)$
 $/VV/ \rightarrow \emptyset, (0,0,2,0,0)$
 $/VVC/ \rightarrow \emptyset, (0,0,3,0,0)$
 $/VVV/ \rightarrow \emptyset, (0,0,3,0,0)$

Language 26 Occurs in the typology of: HG_{OT}

$/C/ \rightarrow [CV], (0,1,0,0,0)$
 $/CC/ \rightarrow [CVC], (0,1,0,1,0)$
 $/CCC/ \rightarrow [CV.CVC] \mid [CVC.CV], (0,2,0,1,0)$
 $/CCV/ \rightarrow [CV.CV], (0,1,0,0,0)$
 $/CV/ \rightarrow [CV], (0,0,0,0,0)$
 $/CVC/ \rightarrow [CVC], (0,0,0,1,0)$
 $/CVV/ \rightarrow [CV], (0,0,1,0,0)$
 $/V/ \rightarrow \emptyset, (0,0,1,0,0)$
 $/VC/ \rightarrow [CVC], (1,0,0,1,0)$
 $/VCC/ \rightarrow [CVC], (0,1,1,1,0)$

/VCV/ \rightarrow [CV], (0,0,1,0,0)
 /VV/ \rightarrow \emptyset , (0,0,2,0,0)
 /VVC/ \rightarrow [CV.CVC], (2,0,0,1,0)
 /VVV/ \rightarrow \emptyset , (0,0,3,0,0)

Language 27 Occurs in the typology of: HG_{OT}

/C/ \rightarrow \emptyset , (0,0,1,0,0)
 /CC/ \rightarrow [CVC], (0,1,0,1,0)
 /CCC/ \rightarrow [CV.CVC] | [CVC.CV], (0,2,0,1,0)
 /CCV/ \rightarrow [CV], (0,0,1,0,0)
 /CV/ \rightarrow [CV], (0,0,0,0,0)
 /CVC/ \rightarrow [CVC], (0,0,0,1,0)
 /CVV/ \rightarrow [CV.CV], (1,0,0,0,0)
 /V/ \rightarrow [CV], (1,0,0,0,0)
 /VC/ \rightarrow [CVC], (1,0,0,1,0)
 /VCC/ \rightarrow [CVC], (1,0,1,1,0)
 /VCV/ \rightarrow [CV.CV], (1,0,0,0,0)
 /VV/ \rightarrow [CV.CV], (2,0,0,0,0)
 /VVC/ \rightarrow [CV.CVC], (2,0,0,1,0)
 /VVV/ \rightarrow [CV.CV.CV], (3,0,0,0,0)

Language 28 Occurs in the typology of: HG_{OT}

/C/ \rightarrow \emptyset , (0,0,1,0,0)
 /CC/ \rightarrow [CVC], (0,1,0,1,0)
 /CCC/ \rightarrow \emptyset , (0,0,3,0,0)
 /CCV/ \rightarrow [CV], (0,0,1,0,0)
 /CV/ \rightarrow [CV], (0,0,0,0,0)
 /CVC/ \rightarrow [CVC], (0,0,0,1,0)
 /CVV/ \rightarrow [CV], (0,0,1,0,0)
 /V/ \rightarrow \emptyset , (0,0,1,0,0)
 /VC/ \rightarrow [VC], (0,0,0,1,1)
 /VCC/ \rightarrow [CVC], (0,1,1,1,0)
 /VCV/ \rightarrow [CV], (0,0,1,0,0)
 /VV/ \rightarrow \emptyset , (0,0,2,0,0)
 /VVC/ \rightarrow \emptyset , (0,0,3,0,0)
 /VVV/ \rightarrow \emptyset , (0,0,3,0,0)

Language 29 Occurs in the typology of: HG_{OT}

/C/ \rightarrow \emptyset , (0,0,1,0,0)
 /CC/ \rightarrow [CVC], (0,1,0,1,0)
 /CCC/ \rightarrow \emptyset , (0,0,3,0,0)
 /CCV/ \rightarrow [CV], (0,0,1,0,0)
 /CV/ \rightarrow [CV], (0,0,0,0,0)
 /CVC/ \rightarrow [CVC], (0,0,0,1,0)
 /CVV/ \rightarrow [CV], (0,0,1,0,0)
 /V/ \rightarrow \emptyset , (0,0,1,0,0)
 /VC/ \rightarrow \emptyset , (0,0,2,0,0)
 /VCC/ \rightarrow [CVC], (0,1,1,1,0)
 /VCV/ \rightarrow [CV], (0,0,1,0,0)
 /VV/ \rightarrow \emptyset , (0,0,2,0,0)
 /VVC/ \rightarrow \emptyset , (0,0,3,0,0)

/VVV/ $\rightarrow \emptyset, (0,0,3,0,0)$

Language 30 Occurs in the typology of: HG_{OT}

/C/ $\rightarrow \emptyset, (0,0,1,0,0)$

/CC/ \rightarrow [CVC], (0,1,0,1,0)

/CCC/ \rightarrow [CV.CVC] | [CVC.CV], (0,2,0,1,0)

/CCV/ \rightarrow [CV], (0,0,1,0,0)

/CV/ \rightarrow [CV], (0,0,0,0,0)

/CVC/ \rightarrow [CVC], (0,0,0,1,0)

/CVV/ \rightarrow [CV], (0,0,1,0,0)

/V/ $\rightarrow \emptyset, (0,0,1,0,0)$

/VC/ \rightarrow [CVC], (1,0,0,1,0)

/VCC/ \rightarrow [CVC], (0,1,1,1,0)

/VCV/ \rightarrow [CV], (0,0,1,0,0)

/VV/ $\rightarrow \emptyset, (0,0,2,0,0)$

/VVC/ \rightarrow [CV.CVC], (2,0,0,1,0)

/VVV/ $\rightarrow \emptyset, (0,0,3,0,0)$

Language 31 Occurs in the typology of: HG_{OT}

/C/ $\rightarrow \emptyset, (0,0,1,0,0)$

/CC/ \rightarrow [CVC], (0,1,0,1,0)

/CCC/ \rightarrow [CV.CVC] | [CVC.CV], (0,2,0,1,0)

/CCV/ \rightarrow [CV], (0,0,1,0,0)

/CV/ \rightarrow [CV], (0,0,0,0,0)

/CVC/ \rightarrow [CVC], (0,0,0,1,0)

/CVV/ \rightarrow [CV], (0,0,1,0,0)

/V/ $\rightarrow \emptyset, (0,0,1,0,0)$

/VC/ $\rightarrow \emptyset, (0,0,2,0,0)$

/VCC/ \rightarrow [CVC], (0,1,1,1,0)

/VCV/ \rightarrow [CV], (0,0,1,0,0)

/VV/ $\rightarrow \emptyset, (0,0,2,0,0)$

/VVC/ $\rightarrow \emptyset, (0,0,3,0,0)$

/VVV/ $\rightarrow \emptyset, (0,0,3,0,0)$

Language 32 Occurs in the typology of: HG_{OT}

/C/ $\rightarrow \emptyset, (0,0,1,0,0)$

/CC/ \rightarrow [CVC], (0,1,0,1,0)

/CCC/ $\rightarrow \emptyset, (0,0,3,0,0)$

/CCV/ \rightarrow [CV], (0,0,1,0,0)

/CV/ \rightarrow [CV], (0,0,0,0,0)

/CVC/ \rightarrow [CVC], (0,0,0,1,0)

/CVV/ \rightarrow [CV], (0,0,1,0,0)

/V/ $\rightarrow \emptyset, (0,0,1,0,0)$

/VC/ \rightarrow [CVC], (1,0,0,1,0)

/VCC/ \rightarrow [CVC], (0,1,1,1,0)

/VCV/ \rightarrow [CV], (0,0,1,0,0)

/VV/ $\rightarrow \emptyset, (0,0,2,0,0)$

/VVC/ $\rightarrow \emptyset, (0,0,3,0,0)$

/VVV/ $\rightarrow \emptyset, (0,0,3,0,0)$

Language 33 Occurs in the typology of: HG_{OT}

/C/ $\rightarrow \emptyset, (0,0,1,0,0)$

/CC/ → [CVC], (0,1,0,1,0)
 /CCC/ → ∅, (0,0,3,0,0)
 /CCV/ → [CV], (0,0,1,0,0)
 /CV/ → [CV], (0,0,0,0,0)
 /CVC/ → [CVC], (0,0,0,1,0)
 /CVV/ → [CV], (0,0,1,0,0)
 /V/ → ∅, (0,0,1,0,0)
 /VC/ → [CVC], (1,0,0,1,0)
 /VCC/ → [CVC], (1,0,1,1,0)
 /VCV/ → [CV], (0,0,1,0,0)
 /VV/ → ∅, (0,0,2,0,0)
 /VVC/ → [CV.CVC], (2,0,0,1,0)
 /VVV/ → ∅, (0,0,3,0,0)

Language 34 Occurs in the typology of: HG_{OT}

/C/ → ∅, (0,0,1,0,0)
 /CC/ → [CVC], (0,1,0,1,0)
 /CCC/ → ∅, (0,0,3,0,0)
 /CCV/ → [CV], (0,0,1,0,0)
 /CV/ → [CV], (0,0,0,0,0)
 /CVC/ → [CVC], (0,0,0,1,0)
 /CVV/ → [CV], (0,0,1,0,0)
 /V/ → ∅, (0,0,1,0,0)
 /VC/ → [CVC], (1,0,0,1,0)
 /VCC/ → [CVC], (1,0,1,1,0)
 /VCV/ → [CV], (0,0,1,0,0)
 /VV/ → ∅, (0,0,2,0,0)
 /VVC/ → ∅, (0,0,3,0,0)
 /VVV/ → ∅, (0,0,3,0,0)

Language 35 Occurs in the typology of: HG_{OT}

/C/ → ∅, (0,0,1,0,0)
 /CC/ → [CVC], (0,1,0,1,0)
 /CCC/ → [CV.CVC] | [CVC.CV], (0,2,0,1,0)
 /CCV/ → [CV], (0,0,1,0,0)
 /CV/ → [CV], (0,0,0,0,0)
 /CVC/ → [CVC], (0,0,0,1,0)
 /CVV/ → [CV], (0,0,1,0,0)
 /V/ → ∅, (0,0,1,0,0)
 /VC/ → [VC], (0,0,0,1,1)
 /VCC/ → [CVC], (0,1,1,1,0)
 /VCV/ → [CV], (0,0,1,0,0)
 /VV/ → ∅, (0,0,2,0,0)
 /VVC/ → [V.VC], (0,0,0,1,2)
 /VVV/ → ∅, (0,0,3,0,0)

Language 36 Occurs in the typology of: HG_{OT}

/C/ → ∅, (0,0,1,0,0)
 /CC/ → [CVC], (0,1,0,1,0)
 /CCC/ → [CV.CVC] | [CVC.CV], (0,2,0,1,0)
 /CCV/ → [CV], (0,0,1,0,0)

/CV/ → [CV], (0,0,0,0,0)
 /CVC/ → [CVC], (0,0,0,1,0)
 /CVV/ → [CV], (0,0,1,0,0)
 /V/ → ∅, (0,0,1,0,0)
 /VC/ → [CVC], (1,0,0,1,0)
 /VCC/ → [CVC], (1,0,1,1,0)
 /VCV/ → [CV], (0,0,1,0,0)
 /VV/ → ∅, (0,0,2,0,0)
 /VVC/ → [CV.CVC], (2,0,0,1,0)
 /VVV/ → ∅, (0,0,3,0,0)

Language 37 Occurs in the typology of: HG_{OT}

/C/ → ∅, (0,0,1,0,0)
 /CC/ → [CVC], (0,1,0,1,0)
 /CCC/ → [CV.CVC] | [CVC.CV], (0,2,0,1,0)
 /CCV/ → [CV], (0,0,1,0,0)
 /CV/ → [CV], (0,0,0,0,0)
 /CVC/ → [CVC], (0,0,0,1,0)
 /CVV/ → [CV], (0,0,1,0,0)
 /V/ → ∅, (0,0,1,0,0)
 /VC/ → [VC], (0,0,0,1,1)
 /VCC/ → [VC], (0,0,1,1,1)
 /VCV/ → [CV], (0,0,1,0,0)
 /VV/ → ∅, (0,0,2,0,0)
 /VVC/ → [V.VC], (0,0,0,1,2)
 /VVV/ → ∅, (0,0,3,0,0)

Language 38 Occurs in the typology of: HG_{OT}

/C/ → ∅, (0,0,1,0,0)
 /CC/ → [CVC], (0,1,0,1,0)
 /CCC/ → ∅, (0,0,3,0,0)
 /CCV/ → [CV], (0,0,1,0,0)
 /CV/ → [CV], (0,0,0,0,0)
 /CVC/ → [CVC], (0,0,0,1,0)
 /CVV/ → [CV], (0,0,1,0,0)
 /V/ → ∅, (0,0,1,0,0)
 /VC/ → [VC], (0,0,0,1,1)
 /VCC/ → [VC], (0,0,1,1,1)
 /VCV/ → [CV], (0,0,1,0,0)
 /VV/ → ∅, (0,0,2,0,0)
 /VVC/ → [V.VC], (0,0,0,1,2)
 /VVV/ → ∅, (0,0,3,0,0)

Language 39 Occurs in the typology of: HG_{OT}

/C/ → ∅, (0,0,1,0,0)
 /CC/ → [CVC], (0,1,0,1,0)
 /CCC/ → [CV.CVC] | [CVC.CV], (0,2,0,1,0)
 /CCV/ → [CV], (0,0,1,0,0)
 /CV/ → [CV], (0,0,0,0,0)
 /CVC/ → [CVC], (0,0,0,1,0)
 /CVV/ → [CV], (0,0,1,0,0)

/V/ $\rightarrow \emptyset, (0,0,1,0,0)$
 /VC/ $\rightarrow [\text{CVC}], (1,0,0,1,0)$
 /VCC/ $\rightarrow [\text{CVC}], (0,1,1,1,0)$
 /VCV/ $\rightarrow [\text{CV}], (0,0,1,0,0)$
 /VV/ $\rightarrow \emptyset, (0,0,2,0,0)$
 /VVC/ $\rightarrow \emptyset, (0,0,3,0,0)$
 /VVV/ $\rightarrow \emptyset, (0,0,3,0,0)$

Language 40 Occurs in the typology of: HG_{OT}

/C/ $\rightarrow \emptyset, (0,0,1,0,0)$
 /CC/ $\rightarrow [\text{CVC}], (0,1,0,1,0)$
 /CCC/ $\rightarrow \emptyset, (0,0,3,0,0)$
 /CCV/ $\rightarrow [\text{CV}], (0,0,1,0,0)$
 /CV/ $\rightarrow [\text{CV}], (0,0,0,0,0)$
 /CVC/ $\rightarrow [\text{CVC}], (0,0,0,1,0)$
 /CVV/ $\rightarrow [\text{CV}], (0,0,1,0,0)$
 /V/ $\rightarrow \emptyset, (0,0,1,0,0)$
 /VC/ $\rightarrow [\text{VC}], (0,0,0,1,1)$
 /VCC/ $\rightarrow [\text{VC}], (0,0,1,1,1)$
 /VCV/ $\rightarrow [\text{CV}], (0,0,1,0,0)$
 /VV/ $\rightarrow \emptyset, (0,0,2,0,0)$
 /VVC/ $\rightarrow \emptyset, (0,0,3,0,0)$
 /VVV/ $\rightarrow \emptyset, (0,0,3,0,0)$

Language 41 Occurs in the typology of: HG_{OT}

/C/ $\rightarrow \emptyset, (0,0,1,0,0)$
 /CC/ $\rightarrow \emptyset, (0,0,2,0,0)$
 /CCC/ $\rightarrow \emptyset, (0,0,3,0,0)$
 /CCV/ $\rightarrow [\text{CV}], (0,0,1,0,0)$
 /CV/ $\rightarrow [\text{CV}], (0,0,0,0,0)$
 /CVC/ $\rightarrow [\text{CVC}], (0,0,0,1,0)$
 /CVV/ $\rightarrow [\text{CV}], (0,0,1,0,0)$
 /V/ $\rightarrow \emptyset, (0,0,1,0,0)$
 /VC/ $\rightarrow [\text{VC}], (0,0,0,1,1)$
 /VCC/ $\rightarrow [\text{VC}], (0,0,1,1,1)$
 /VCV/ $\rightarrow [\text{CV}], (0,0,1,0,0)$
 /VV/ $\rightarrow \emptyset, (0,0,2,0,0)$
 /VVC/ $\rightarrow \emptyset, (0,0,3,0,0)$
 /VVV/ $\rightarrow \emptyset, (0,0,3,0,0)$

Language 42 Occurs in the typology of: HG_{OT}

/C/ $\rightarrow [\text{CV}], (0,1,0,0,0)$
 /CC/ $\rightarrow [\text{CVC}], (0,1,0,1,0)$
 /CCC/ $\rightarrow [\text{CV.CVC}] \mid [\text{CVC.CV}], (0,2,0,1,0)$
 /CCV/ $\rightarrow [\text{CV.CV}], (0,1,0,0,0)$
 /CV/ $\rightarrow [\text{CV}], (0,0,0,0,0)$
 /CVC/ $\rightarrow [\text{CVC}], (0,0,0,1,0)$
 /CVV/ $\rightarrow [\text{CV}], (0,0,1,0,0)$
 /V/ $\rightarrow \emptyset, (0,0,1,0,0)$
 /VC/ $\rightarrow [\text{VC}], (0,0,0,1,1)$
 /VCC/ $\rightarrow [\text{CVC}], (0,1,1,1,0)$

/VCV/ → [CV], (0,0,1,0,0)
 /VV/ → ∅, (0,0,2,0,0)
 /VVC/ → [V.VC], (0,0,0,1,2)
 /VVV/ → ∅, (0,0,3,0,0)

Language 43 Occurs in the typology of: HG_{OT}

/C/ → ∅, (0,0,1,0,0)
 /CC/ → ∅, (0,0,2,0,0)
 /CCC/ → ∅, (0,0,3,0,0)
 /CCV/ → [CV], (0,0,1,0,0)
 /CV/ → [CV], (0,0,0,0,0)
 /CVC/ → [CVC], (0,0,0,1,0)
 /CVV/ → [CV], (0,0,1,0,0)
 /V/ → ∅, (0,0,1,0,0)
 /VC/ → [CVC], (1,0,0,1,0)
 /VCC/ → [CVC], (1,0,1,1,0)
 /VCV/ → [CV], (0,0,1,0,0)
 /VV/ → ∅, (0,0,2,0,0)
 /VVC/ → ∅, (0,0,3,0,0)
 /VVV/ → ∅, (0,0,3,0,0)

Language 44 Occurs in the typology of: HG_{OT}

/C/ → [CV], (0,1,0,0,0)
 /CC/ → [CVC], (0,1,0,1,0)
 /CCC/ → [CV.CVC] | [CVC.CV], (0,2,0,1,0)
 /CCV/ → [CV.CV], (0,1,0,0,0)
 /CV/ → [CV], (0,0,0,0,0)
 /CVC/ → [CVC], (0,0,0,1,0)
 /CVV/ → [CV], (0,0,1,0,0)
 /V/ → ∅, (0,0,1,0,0)
 /VC/ → [VC], (0,0,0,1,1)
 /VCC/ → [CVC], (0,1,1,1,0)
 /VCV/ → [CV], (0,0,1,0,0)
 /VV/ → ∅, (0,0,2,0,0)
 /VVC/ → [CV], (0,1,2,0,0)
 /VVV/ → ∅, (0,0,3,0,0)

Language 45 Occurs in the typology of: HG_{OT}

/C/ → ∅, (0,0,1,0,0)
 /CC/ → ∅, (0,0,2,0,0)
 /CCC/ → ∅, (0,0,3,0,0)
 /CCV/ → [CV], (0,0,1,0,0)
 /CV/ → [CV], (0,0,0,0,0)
 /CVC/ → [CVC], (0,0,0,1,0)
 /CVV/ → [CV], (0,0,1,0,0)
 /V/ → ∅, (0,0,1,0,0)
 /VC/ → [VC], (0,0,0,1,1)
 /VCC/ → [VC], (0,0,1,1,1)
 /VCV/ → [CV], (0,0,1,0,0)
 /VV/ → ∅, (0,0,2,0,0)
 /VVC/ → [V.VC], (0,0,0,1,2)

/VVV/ $\rightarrow \emptyset$, (0,0,3,0,0)

Language 46 Occurs in the typology of: HG_{OT}

/C/ \rightarrow [CV], (0,1,0,0,0)

/CC/ \rightarrow [CVC], (0,1,0,1,0)

/CCC/ \rightarrow [CV.CVC] | [CVC.CV], (0,2,0,1,0)

/CCV/ \rightarrow [CV.CV], (0,1,0,0,0)

/CV/ \rightarrow [CV], (0,0,0,0,0)

/CVC/ \rightarrow [CVC], (0,0,0,1,0)

/CVV/ \rightarrow [CV], (0,0,1,0,0)

/V/ $\rightarrow \emptyset$, (0,0,1,0,0)

/VC/ \rightarrow [CVC], (1,0,0,1,0)

/VCC/ \rightarrow [CVC], (0,1,1,1,0)

/VCV/ \rightarrow [CV], (0,0,1,0,0)

/VV/ $\rightarrow \emptyset$, (0,0,2,0,0)

/VVC/ \rightarrow [CV], (0,1,2,0,0)

/VVV/ $\rightarrow \emptyset$, (0,0,3,0,0)

Language 47 Occurs in the typology of: HG_{OT}

/C/ $\rightarrow \emptyset$, (0,0,1,0,0)

/CC/ \rightarrow [CVC], (0,1,0,1,0)

/CCC/ $\rightarrow \emptyset$, (0,0,3,0,0)

/CCV/ \rightarrow [CV], (0,0,1,0,0)

/CV/ \rightarrow [CV], (0,0,0,0,0)

/CVC/ \rightarrow [CVC], (0,0,0,1,0)

/CVV/ \rightarrow [CV.V], (0,0,0,0,1)

/V/ \rightarrow [V], (0,0,0,0,1)

/VC/ \rightarrow [VC], (0,0,0,1,1)

/VCC/ \rightarrow [VC], (0,0,1,1,1)

/VCV/ \rightarrow [V.CV], (0,0,0,0,1)

/VV/ \rightarrow [V.V], (0,0,0,0,2)

/VVC/ \rightarrow [V.VC], (0,0,0,1,2)

/VVV/ \rightarrow [V.V.V], (0,0,0,0,3)

Language 48 Occurs in the typology of: HG_{OT}

/C/ $\rightarrow \emptyset$, (0,0,1,0,0)

/CC/ \rightarrow [CVC], (0,1,0,1,0)

/CCC/ $\rightarrow \emptyset$, (0,0,3,0,0)

/CCV/ \rightarrow [CV], (0,0,1,0,0)

/CV/ \rightarrow [CV], (0,0,0,0,0)

/CVC/ \rightarrow [CVC], (0,0,0,1,0)

/CVV/ \rightarrow [CV.CV], (1,0,0,0,0)

/V/ \rightarrow [CV], (1,0,0,0,0)

/VC/ \rightarrow [CVC], (1,0,0,1,0)

/VCC/ \rightarrow [CVC], (1,0,1,1,0)

/VCV/ \rightarrow [CV.CV], (1,0,0,0,0)

/VV/ \rightarrow [CV.CV], (2,0,0,0,0)

/VVC/ \rightarrow [CV.CVC], (2,0,0,1,0)

/VVV/ \rightarrow [CV.CV.CV], (3,0,0,0,0)

Language 49 Occurs in the typology of: HG_{OT}

/C/ $\rightarrow \emptyset$, (0,0,1,0,0)

/CC/ → [CVC], (0,1,0,1,0)
 /CCC/ → [CV.CVC] | [CVC.CV], (0,2,0,1,0)
 /CCV/ → [CV], (0,0,1,0,0)
 /CV/ → [CV], (0,0,0,0,0)
 /CVC/ → [CVC], (0,0,0,1,0)
 /CVV/ → [CV.V], (0,0,0,0,1)
 /V/ → [V], (0,0,0,0,1)
 /VC/ → [VC], (0,0,0,1,1)
 /VCC/ → [VC], (0,0,1,1,1)
 /VCV/ → [V.CV], (0,0,0,0,1)
 /VV/ → [V.V], (0,0,0,0,2)
 /VVC/ → [V.VC], (0,0,0,1,2)
 /VVV/ → [V.V.V], (0,0,0,0,3)

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