

Using Selective Global Comparison to Investigate the Nature of Phonological Features and the Range of Variation in Segment Inventories and Phonological Processes

RESEARCH PROPOSAL - DRAFT

In this project, we will use the *selective global comparison* methodology to investigate the nature of phonological features, their relationships to one another, and their phonetic variation. We will do this by exploring the make up of segmental inventories as seen through the lens of a highly constrained and explicit feature theory. The goals are 1) to provide in-depth studies of a selection of phonological grammars using contrastive segment inventories and a range of phonetic and phonological facts and principles, 2) to test the limits of feature combinations and the relationship between features and their phonetic manifestations, 3) to assess current models of phonological features and segment-internal representations, and 4) to develop a more satisfactory (explicit, restrictive, economical, explanatory, etc.) model.

Why features and segment inventories?

Until the early 1990s with the advent of Optimality Theory (Prince and Smolensky 1993), the major questions within phonology dealt with the nature of phonological features, the relationship among them, segmental and supra-segmental structure (Autosegmental Phonology, Feature Geometry, Syllable Theory, Moraic Theory), rules, constraints, and the interactions among rules and constraints.

With the introduction of OT and the explicit rejection of phonological and morpho-phonological rules, the focus shifted almost exclusively to one of constraint interactions (often not even questioning the makeup of the constraints themselves). Despite the fact that there are still many unanswered questions regarding the nature of phonological features and how they relate to one another, and despite the fact that “OT is agnostic with respect to structure” (Lombardi...), the majority of researchers using OT as a tool either reject segment-internal representation outright (e.g. Padgett 2002) or simply ignore questions of feature theory and use features conveniently inherited from pre-OT work without worrying about their validity, relationships, or how they fit into the overall grammar of the given language under investigation.

Although the insights brought to the table by OT must be acknowledged, the featural and structural concerns that were of such import to prior work did not disappear with the rejection of phonological rules - as the recent work of Clements, Dresher, Rice, Avery, and the schools of Dependency Phonology and Government Phonology attests.

Some hypotheses/predictions our restrictive feature theory makes¹

- Small consonant inventories are expected to show phonetic dispersion in a way similar to that found in vowel inventories.
- Phonetic variation is more likely along a dimension that is not phonologically specified, and a dimension that is phonologically specified with a feature is more likely to resist phonetic variation.
- Phonetic enhancements should only occur along a dimension that does not involve a contrastive feature.
- The phonetic realization of a particular set of phonological features can differ by context depending on the contrasts found in that context and a range of articulatory/perceptual influences.
- Phonetically predictable characteristics are not phonologically specified unless they form part of a contrastive opposition or are made use of in a phonological process.
- Processes/interactions/alternations not involving a contrastive feature are phonetic in nature (too strong?).
- There are no synchronic phonological unnatural classes. What seem like phonetically unnatural classes are coherent from a phonological feature perspective.
- The presence of a phonologically complex segment implies the presence of a minimally different phonologically less complex segment. This includes segments composed of only single features.
- Phonological segment acquisition should proceed from less complex to more complex as measured by structural complexity. Phonologically simpler segments should arise before phonologically complex segments.

¹ Note that many of these hypotheses have direct impact on important claims in the current literature - e.g. Steriade, Kirchner, Flemming, Boersma, Dresher, Clements, etc.

- Very similar (identical) surface inventories can have very different phonological structures across languages.
- Very similar (identical) surface segments can have very different phonological structures across languages.
- Consonants and vowels should phonologically interact only along a dimension for which they both have a contrastive feature (too strong?).

Research plan

Choose a set of genetically and structurally diverse languages (using individual expertise/experience and perhaps the UPSID as a starting point), which have different sizes and complexities of consonant and vowel inventories. (A major question is what the metric for “size” and “complexity” might be!) For example,

(1)

Small inventory	Large inventory	Simple segments	Complex segments	Possible Languages ²
C, V		C, V		Pirahã (8, 3)
C, V		V	C	
C, V		C	V	Rotokas (6, 5)
C, V			C, V	Hawaiian (8, 5) Maori (10, 5) Palauan (11, 5)
V	C	C, V		
V	C	V	C	
V	C	C	V	
V	C		C, V	
C	V	C, V		
C	V	V	C	
C	V	C	V	
C	V		C, V	
	C, V	C, V		
	C, V	V	C	
	C, V	C	V	
	C, V		C, V	

Look at the phonetics and phonology of the segment inventory and phonological processes, in detail (including contrast, neutralizations, assimilations, dissimilations, alternations, etc.), through the lens of our restrictive feature system. Examples of three languages are given in Appendix B.

² Explore the following resource: <http://www.ling.su.se/staff/olle/form-eng.htm>

Tentative methodology

1. Choose a language
2. Describe the surface segment inventory in as much phonetic detail as possible
 - For vowels - height, major place (i.e. front-central-back), minor place (e.g. rounding, pharyngealization), tenseness/laxness (or ATR/RTR), nasalization, laryngeal characterization (e.g. modal voicing, voicelessness, creakiness, glottalization, tone), etc.
 - For consonants - major class/manner, major place (i.e. active and passive articulators), minor place (i.e. active and passive articulators), stridency, (pre-)nasalization, (pre-)stopping, laryngeal characterization (e.g. plain, voiced, (pre-)aspirated, (pre-)glottalized, creaky, breathy, murmured, tone), laterality, rhoticity, trilling, etc.
3. Describe positional restrictions within morphemes
 - For vowels - hiatus restrictions, harmony, assimilation, dissimilation, reduction, epenthesis
 - For consonants - onset-coda asymmetries, cluster restrictions, harmony, assimilation, dissimilation, lenition, fortition, sonorant-obstruent alternations, epenthesis
 - For both - C-V interactions, C-V alternations
4. Describe positional restrictions between morphemes
 - For vowels - hiatus restrictions, harmony, assimilation, dissimilation, reduction, epenthesis
 - For consonants - onset-coda asymmetries, cluster restrictions, harmony, assimilation, dissimilation, lenition, fortition, sonorant-obstruent alternations, epenthesis
 - For both - C-V interactions, C-V alternations
5. Describe prosodically-conditioned alternations
6. Using the phonetic characteristics, knowledge of phonetic principles, and phonological patterns (i.e. restrictions, interactions, alternations), set up relationships between surface segments and build an economical contrastive segment inventory using the minimum number of (PSM) features necessary. Be sure to adhere to the premise that single feature segments are possible/preferred (by default assumption) and that more complex segments should imply minimally different less complex segments. In addition, C-node features are used unless there is overt evidence that V-node features are also needed.
7. Note any phonetic characteristics that seem to be phonetic enhancement strategies rather than phonologically specified features (i.e. they are phonetically present and help to enhance acoustic distinctiveness, but do not seem to fit into the minimal contrastive phonological feature set and/or do not play a role in phonological processes).
8. Discuss global or context-specific feature co-occurrence restrictions.
9. Provide an autosegmental depiction of each segment, restriction, interaction and alternation.
10. If acquisition data are available, compare the structural markedness/complexity claims with the empirical facts (stages).
11. If data are available for a closely related language, compare and contrast the phonetics, phonological feature specifications and phonological processes.

Appendix A

Important issues in phonology (independent of the rule/constraint debate) and our starting hypotheses

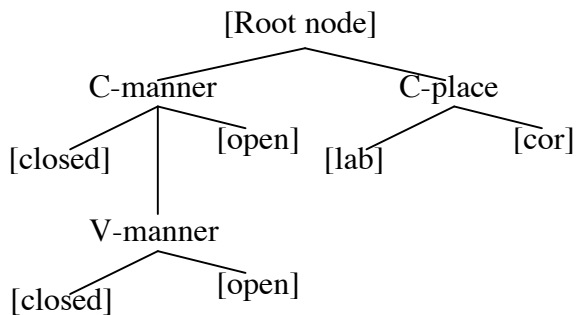
1. Feature theory
 - Privative versus binary features - Hypothesis: privative
 - Articulatory- versus acoustic-based features - Hypothesis: articulatory
 - Featural definition of sonority - Hypothesis: manner/constriction features
 - Odd status of the “Major Class Features” - Hypothesis: manner/constriction features
 - Unity versus disparity between consonant and vowel features - Hypothesis: unity
 - Phonological relationship between tones and other “laryngeal” features - Hypothesis: laryngeal/constriction features
 - Phonetic relationship between tones and other “laryngeal” features - Hypothesis: laryngeal constriction
2. Segment-internal representations
 - Based on vocal tract anatomy? - Hypothesis: no
 - Based on articulatory primitives? - Hypothesis: active articulator, passive articulator, degrees of constriction
 - Based on abstract relations? - Hypothesis: “C-node” with dependent “V-node” (Clements 1991)
3. Markedness relations among segment types
 - Inventory implications - Hypothesis: more features implies fewer features
 - Non-assimilating neutralization implications - Hypothesis: usually to fewer features
4. Segment/feature inventories
 - Inventory construction - Hypothesis: more features implies fewer features, phonetic variation provides clues, phonological alternations provide clues
 - Clement’s work on inventory economy (inventories tend to maximize the use of features)
 - Phonetic “dispersion” versus phonological “dispersion” - Hypothesis: former for phonologically unspecified dimension, latter for phonologically specified dimension
 - Role of contrast in feature specification - Hypothesis: vital
 - Phonologically specified versus phonetically default articulations - Hypothesis: see “inventory construction” and “dispersion”
5. Phonological patterns/behavior
 - Role of pattern in feature specification - Hypothesis: vital
 - Harmony asymmetries - Hypothesis: due to “C-node” versus dependent “V-node” (Clements 1991)
 - Alternations between sonorant consonants and either obstruents or vowels - Hypothesis: sonorant consonants have both a consonant manner and a vowel manner
 - Odd behavior of nasal consonants as either obstruents (stops) or sonorants - Hypothesis: nasal consonants can be mannerless, an obstruent or a sonorant depending on the language
 - Consonant-vowel interactions - Hypothesis: due to unified feature set
6. Distributional restrictions
 - OCP restrictions on vowels - Hypothesis: “V-node” features
 - OCP restrictions on consonants- Hypothesis: “C-node” features
 - OCP restrictions among consonants and vowels - Hypothesis: due to unified feature set
7. Relationship between phonetics and phonology - Hypothesis: they are related, but distinct in that phonological features are “grounded” in articulation, but phonetic characteristics and phonological feature specification are not 1:1
8. Acquisition
 - How do children map the phonetic variables onto phonological features given the range of possibilities?
 - Is there a universal progression in the early stages of segment acquisition, as claimed by Jakobson and others? If so, how is this explained and how/when do the stages become language-particular? - Hypothesis: the Jacobsonian progression falls out of our hypothesis that more features implies fewer features (similar to the work of Dresher, Avery and Rice).
9. Language change
 - Issues listed here

Appendix B

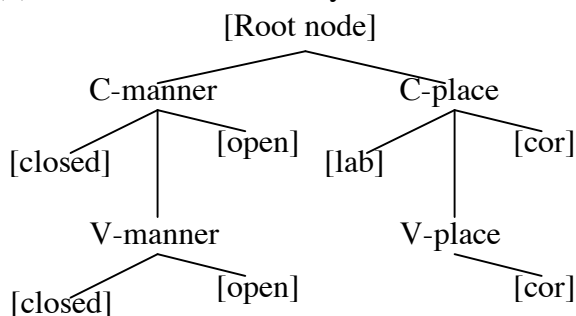
Hawaiian, Serbian and Russian examples

The following are preliminary analyses of Hawaiian, Serbian and Russian consonant and vowel inventories (ignoring nasals and laryngeal features) using the Parallel Structures Model of feature geometry. In comparing the representations in (2) through (4), we see that these three languages (two genetically related and one not) have the same basic segmental structures. They differ in terms of their use of place features, in the phonetic realization of phonological feature combinations, and in the level of segmental complexity allowed, as seen in the charts in (5) through (7).

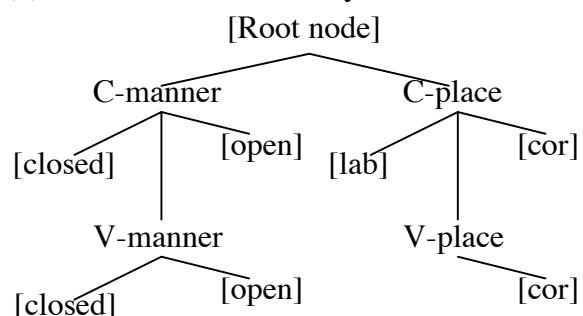
(2) Hawaiian PSM Geometry



(3) Serbian PSM Geometry



(4) Russian PSM Geometry



Things to note about these inventories:

1. Although the inventories of these languages are quite different, the segmental-internal structures are nearly identical. The difference is in the choice of place features.
2. Traditional feature theory and markedness relationships based on them claim that the least marked place of articulation is coronal, thus all languages should have coronals. One puzzle of Hawaiian phonology has been the lack of coronal obstruents. Under the Parallel Structures Model assumed here, the phonetically velar obstruent is phonologically coronal since there is no need to contrast differences among segments using the tongue as the active articulator (or the roof of the mouth as the passive articulator). This resolves the Hawaiian paradox by making phonetic-phonology mapping partially dependent on phonological contrast, not just phonetics.
3. Although Russian and Serbian are genetically related, and their inventories and some phonological processes are similar, the mapping between phonetic characteristics and phonological features is sometimes quite different. This is particularly apparent in looking at the vowel inventories, where both languages have surface vowels in roughly the same phonetic positions, but Serbian vowels appear to be of only two phonological heights, while Russian vowels are of three phonological heights. In addition, the Serbian “default” vowel (featurally minimal non-low) is [ɔ], while the Russian “default” vowel is [ɪ].

(5) Hawaiian segments (ignoring nasals)

			PSM Features					
			C-place		C-manner		V-manner	
			[lab]	[cor]	[closed]	[open]	[closed]	[open]
Mannerless	/w/	[w][v]	✓					
	/l/	[l][r]		✓				
Stop	/ʔ/	[ʔ]			✓			
	/p/	[p]	✓		✓			
	/k/	[k][t]		✓	✓			
Stop + Continuant	/n/	[n]			✓	✓		
	/m/	[m]	✓		✓	✓		
Continuant	/h/	[h]				✓		
High	/i/	[i]					✓	
	/u/	[u]	✓				✓	
Mid	/e/	[e]					✓	✓
	/o/	[o]	✓				✓	✓
Low	/a/	[a]						✓
Traditional features			[lab]/ [+rnd]	[cor]	[-cont]	[+cont]	[+high]	[+low]

(6) Standard Serbian segments (ignoring laryngeal and nasal features)

			PSM Features						
			C-place		V-place	C-manner		V-manner	
			[lab]	[cor]	[cor]	[closed]	[open]	[closed]	[open]
Mannerless	/f/	[f]	✓						
	/ṭ/	[ṭ]		✓					
	/ʲ/ iot				✓				
	/ḱ/	[ṭṣ]		✓	✓				
Stop	/k/	[k]				✓			
	/p/	[p]	✓			✓			
	/ṭ/	[ṭṣ]		✓		✓			
	/c/	[ṭṣ ^w]			✓	✓			
Fricative	/x/	[x]					✓		
	/s̺/	[s̺]		✓			✓		
	/ʃ/	[ʃ]			✓		✓		
Closed Approx.	/l/	[ɭ]				✓		✓	
	/v/	[v]	✓			✓		✓	
	/ʎ/	[ʎ]			✓	✓		✓	
Open Approx.	/r/	[r]					✓	✓	
High	/ɔ/	[ɔ]						✓	
	/u/	[u]	✓					✓	
	/i/ front	[i]		✓				✓	
	/ɛ/	[ɛ]			✓			✓	
	/i/ pal	[i]		✓	✓			✓	
Low	/a/	[a]							✓
Traditional Features			[lab]/ [+rnd]	[cor]/ ??	[+front]/ [-ant]	[-cont]	[+cont]	[+high]	[+low]

(7) Standard Russian segments (ignoring laryngeals, nasals and non-native segments)

			PSM Features						
			C-place		V-place	C-manner		V-manner	
			[lab]	[cor]	[cor]	[closed]	[open]	[closed]	[open]
Mannerless	/v/	[v ^v]	✓						
	/v ^j /	[v ^j]	✓		✓				
	/T/	[ts ^v]		✓					
	/ɸ/				✓				
Stop	/K/	[k] [c]				✓			
	/K ^j /	[tʃ ^j]			✓	✓			
	/p/	[p ^v]	✓			✓			
	/p ^j /	[p ^j]	✓		✓	✓			
	/t/	[t ^v]		✓		✓			
	/t ^j /	[t ^j]		✓	✓	✓			
Fricative	/X/	[x] [ç]					✓		
	/X ^j /	[ʃ ^v]			✓		✓		
	/f/	[f ^v]	✓				✓		
	/f/	[f ^j]	✓		✓		✓		
	/s/	[s ^v]		✓			✓		
	/s/	[s ^j]		✓	✓		✓		
Closed Approx.	/l/	[l ^v]				✓		✓	
	/l ^j /	[l ^j]			✓	✓		✓	
Open Approx.	/r/	[r ^v]					✓	✓	
	/r ^j /	[r ^j]			✓		✓	✓	
High	/i/	[i][i̯][ɪ][ɨ]						✓	
	/u/	[u][ʊ]	✓					✓	
	/e/	[e][ɪ][ɨ]			✓			✓	
Mid	/o/	[o]						✓	✓
Low	/a/	[a][ʌ][ə]							✓
Traditional Features			[lab]/ [+rnd]	[cor] /??	[+front]/ [-ant]	[-cont]	[+cont]	[+high]	[+low]