

Feature geometry and markedness

Plan for today

- Motivation for feature geometry
- Geometry, visibility and activity
- Linking geometrical structure to markedness and underspecification

Feature geometry: what and why?

Autosegmental phonology: tone spreading

Table 1: One-to-many tonal mapping in Shona

'N'	'with N'	Gloss
mbwá	né-mbwà	'dog'
hóvé	né-hòvè	'fish'
mbúndúdzí	né-mbùndùdzì	'worm'
hákàtà	né-hàkàtà	'bones'
bénzìbvúnzá	né-bènzìbvúnzá	'fool'
mùrúmé	né-mùrúmé	'man'
bàdzá	né-bàdzá	'hoe'

- All H tones in an initial sequence of H become L after a prefix H
- No lowering of non-initial H tones (*mùrúmé)
- We can't rely on a rule lowering a H after another H: no other way of getting [né-mbùndùdzì]



Place assimilation

- Full place assimilation: [C +nas] → [acor βant] / _[C acor βant]
- No [αPlace] feature in standard theories
- Why?
 - Difficult to avoid with binary features
 - Hangover from Jakobson, Fant & Halle,¹ who had an acoustic justification
 - [±lab], [±dor], [±cor] predict rare or unattested phonological classes

¹ Roman Jakobson, Gunnar Fant & Morris Halle. 1951. *Preliminaries to speech analysis*. Cambridge, MA: MIT Press.

A bad prediction

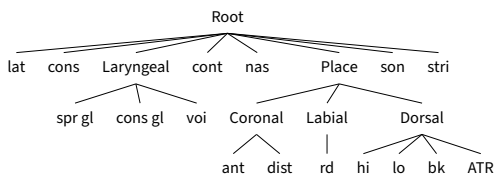
- What about C → [acor] / _[acor]?
- Should be simple, but it's a car crash

Input	Output	Input	Output
m̂tʃ	→ n̂tʃ	ŋtʃ	→ ntʃ
ɲp	→ ɲp	np	→ mp
ɲk	→ ɲk	nk	→ mk
ɲt	→ ɲt	n̂tʃ	→ n̂tʃ

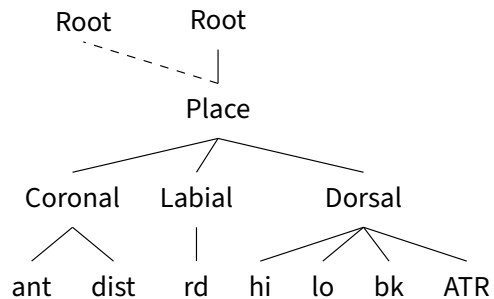
A solution

- Assimilation: identity between two feature values
- How do we enforce identity?
 - Traditional approach: *agreement* (via alpha rules)
 - Autosegmental approach: one-to-many mapping between non-segmental units (tones) and segments
- Extension of autosegmentalism to features: **feature geometry**
- Features are not rows in a matrix
- They reside on a separate tier and associate to (possibly multiple) segments, just like tones
- Further refinement: *nodes* unifying several features

A possible geometry



Spreading of nodes



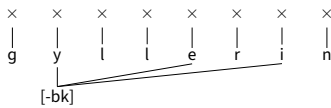
- A node that spreads brings all of its daughters: total place assimilation
- Subnodes may spread independently

Iterative processes: harmony

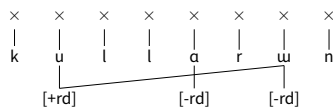
Table 3: Turkish vowel harmony

NOM	NOM.PL	GEN.PL	Gloss
jel	jel-ler	jel-ler-in	‘wind’
dij	dij-ler	dij-ler-in	‘tooth’
gyl	gyl-ler	gyl-ler-in	‘rose’
gøł	gøł-ler	gøł-ler-in	‘sea’
kuuz	kuuz-lar	kuuz-lar-un	‘girl’
dal	dal-lar	dal-lar-un	‘branch’
kol	kol-lar	kol-lar-un	‘arm’
kul	kul-lar	kul-lar-un	‘slave’

- Iterative processes like harmony work exactly like the spreading of tone



The Line Crossing Condition



- Rounding harmony cannot skip non-round vowels, because the result would violate the *Line Crossing Condition*
- The LCC basically states that association lines do not cross
- More formally: if a segment follows the start of an association domain and precedes its end, it is within that domain

Subnode spreading: Meadow Mari

NOM.SG	POSS.3SG	Gloss
ola	olaʒɛ	‘city’
tɛr	tɛrʒɛ	‘sledge’
kit	kitʃɛ	‘hand’
lym	lymʒø	‘name’
pørt	pørtʃø	‘house’

NOM.SG	POSS.3SG	Gloss
oŋ	oŋʒo	‘breast’
myj	myjʒø	‘honey’
tul	tulʒo	‘fire’
kol	kolʒo	‘fish’

- [±bk] and [±rd] spreading together
- Could be analysed using a Colour node

Other uses

- Under-use of features
 - The feature [±anterior] is basically useful only for the alveolar/postalveolar contrast in coronals, so lives under the Coronal node
- Unified Feature Theory² and cognate theories:³ single set of features for consonants and vowels
 - Dorsal = [+back]
 - Coronal = [-back]⁴
 - Consonant-vowel place assimilation as spreading

² G. Nick Clements. 1991. Place of articulation in consonants and vowels: a unified theory. In *Working papers of the Cornell Phonetics Laboratory*, vol. 5. Ithaca, NY; G. Nick Clements & Elizabeth V. Hume. 1995. The internal organization of speech sounds. In John Goldsmith (ed.), *The handbook of phonological theory*, 245–306. Oxford: Blackwell.

³ Bruce Morén. 2003. The Parallel Structures model of feature geometry. In *Working Papers of the Cornell Phonetics Laboratory*, vol. 15, 194–270. Ithaca, NY.

⁴ Elizabeth Hume. 1996. Coronal consonant, front vowel parallels in Maltese. *Natural Language & Linguistic Theory* 14(1). 163–203.

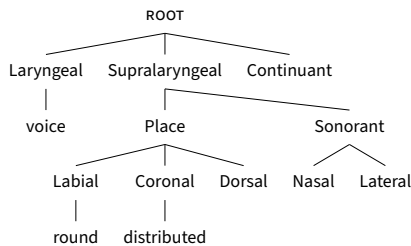
Quick summary

- Separation of skeleton and subsegmental representation
- Many-to-one mappings
- Link between presence of autosegmental structure and phonological behaviour

Geometry, visibility and activity

A geometry for place features

The following is based on.⁵



⁵ Peter Avery & Keren Rice. 1989. Segmental structure and coronal underspecification. *Phonology* 6(2). 179–200.

The Node Activation Condition

If a secondary content node is the sole distinguishing feature between two segments, then the primary feature is activated for the segments distinguished. Active nodes must be present in underlying representation.

Catalan place assimilation

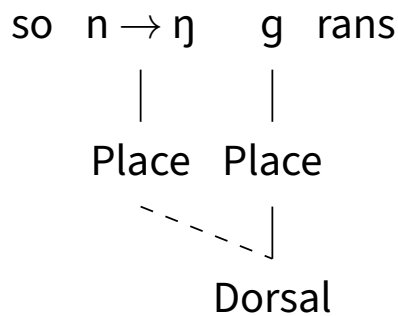
- Much like English, coronal nasals assimilate freely but non-coronal nasals resist assimilation

/son/	/som/	/tin/	before...
[n]	[m]	[ŋ]	<i>amics</i> 'friends'
[m]	[m]	[ŋ]	<i>pocs</i> 'few'
[ŋ]	[m]	[ŋ]	<i>dos</i> 'two'
[n]	[m]	[ŋ]	<i>sincers</i> 'sincere'
[ŋ]	[m]	[ŋ]	<i>grans</i> 'big'

Analysis: major place

- Underlyingly, coronals are [Place], labials are [Place [Labial]], dorsals are [Place [Dorsal]]
- Standard autosegmental assumption: spreading only occurs into an empty position

Figure 1: Coronal → Dorsal assimilation



Analysis: coronals

- Coronal is only absent underlyingly: /t/ and /s/ differ in [±dist] but distinguished by [Continuant]
- [Stop] → [+dist] by a postlexical default rule
- We now must have a Coronal node
- The two Coronal nodes undergo *fusion*

Figure 2: No Labial → Dorsal assimilation

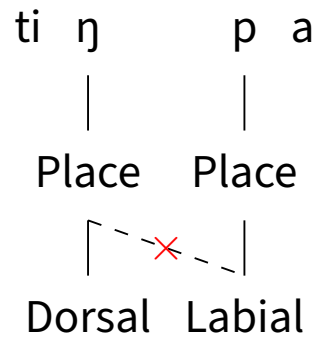
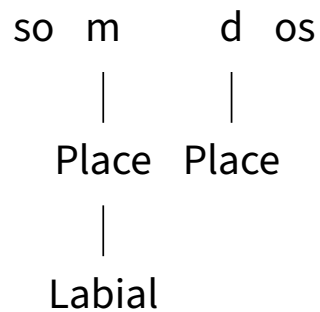


Figure 3: Coronals are not triggers



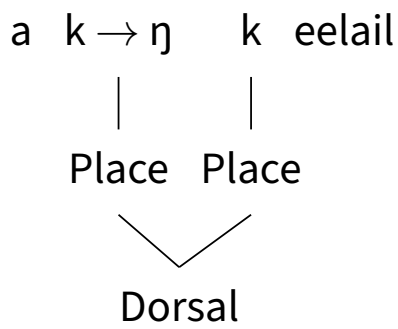
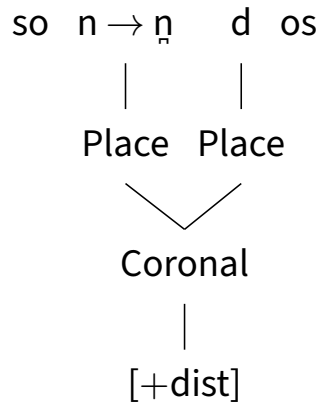
Pohnpeian

- Heterorganic clusters: epenthesis
 - /kitik-men/ → [kitikimen] 'rat'
 - /ak-suwei/ → [akusuwei] 'demonstrating boastfulness'
- Homorganic non-coronal clusters: **nasal substitution**
 - /kehp-m^wot/ → [kehm^wm^wot] 'variety of yam'
 - /ak-keelail/ → [aŋkeelail] 'demonstrate strength'

Pohnpeian: nasal substitution

Nasal substitution applies when one of the Place nodes is fused

Figure 4: Coronal fusion



Pohnpeian: no nasal substitution with coronals

- Coronal clusters: epenthesis
 - /weid-da/ → [weidida] ‘proceed upwards’
 - /lus-saŋ/ → [lusisaŋ] ‘jump from’
- Nothing to fuse below Place, because in Pohnpeian Coronal is never inserted, not even postlexically
 - /e kalap pahŋ soupisek/ ‘he will always be busy’ → [kalam pahŋ]
 - /ke meid daŋahŋa/ ‘aren’t you lazy!’ → *[mein daŋahŋa]

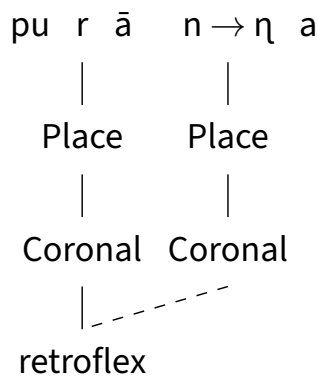
Sanskrit nati

	Place						
retroflex	t	t ^h	d	d ^h	ŋ	r	ʂ
dental	t	t ^h	d	d ^h	n	l	s

Place					
palatoalveolar	c	c ^h	ʃ	ʃ ^h	ɲ

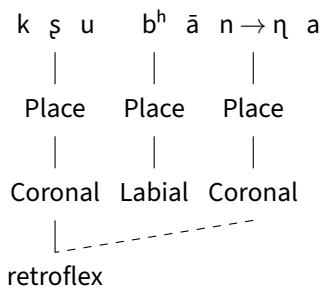
- Sanskrit has a rich Coronal inventory, so that node must be present underlyingly
- Dentals are [Coronal], retroflexes and palatoalveolars are [Coronal + feature]
- n → ɲ / {r, ʃ} _ across non-coronals
 - pur-āɲa- ‘filled’
 - kʂub^h-āɲa- ‘quaked’ (non-coronal transparency)
 - marʃ-āna- ‘wiped’ (coronal blocking)

Analysis



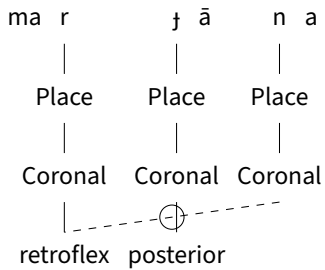
Spreading is local

Non-coronals are transparent because [retroflex] must be on a Coronal tier



Blocked spreading

Marked coronals do block spreading, because of LCC



Interim summary

- Feature geometry expresses locality and visibility effects
- Presence of structure allows
 - Triggering of spreading
 - Non-targeting by spreading
 - Blocking in long-distance processes
- There are all markedness diagnostics

Size and markedness

A refresher: Yakkha place

Infinitive	3SG.PST	Gloss
lapma	labana	‘seize’
apma	abana	‘come’
jokma	jogana	‘search’
p ^h aʔma	p ^h atana	‘help’
keʔma	ketana	‘bring up’
liʔma	litana	‘plant’
t ^h uʔma	t ^h urana	‘sew’
poʔma	porana	‘topple’

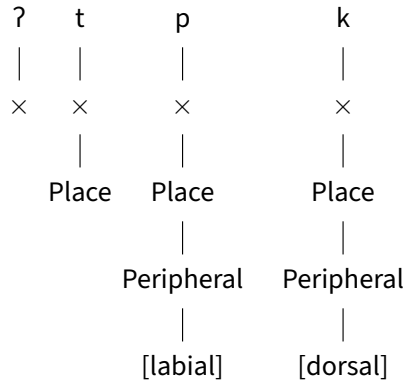
The coda inventory labial = dorsal » coronal » glottal

An analysis

Based on the proposals in Causley.⁶ The Peripheral node is justified by other kinds of data, notably from vowels⁷

⁶ Trisha Causley. 1999. *Complexity and markedness in Optimality Theory*. Toronto: University of Toronto dissertation.

⁷ Keren Rice. 2002. Vowel place contrasts. In Mengistu Amberber & Peter Collins (eds.), *Language universals and variation*, 239–270. Westport, CT: Praeger.



- Coda neutralization: delink Place
- Preservation of the Marked: maintain Peripheral
- This works well in OT

Markedness and size

- ‘More marked’ literally means ‘bigger’
- Preservation of the Marked: more chances to single out a piece of structure for preservation
- Submergence of the Unmarked:
 - Cannot trigger if you don’t have structure
 - Easily targeted if you accept spreading
- Emergence of the Unmarked
 - Reduction produces lack of structure

Markedness orders and xo Theory

- xo Theory⁸
 - Glottal is [oooPlace]
 - Coronal is [xooPlace]
 - Dorsal is [xxoPlace]
 - Labial is [xxxPlace]
- Similar size effects emerge in OT, as Causley⁹ shows for the autosegmental option

⁸ Paul de Lacy. 2006. *Markedness: Reduction and preservation in phonology*. Cambridge: Cambridge University Press.

⁹ Causley, “Complexity and markedness in Optimality Theory”.

Summary

- We’re all the way back to the *Merkmal*
- Underspecification and size explain why markedness diagnostics work the way they do
- Tomorrow: where does geometrical structure come from?

References

- Avery, Peter & Keren Rice. 1989. Segmental structure and coronal underspecification. *Phonology* 6(2). 179–200.
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