

[1] Allophonic distribution in OT

- Two surface variants of an underlying phoneme [a] and [ɔ]; typically one variant [a] is restricted to a particular context while the other [ɔ] is the elsewhere case or at least occurs in a different range of contexts
- For example, in Canadian English the diphthongs [ɔj] and [ɔw] with raised nuclei are restricted to appear before a voiceless consonant: tight [ɔj] vs. tide, time, tie, etc. [a]
- We require a markedness constraint that bars the elsewhere allophone [ɔ] in a certain context ranked above a more general markedness constraint that bans the conditioned allophone [a]: *b in some context » *a
- *[+syll, +low] [-cons, +high] [-voice] (*ajt) »
*[+syll, -low, +back, -round] [-syll, -cons, +high] (*ɔj, ɔw)
- repair is to change [low] thus M » F: *ajt » Ident-[low]
- Context-Sensitive M » Context-Free M

/tajt/	*ajt	*[ɔj]	Ident-[low]
> tɔjt		*	*
tajt	*!		

/tajd/	*ajt	*[ɔj]	Ident-[low]
> tajd			
tɔjd		*	*

- Alternative repairs protected by higher ranked faithfulness (F » F):
e.g. /tajt/ -/-> tajd (Ident-[voice] » Ident-[low])

/tajt/	Ident-[voice]	Ident-[low]
> tɔjt		*
tajd	*!	

[2] vowel nasality in four languages in CV syllables

	French	Gbe	Malay	English
ta	+	+	+	+
tã	+	+	-	-
na	+	-	-	+
nã	+	+	+	-

French:	mõ ‘my masc.	ma ‘my fem.’	bõ ‘bon’	bo ‘beau’
Gbe:	mù ‘cut down’		zè ‘walk’	zé ‘pot’
Malay:	mākan ‘to eat’			baṅōn ‘rise’
English:		no ‘know’		bo ‘bow’

Observations

- In French vowels contrast for nasality after oral and nasal consonants
- In Gbe vowels contrast for nasality after oral consonants but after nasal consonants only nasal vowels are found (nasal harmony)
- In Malay vowels do not contrast for nasality after oral consonants but after nasal consonants only nasal vowels are found (nasal harmony)
- In English CV syllables nasal vowels are excluded entirely

Generalizations

- All languages allow [ta]; for Stampe this reflects the context-free denasalization process; for Jakobson the Law of Solidarity that nasal vowels imply oral vowels but not the inverse; for OT it reflects the Markedness constraint *[+syll, +nasal] (and the absence of any context-free M ban on oral vowels)

Analysis

- Nasal harmony arises from a contextual markedness constraint banning an oral vowel after a nasal consonant: *NV *[+cons, +nasal] [+syll, -nasal]
- In order to have nasal vowels in the context after a non-nasal consonant (where there is no M constraint demanding nasality), nasality must be protected from *[+syll, +nasal] by a faithfulness constraint: Ident-[nasal] » *[+syll, +nasal]

- There are thus three constraints at play: context-free markedness banning nasal vowels everywhere, context-sensitive markedness barring an oral vowel after a nasal consonant, and faithfulness:¹

* \underline{V} * [+syll, +nasal]

*NV * [+cons, +nasal] [+syll, +nasal]

Ident-[nasal]: corresponding input and output segments have the same values for [\pm nasal]

- They can be ranked in six ways; two pairs of rankings lead to equivalent outputs
- French: Ident-[nasal] » *NV » * \underline{V}
 Ident-[nasal] » * \underline{V} » *NV
- Gbe: *NV » Ident-[nasal] » * \underline{V}
- Malay: *NV » * \underline{V} » Ident-[nasal]
- English: * \underline{V} » *NV, Ident-[nasal]
 * \underline{V} » Ident-[nasal] » *NV
- As usual in languages with nasal harmony (i.e. *NV » *V), other repairs must be blocked such as denasalizing the nasal consonant (/ma/ -> [ba]) or inserting an oral consonant [(/ma/ -> [mba])]

Remarks

- For Malay (and English) the input could contain nasal vowels and they will be distributed properly by the *NV and * \underline{V} markedness constraints
- Since in the OT model constraints are defined over the output, no mechanism exists in the grammar to impose a choice between oral and nasal vowels in the input
- This corollary is known as “Richness of the Base” (RoB)
- The grammar will generate the correct output regardless of which input occurs
- To the extent that it is necessary to have a single definitive input, it must be obtained from some extra-grammatical source: e.g. learning algorithms (Lexicon Optimization)
- Different researchers have different suggestions on this matter: choose the input that is the most optimal output (Tesar & Smolensky); thus oral for English and nasal after a nasal consonant in Malay and oral otherwise; others have suggested the opposite: free-ride on nasalization process and posit unmarked value always
- Raises various questions about the lexicon and lexical access; can one “reach” the lexicon without the intervention of the rules/constraints?

¹ Context-sensitive (positional) faithfulness is also possible (e.g. nasal vowels in some languages are restricted to stressed syllables).

[3]. Phonetic Scales and Typology by Ranking (Prince & Smolensky 2004)

Observation: phonological processes and structures often involve setting some threshold on a quasi-continuous phonetic scale; OT formalism provides an insightful way to express this as constraint ranking

4. Harmonic Nucleus: vowel > liquid > nasal > obstruent

Sonority: vowel > glide > liquid > nasal > obstruent

- syllabic nuclei prefer to be sonority peaks
- align the scale as elementary constraints evaluated from “worst to best”
- *obstr_{nuc} » *nasal_{nuc} » *liquid_{nuc} » *vowel_{nuc}
- ranking reflects phonetic scale
- typology

	V	L	N	Ob	nuclei
Spanish	+	-	-	-	
Czech	+	+	-	-	
German	+	+	+	-	
Berber	+	+	+	+	

Spanish: abr-ir 'to open', aber.tura 'opening'

Czech: prst 'finger', slza, but ohn-o, ohen 'fire'; pad-l, pad-l-a

German: Nebel [nebl], nebl-ig; handl-ung, handel-n [dɪn]; haben [bʌ]

Berber: tɾɣlt 'you locked', tɾznt 'you stocked', tɾtft 'you X-ed'

SSG: a sonority peak (segment of higher sonority than its neighbors) is a syllable peak

Spanish

/abr-tura/	SSG	*liquid _{nuc}	Dep-V
> abertura			*
abrtura	*!		
abɾtura		*!	

Czech

/ohn/	SSG	*nasal _{nuc}	Dep-V	*liquid _{nuc}
> ohen			*	
ohn	*!			
ohŋ		*!		
/padl/				
> padl				*
padl	*!			
padel			*!	

German

/habn/	SSG	Dep-V	*nasal _{nuc}	*liquid _{nuc}
> habm̩			*	
habn	*!			
haben		*!		
/nebl/				
> nebl̩				*
nebl	*!			
nebel		*!		

Berber

/tkʈft/	SSG	Dep-V	*obstr _{nuc}
> tkʈft			**
tkʈft	*!		
tekteft		*!*	

Typology:

Sp: *obstr_{nuc} » *nasal_{nuc} » *liquid_{nuc} » **Dep-V**

Cz: *obstr_{nuc} » *nasal_{nuc} » **Dep-V** » *liquid_{nuc}

Ger: *obstr_{nuc} » **Dep-V** » *nasal_{nuc} » *liquid_{nuc}

Ber: **Dep-V** » *obstr_{nuc} » *nasal_{nuc} » *liquid_{nuc}

Practice

In many languages a [-contin] consonant (stop or nasal) assimilates the major place of articulation of a following consonant: e.g. English *in-ert* but *i[m]-potent*. According to Jun (2004)

there is a cross-linguistic hierarchy on which of the three oral places (labial, coronal, dorsal) are subject to assimilation.

1. Use the information in the following table from Jun (2004) to state the hierarchy.

Diola Fogy:	{p,t,k}Cαplace ->	CαplaceCαplace	(kp > pp,
Korean:	{p,t} Cαplace ->	CαplaceCαplace	(pk > kk, but kp > kp
Catalan:	{t} Cαplace ->	CαplaceCαplace	(tk > kk, but pt > pt,
Arabic:	no place assimilation		

2. Express the typology in OT. Let's limit the discussion to intervocalic clusters, i.e. VC₁C₂V. You may assume a markedness constraint that penalizes a heterorganic consonant cluster (i.e. a cluster of two consonants with distinct major articulators) as well as a faithfulness constraint protecting the place feature of the final, prevocalic member of the cluster. The result will be a cluster with one major place articulator. We will see the motivation for this constraint later in the semester. Try to express the hierarchy with a UG fixed ranking of Faithfulness constraints. Show how your analysis works with some illustrative tableaux.

Jun, Jongho. 2004. Place assimilation. Hayes, Bruce, Robert Kirchner, Donca Steriade, eds. Phonetically Based Phonology. Cambridge University Press. Pp. 58-85.
 Prince, Alan and Paul Smolensky. 1993, 2004. Optimality Theory: Constraint Interaction in Generative Grammar. Blackwell Publishers, Malden,MA and Oxford.

Illustrative analysis

Kaqchikel (Mayan) Kenstowicz 2013

citation	chom	po?t	ixim	äj	oj
'my N'	nu-chom	nu-po?t	w-ixim	w-äj	w-oj
'your sg. N'	a-chom	a-po?t	aw-ixim	aw-äj	aw-oj
'his N'	ru-chom	ru-po?t	r-ixim	r-äj	r-oj
'our N'	qa-chom	qa-po?t	q-ixim	q-äj	q-oj
'your pl.'	i-chom	i-po?t	iw-ixim	iw-äj	iw-oj
'their N'	ki-chom	ki-po?t	k-ixim	k-äj	k-oj
gloss	'shrimp'	'blouse'	'corn'	'ear of corn'	'avacado'

descriptive generalizations:

- The prefixes have the shape (C)V while the stems can begin with either a consonant or a vowel.

- Hiatus is created when a vowel initial stem is combined with a prefix.
- Two alternations are occasioned: $w \approx 0$ as in /a-chom/ -> [achom] vs. /a-oj/ -> [awoj] and $V \approx 0$ as in /ki-chom/ -> [kichom] vs. /ki-oj/ -> [koj]

The following **constraints** seem relevant

- *V.V: penalize a sequence of heterosyllabic vowels (M)
- Max-V: penalize a vowel in the input lacking an output correspondent (F)
- Dep-C: penalize a consonant (nonvowel) in the output lacking an input correspondent (F)

minimal violation tableau with a single winner-loser pair establishing a ranking

*V.V » Dep-C

/a-oj/	*V.V	Dep-C
> awoj		*
a.oj	*!	

alternative candidates

Max-V » Dep-C

/a-oj/	Max-V	Dep-C
> awoj		*
oj	*!	
aj	*!	

*V.V » Max-V_{stem} » Max-V

/ki-oj/	*V.V	Max-V _{stem}	Max-V
> koj			*
ki.oj	*!		
kij		*!	*

alternative repairs: coalescence

Uniformity (anti-coalescence)

penalize a candidate with two distinct input segments that have the same correspondent in the output (indicated by coindexing if necessary)

/ki-oj/	*V.V	Uniformity	Max-V
> koj			*
ki.oj	*!		
ke _{i,j}		*!	

combination tableau (cells in loser rows labeled whether they favor the winner or loser)

/ki-oj/	*V.V	Uniformity	Max-V	Dep-C
> koj			*	
ki.oj	*W		L	
kej		*W	L	
kiwoj			L	*W

diagnoses that the current ranking does not account for the competition between deletion and epenthesis for /ki-oj/ since in the kiwoj row L precedes all W's
simplest solution is to change the ranking of Max-V and Dep-C

/ki-oj/	*V.V	Uniformity	Dep-C	Max-V
> koj				*
ki.oj	*W			L
kej		*W	L	L
kiwoj			*W	L

But with this ranking a problem appears with /a-oj/ -> [awoj]

/a-oj/	*V.V	Dep-C	Max-V
> awoj		*	
a.oj	*W		
oj		L	*W

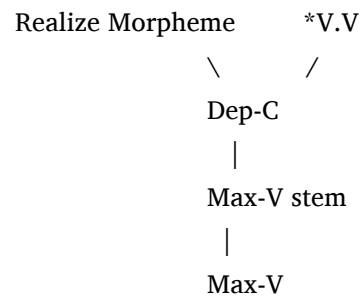
Solution: another constraint must be at play

Realize Morpheme (Kurusu 2001): penalize a candidate that has a morpheme with zero exponence in the output (i.e. no corresponding segment or feature)

RM » Dep-C » Max-V

/a-oj/	*V.V	RM	Dep-C	Max-V
> awoj			*	
a.oj	*W			
oj		*W	L	*W

final ranking (Hasse diagram)



Michael Kenstowicz. 2013. Realize morpheme in Kaqchikel. *Studies in Kaqchikel Grammar*. MIT Working Papers in Endangered and Less Familiar Languages 8, 67-80.

Kurizu, Kazutaka. 2001. *The Phonology of Morpheme Realization*. University of California, Santa Cruz Ph.D. dissertation. [ROA0-490]

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