

Class 14: Autosegmental representations, part I

To do

- Holoholo assignment due Tuesday
- Next reading is Kager (for Nov. 20)
- Be working on project

Overview of reading and today's class

We've mostly treated a phonological representation as a sequence of feature matrices. Goldsmith, using examples from tone phonology, argues that this is inadequate and we need to move tones onto their own "tier". We'll see some more cases along those lines. Next time we'll consider whether we should move other features onto their own tiers too.

1. Tiers

A "linear representation" (i.e., what we've been using till now) of [mãĩãb] might look like:

$$\begin{bmatrix} +nas \\ +cons \\ +labial \\ \dots \end{bmatrix} \begin{bmatrix} +nas \\ -cons \\ +lo \\ \dots \end{bmatrix} \begin{bmatrix} +nas \\ -cons \\ +hi \\ \dots \end{bmatrix} \begin{bmatrix} +nas \\ -cons \\ +lo \\ \dots \end{bmatrix} \begin{bmatrix} -nas \\ +cons \\ +labial \\ \dots \end{bmatrix}$$

but we could imagine a reasonable notation system where we write instead:

$$\begin{bmatrix} & & +nas & & \\ +cons & & & & \\ +labial & & & & \\ \dots & & & & \end{bmatrix} \begin{bmatrix} & & -cons & & \\ -cons & & & & \\ +lo & & & & \\ \dots & & & & \end{bmatrix} \begin{bmatrix} & & -cons & & \\ -cons & & & & \\ +hi & & & & \\ \dots & & & & \end{bmatrix} \begin{bmatrix} & & -cons & & \\ -cons & & & & \\ +lo & & & & \\ \dots & & & & \end{bmatrix} \begin{bmatrix} & & -nas & & \\ +cons & & & & \\ +labial & & & & \\ \dots & & & & \end{bmatrix}$$

If we add a "C-V skeleton" tier, as Goldsmith does, this might look like (arbitrarily putting the nasal tier on top):

$$\begin{array}{ccccccccc} & & [+nas] & & & & & & [-nas] \\ & & / \quad \backslash \quad / \quad \backslash & & & & & & | \\ C & & V & & C & & V & & C \\ | & & | & & | & & | & & | \\ \begin{bmatrix} +cons \\ +labial \\ \dots \end{bmatrix} & & \begin{bmatrix} -cons \\ +lo \\ \dots \end{bmatrix} & & \begin{bmatrix} -cons \\ +hi \\ \dots \end{bmatrix} & & \begin{bmatrix} -cons \\ +lo \\ \dots \end{bmatrix} & & \begin{bmatrix} +cons \\ +labial \\ \dots \end{bmatrix} \end{array}$$

We could even put every feature on its own tier:

$$\begin{array}{ccccccc} & & +nas & & & & \\ [+cons] & & & & & & \\ [+labial] & & & & & & \\ & & [+lo] & & & & \\ & & [-lo] & & & & \\ & & [+lo] & & & & \\ & & [-hi] & & & & \\ & & [+hi] & & & & \\ & & [-hi] & & & & \end{array}$$

2. How can we decide?

Changing the theory in this way is a good idea only if the new theory does a better job than the old at correctly¹ distinguishing highly valued from lowly valued grammars (or grammar fragments).

As before, the claim is that rules that can be expressed in a simple form (though we will not attempt to spell out how rule simplicity is to be calculated in this new notation) are highly valued. So, we are interested in

- rules that look relatively complicated (relative to other rules, that is) in the old theory but relatively simple in the new one—new theory predicts they are highly valued
- rules that look relatively simple in the old theory but relatively complicated in the new one—new theory predicts they are lowly valued

3. Notation clarification

We often use acute (á) and grave (à) accent marks to mark primary and secondary stresses. In strict IPA usage, these marks are reserved for tone, and today we'll use them only for tone.

á = [a] with high tone
 à = [a] with low tone
 ā, or sometimes just *a* = [a] with mid tone
 â = [a] with falling tone (high then low)
 ã = [a] with rising tone (low then high)

} contour tones

When a language has no mid tone, often the highs (and contours) are marked, but not the lows.

4. Tonal association

Kikuyu (Niger-Congo language from Kenya with about 5.3 million speakers; discussed here based on Goldsmith 1990, whose data come from Clements & Ford)

tò r̀̀̀r ìré	‘we looked at’	má r̀̀̀r ìré	‘they looked at’
tò <u>m̀̀̀</u> r̀̀̀r ìré	‘we looked at <u>him</u> ’	má <u>m̀̀̀</u> r̀̀̀r ìré	‘they looked at <u>him</u> ’
tò <u>m̀̀̀</u> r̀̀̀r ìré	‘we looked at <u>them</u> ’	má <u>m̀̀̀</u> r̀̀̀r ìré	‘they looked at <u>them</u> ’
tò t̀̀̀m íré	‘we sent’	má t̀̀̀m íré	‘they sent’
tò <u>m̀̀̀</u> t̀̀̀m íré	‘we sent <u>him</u> ’	má <u>m̀̀̀</u> t̀̀̀m íré	‘they sent <u>him</u> ’
tò <u>m̀̀̀</u> t̀̀̀m íré	‘we sent <u>them</u> ’	má <u>m̀̀̀</u> t̀̀̀m íré	‘they sent <u>them</u> ’

- Take a minute to ascertain the basic facts—on what does the tone of the tense suffix *ìré/íré* depend? On what do the tones of the two verb roots (in **bold**) depend? On what do the tones of the object suffixes (underlined) depend?

¹ As before, the evidence as to what is actually highly valued comes, in practice, mainly from typology—even though typological evidence can be problematic.

- Ideas for how we can account for this with linear representations and rules (assume a feature [hi tone])?

In the “autosegmental” notation proposed by Goldsmith, we can write a rule thus (Goldsmith’s (9)—“T” stands for any tone, such as H or L in this language):

$$\left[\begin{array}{c} C_0 \quad V \quad C_0 \quad V \\ \text{---} \\ T \end{array} \right] \quad \textit{peninitial association}$$

Yes, this is a rule! Its structural description is

$$\left[\begin{array}{c} C_0 \quad V \quad C_0 \quad V \\ T \end{array} \right]$$

(i.e., everything except the dashed line), and the structural change it requires is insertion of the association line that is shown dashed.

We need two more rules for the rest of the tones:

$$\begin{array}{c} V \quad C_0 \quad V \\ | \quad \text{---} \\ T \quad T \end{array} \quad \textit{association convention}^2$$

$$\left[\begin{array}{c} C_0 \quad (V) \\ \text{---} \\ T \end{array} \right] \quad \textit{initial association}$$

The circle is part of the structural description, and means “not associated to anything on the other tier”.

- Let’s apply this grammar fragment to derive ‘we looked at them’—what must we assume about the association of tones in underlying forms?

All three rules are typical of the kind of thing you see in tone languages, and all three rules are some of the simplest that could be written in this notation.

- Compare this to the linear analysis we developed above: do the linear rules look simple compared to other, less plausible linear tone rules we could write? [It’s not whether the autosegmental rule looks simpler than the liner rule that matters.]

² For Goldsmith, association conventions actually derive from universal principles, and don’t need to be specified on a language-particular basis.

5. Autosegmentalism in OT

Whether representations are linear or autosegmental is (mostly) orthogonal to whether the grammar consists of rules or constraints or both.

For example, if we were to re-cast the analysis of Hakha Lai in OT with autosegmental representations, we could have a constraint like

$$\begin{array}{ccc}
 * & V & C_0 & V \\
 & | & & | \\
 & T & & -T
 \end{array}
 \quad (\text{where } -H = L \text{ and } -L = H)$$

Let's assume that in order to meet the definition of the constraint (i.e., to potentially violate it), every tier that's mentioned has to have the elements mentioned with nothing intervening; but there can be other material earlier or later on that tier.

Thus, there can't be another tone in between the two tones mentioned, but there could be other tones associated to the beginning of the first V or the end of the second V.

This forbids the following sequences: âCâ, âCá, àCá, àCâ, áCà, áCă, ăCà, ăCă

and is equivalent to the linear constraint $*[\alpha\text{HiFinish}]C_0[-\alpha\text{HiFinish}]$

(As many of you pointed out, though, and as Hyman and VanBik discuss, an OT analysis would be problematic because there is some opacity.)

6. Something else that autosegmentalism is good for: tonal stability

Margi (Hoffman 1963 via ?Kenstowicz 1994)

sál	sál-áři	'man'
kùm	kùm-áři	'meat'
ʔímí	ʔímj-áři	'water'
kú	kw-áři	'goat'
tágú	tágw-áři	'horse'
tĩ	tj-ăři	'morning'
hù	hw-ăři	'grave'
úʔù	úʔw-ăři	'fire'

- What's the underlying form of the suffix?
- How could we describe the tonal alternation in rules?

- What about with constraints—what's the problem with using IDENT(tone)?

If we really are treating tones not as features (properties of segments) but as segments, then it makes sense to let the MAX and DEP constraints refer to them just as they refer to Cs and Vs:

/hu + ari/ L HL	ONSET	IDENT(syll)	MAX-Tone
a hu . ari L H L	*!		
b hwari ^ \ L H L		*	
c hwari HL		*	*!

7. An even more extreme example of tonal stability

Etsako (Elimelech 1976, via Kenstowicz 1994)

ìkpà ‘cup’	ìkp-ìkpà ‘every cup’
ówà ‘house’	ów-ówà ‘every house’
òyèdé ‘banana’	òyèd-òyèdé ‘every banana’

8. Something else autosegmental representations are good for: floating tones

Igbo, from Goldsmith 1976.

Assume that LH becomes mid. Igbo H tone marks subordinate clauses:

ònù ‘yam’	ònū [rèré èré]	‘the yam [that is rotten]’
ázù ‘fish’	ázū [rèré èré]	‘the fish [that is rotten]’
ánú ‘meat’	ánū [rèré èré]	‘the meat [that is rotten]’
àkwhá ‘eggs’	àkwhá [rèré èré]	‘the eggs [that are rotten]’

- Where does the H tone attach? What does the input representation of one of these complex DPs look like?

9. Tones behaving as a block

Shona (Odden 1980) Niger-Congo language with 7,000,000 speakers in Zimbabwe and Zambia

mbwá ‘dog’	né-mbwà ‘with dog’
hóvé ‘fish’	né-hòvè ‘with fish’
mbúndúdzí ‘army worm’	né-mbùndùdźí ‘with army worm’
hákátá ‘diviner’s bones’	né-hàkàtà ‘with diviner’s bones’
bénzìbvùnzá ‘inquisitive fool’	né-bènzìbvùnzá ‘with inquisitive fool’

⇒ sequences of the same tone undergo a rule together, as though they were a single tone.

Let's assume there is some reason why $H \rightarrow L$ after né-, and only consider outputs that do so:

- Why [né-hòvè] and not *[né-hòvé]? What must be the surface representation of [hóvé]?
- Why [né-bènzìbvùnzá] and not *[né-bènzìbvùnà]?
- Richness of the base: what if the input for 'dog' were $\begin{matrix} /hove/ \\ H H \end{matrix}$?

The OCP (Obligatory Contour Principle) constraint says that adjacent identical elements (such as two Hs in a row) are not permitted. Does this help with the Richness of the Base question?

- We still have a puzzle if we add né- to hypothetical $\begin{matrix} /hove/ \\ H H \end{matrix}$... Will strata help?

10. What about East-Asian-type tone? (examples taken from Kenstowicz 1994, ch. 7)

Seems to be different from African-type tone:

- often more than three levels (5 is typical)
- often transcribed with numbers: [ma²¹⁴] means tone starts lowish (2), then dips to the bottom of the range (1) then goes up nearly to the top (4)
- contour tones often behave as a unit.

Various proposals—here's a simple one: add the features [hi register] and [lo register].

register	("contour") tone	resulting pitch
high	H	5
	M	4
	L	3
mid	H	4
	M	3
	L	2
low	H	3
	M	2
	L	1

hence many phonetic tone levels are phonologically ambiguous; it's typically assumed that the register stays constant for the whole syllable, so this can help disambiguate—e.g., V⁴² must be mid register.

$$\begin{array}{c}
 H \quad L \\
 \backslash / \\
 V \\
 | \\
 \text{high.register}
 \end{array}
 = V^{53}$$

- Allows the register of an entire contour to change by just changing one feature, e.g. 53 → 31 (What is register, articulatorily? *Maybe* something like stiff vs. slack vocal folds)
- Sometimes register is also associated with voice quality.
- See Moira Yip's "Tone" chapter in the new *Cambridge Handbook of Phonology* for more.
- The feature [contour] has also been proposed—we have to worry about whether [+contour] gets implemented as falling or rising.

Example: Songjiang dialect of suburban Shanghai (data from Bao, via Kenstowicz)

Distribution of tones

voiced onset, unchecked syll.	voiced onset, checked syll.	voiceless onset, unchecked syll.	voiceless onset, checked syll.
22	3	44	5
31		53	
13		35	

“checked” syllable = syllable that ends in a glottal stop

- Write out the representation of each tone.
- What markedness constraints can we develop to explain the inventory?

Example: Tibetan compounds (data from Meredith, via Kenstowicz)

(I am simplifying some of the tones!! For instance, 3 is really 2. Sorry for missing data)

- Propose representations for the members of the tone inventory: 5, 53, 3, 31
- Develop an analysis of the tone changes that occur in compounds—you can invent some arbitrary morphological restrictions on the feature values that first and second members of a compound should have.

<i>1st member</i>	<i>2nd member</i>	<i>compound</i>	
5	5	5-5	
53	5	5-5	
yum 3	chěẽ 5	yum-chěẽ 3-5	‘mother-hon.’ (mother+great)
31	5	3-5	
5	53	5-53	
thuu 53	caa 53	thuu-caa 5-53	‘iron banner fixture’ (banner+iron)
3	53	3-53	
31	53	3-53	
5	3	5-5	
see 53	yöö 3	see yöö 5-5	‘intellectual’ (knowledge+possessor)
phöö 3	mi 3	phöö-mi 3-5	‘Tibetan’ (Tibet+person)
ree 31	see 3	ree-see 3-5	‘cotton robe’ (cotton+robe)
cu 5	kεε 31	copkεε 5- 53	‘eighteen’ (eight+ten)
53	31	5-53	
3	31	3- 53	
31	31	3-53	