Vowel Harmony is Local

Eileen Blum

Rutgers University

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Introduction

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- Vowel harmony as a phonotactic constraint rather than a transformation from an underlying form into the surface form (Goldsmith, 1976; Clements, 1976; a.o.)
- Transparent vowels don't rely on underspecification

Locality

- Attested vowel harmony patterns captured by static surface well-formedness constraints: forbidden substructure constraints (FSCs) (Jardine 2016, 2017)

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- Attested vowel harmony patterns captured by static surface well-formedness constraints: forbidden substructure constraints (FSCs) (Jardine 2016, 2017)
- FSCs over autosegmental representations (ARs) use one of two relations: association ($|$) and successor ($\rightarrow$)

Autosegmental Representations (ARs)

- Tone patterns have been represented with two autosegmental tiers (Goldsmith, 1976; Jardine, 2016, 2017, etc.)

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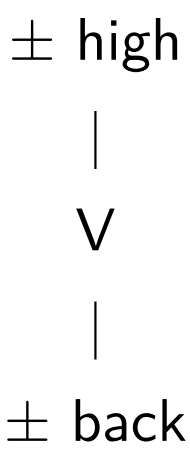
(3)

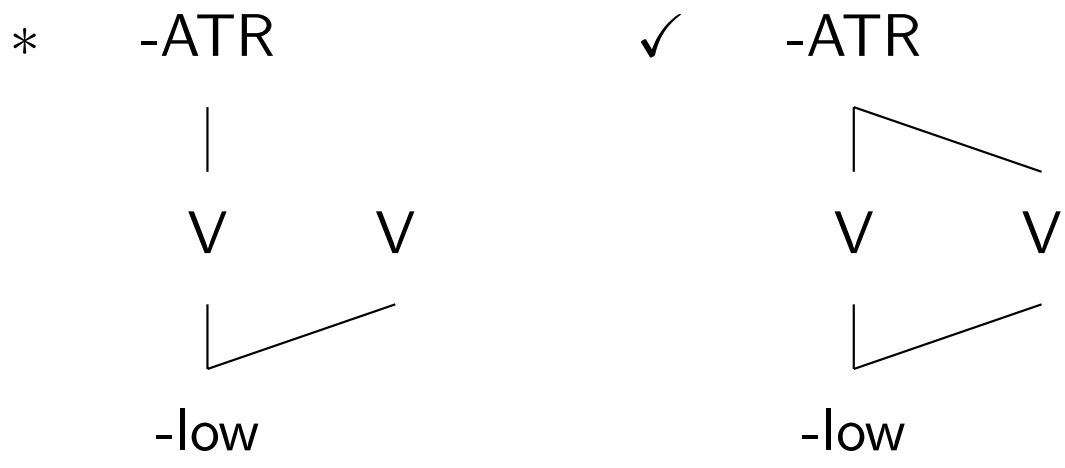


Representational Assumptions

Full Specification (FS):

- each featural element must be associated to at least one vowel

(4) Full Specification

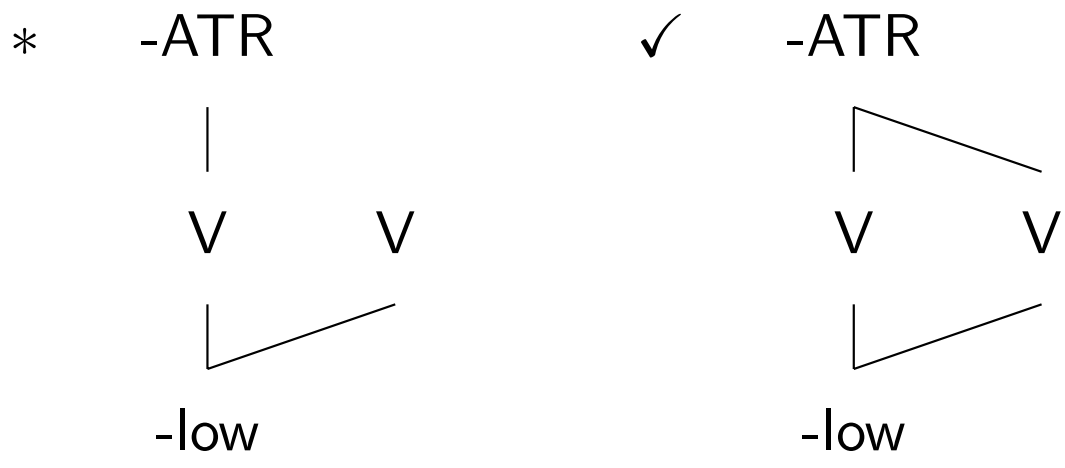


Representational Assumptions

Full Specification (FS):

- each featural element must be associated to at least one vowel
- each vowel must be associated to at least one element on each feature tier

(5) Full Specification

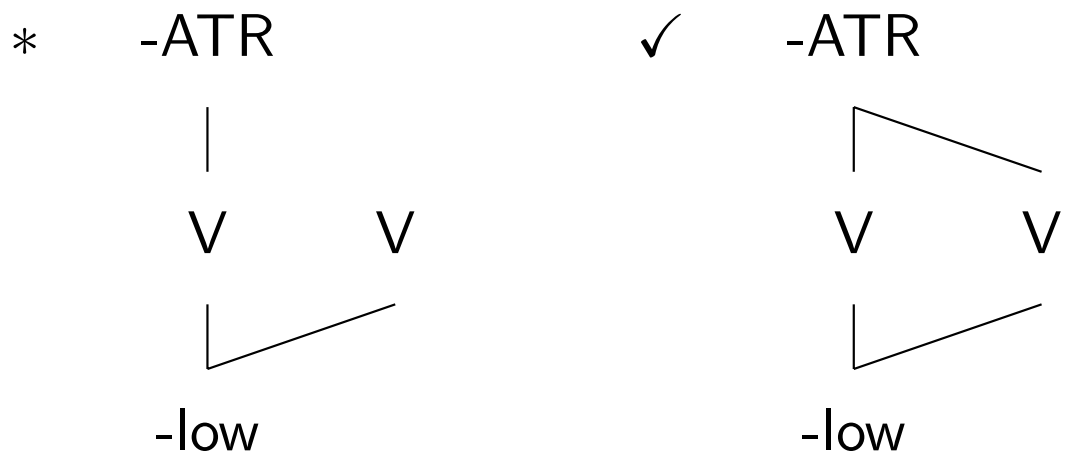


Representational Assumptions

Full Specification (FS):

- each featural element must be associated to at least one vowel
- each vowel must be associated to at least one element on each feature tier
- consonants are not associated to vowel features

(6) Full Specification

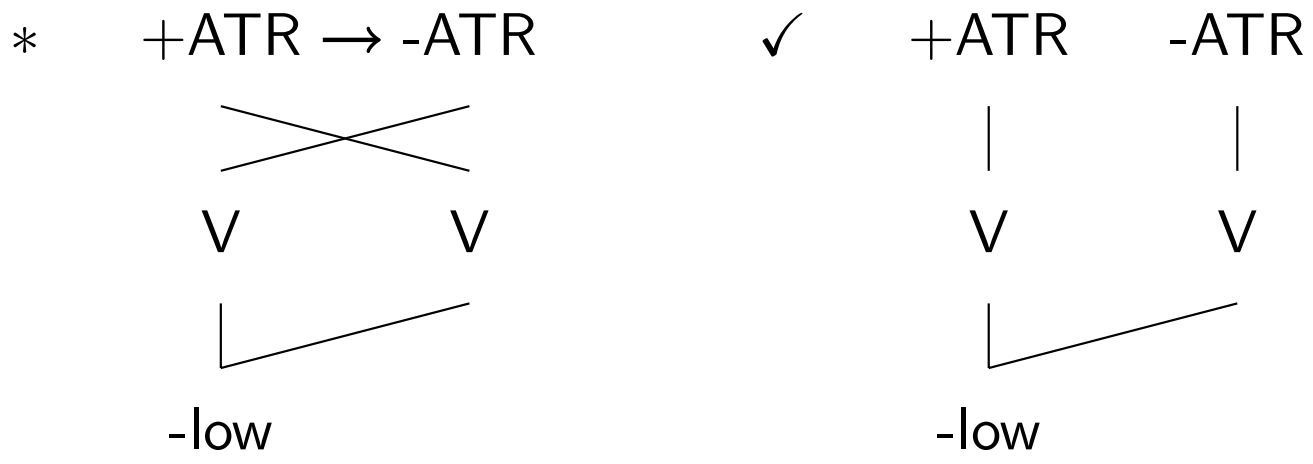


Representational Assumptions

No Crossing Constraint (NCC):

- association lines between the segmental tier and a feature tier never cross

(7) No Crossing Constraint

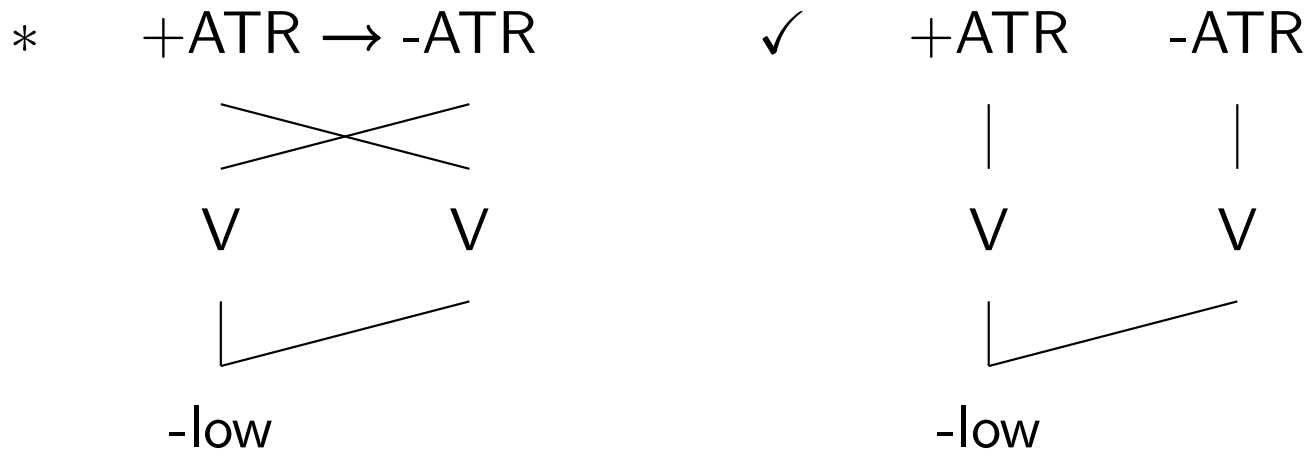


Representational Assumptions

No Crossing Constraint (NCC):

- association lines between the segmental tier and a feature tier never cross
- FS and NCC prevent gapped structures (Archangeli & Pulleyblank, 1994; Ringen & Vago, 1998)

(8) No Crossing Constraint

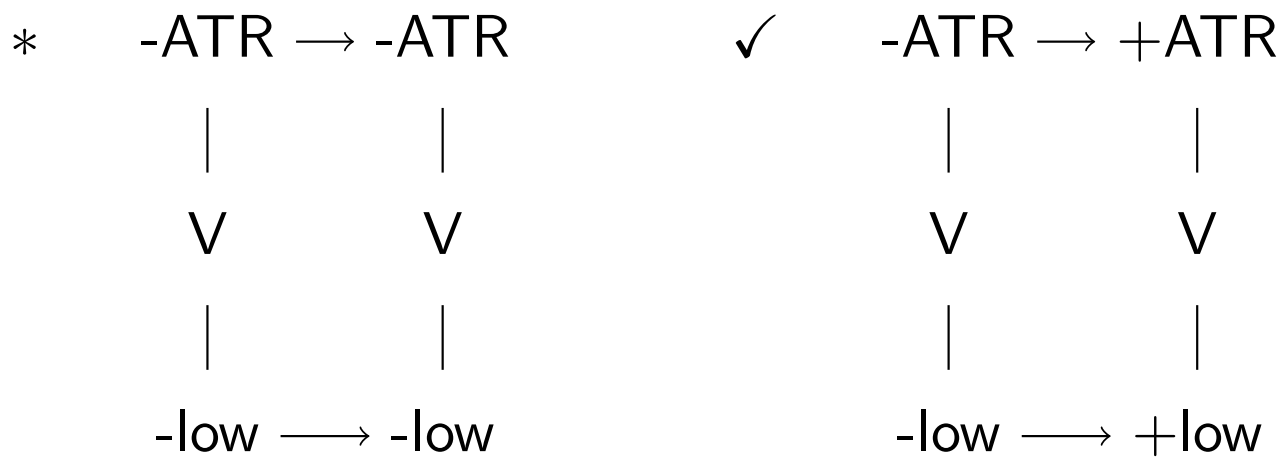


Representational Assumptions

Obligatory Contour Principle (OCP):

- adjacent featural elements must be distinct

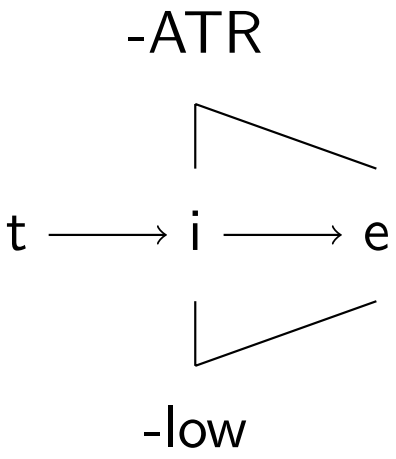
(9) Obligatory Contour Principle



Representational Assumptions

- A well-formed AR obeys FS, the NCC, and the OCP

(10)



Terminology

- Assimilation: vowels have the same feature

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- Spreading: multiple association

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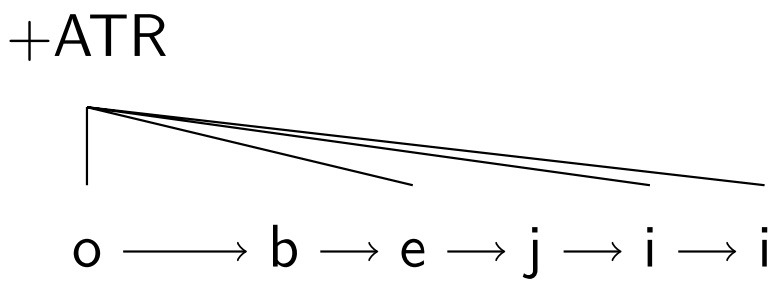
(13) Spreading



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- Agreement: different vowels associated to different iterations of the same feature

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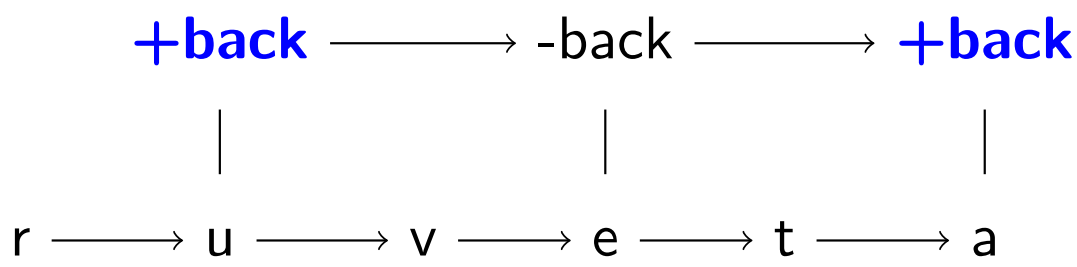
(15) Agreement



Forbidden Substructure Constraints (FSCs)

- **Phonotactic restriction** that combines the OT (Prince & Smolensky, 1993, 2004) representation of **surface markedness (*)** with **forbidden substructures** (Heinz et al., 2011; Rogers et al., 2013; Jardine, 2017)

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- **Phonotactic restriction** that combines the OT (Prince & Smolensky, 1993, 2004) representation of **surface markedness (*)** with **forbidden substructures** (Heinz et al., 2011; Rogers et al., 2013; Jardine, 2017)
- FSCs define locality because they refer to elements in a structure connected by an ordering or association relation

Neutral Vowels

Blocking Vowels: Akan

Akan ATR harmony:

- If a word contains a sequence of -low vowels they will be associated to a single ATR feature (Clements, 1976)

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Blocking Vowels: Akan

Table 1: Akan Vowels

	+ATR	-ATR
-low	i	ɪ
	u	ʊ
	e	ɛ
	o	ɔ
+low	ɜ	a

- -low vowels in sequence are associated to a single ATR feature: [obejii] 'he came and removed it'

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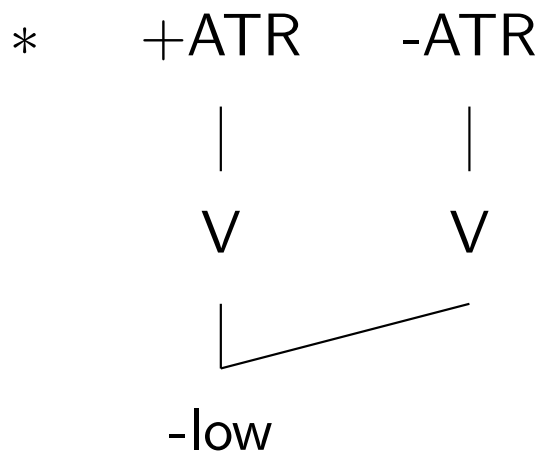
- -low vowels on either side of a +low vowel can be associated to different ATR features: [pɪrɜko] 'pig'

Blocking Vowels: Akan

- Akan ATR harmony pattern captured by a single FSC
  - forbids two -low vowels from being associated to different ATR features

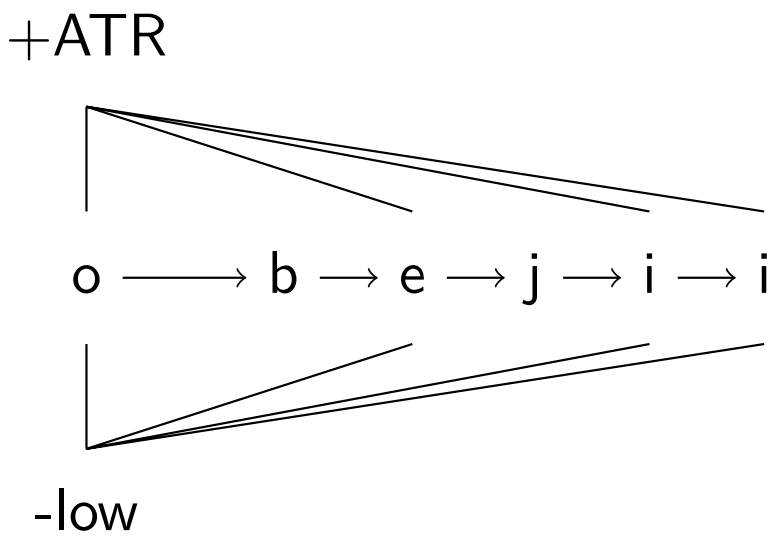
(16)



Blocking Vowels: Akan

- Akan FSC in (16) allows grammatical spreading AR

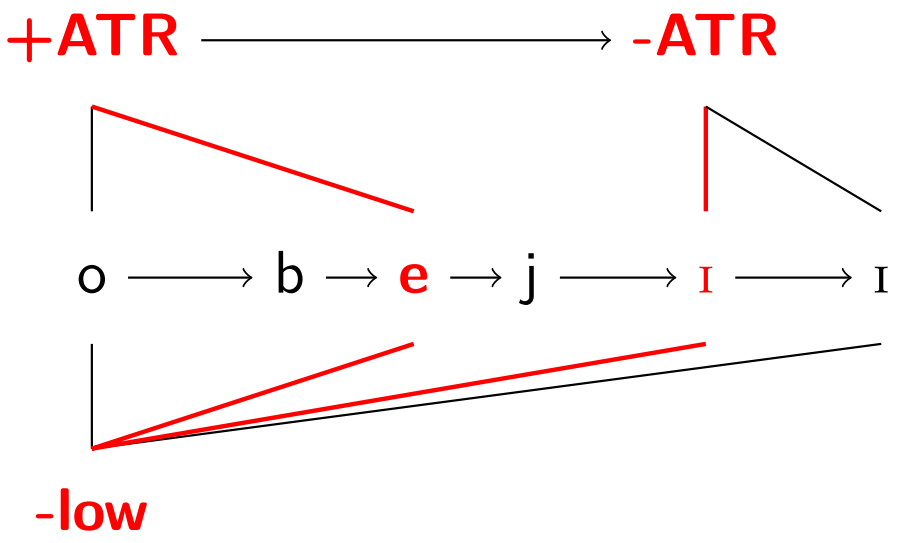
(17) [obejii] 'he came and removed it'



Blocking Vowels: Akan

- and (16) rules out an ungrammatical disharmonic AR because it contains the forbidden substructure

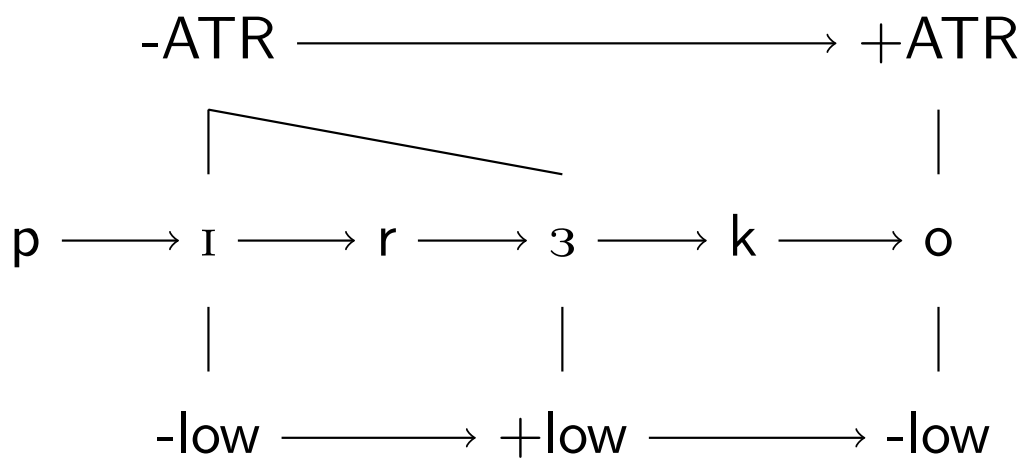
(18) Ungrammatical AR



Blocking Vowels: Akan

- The same FSC in (16) also allows a grammatical disharmonic AR with a +low vowel

(19) [pɪrɜko] 'pig'



Spreading is local

Spreading ARs consist of...

- an unbounded span of contiguous vowels associated to a single feature

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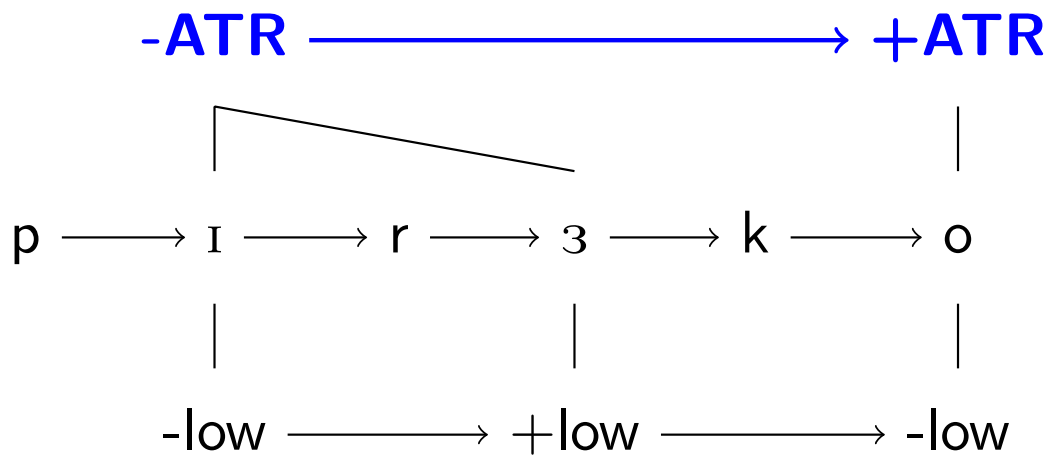
Spreading ARs consist of...

- an unbounded span of contiguous vowels associated to a single feature
- successor relation between two different features on the same tier

Spreading is local

- **OCP makes ARs local** because different features on a tier are in successor relation regardless of how many vowels are associated to each.

(20) [pɪrɜko] 'pig'



Transparent Vowels: Finnish

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- Back harmony appears to skip over [-back, -round, -low] vowels

Transparent Vowels: Finnish

Table 2: Finnish Vowels

	-round	+round		
-low	i, iː	y, yː	u, uː	
	e, eː	ø, øː	o, oː	
+low		æ, æː	ɑ, ɑː	-round
	-back		+back	

- Default -back suffix vowel: [tienæ] ‘road’

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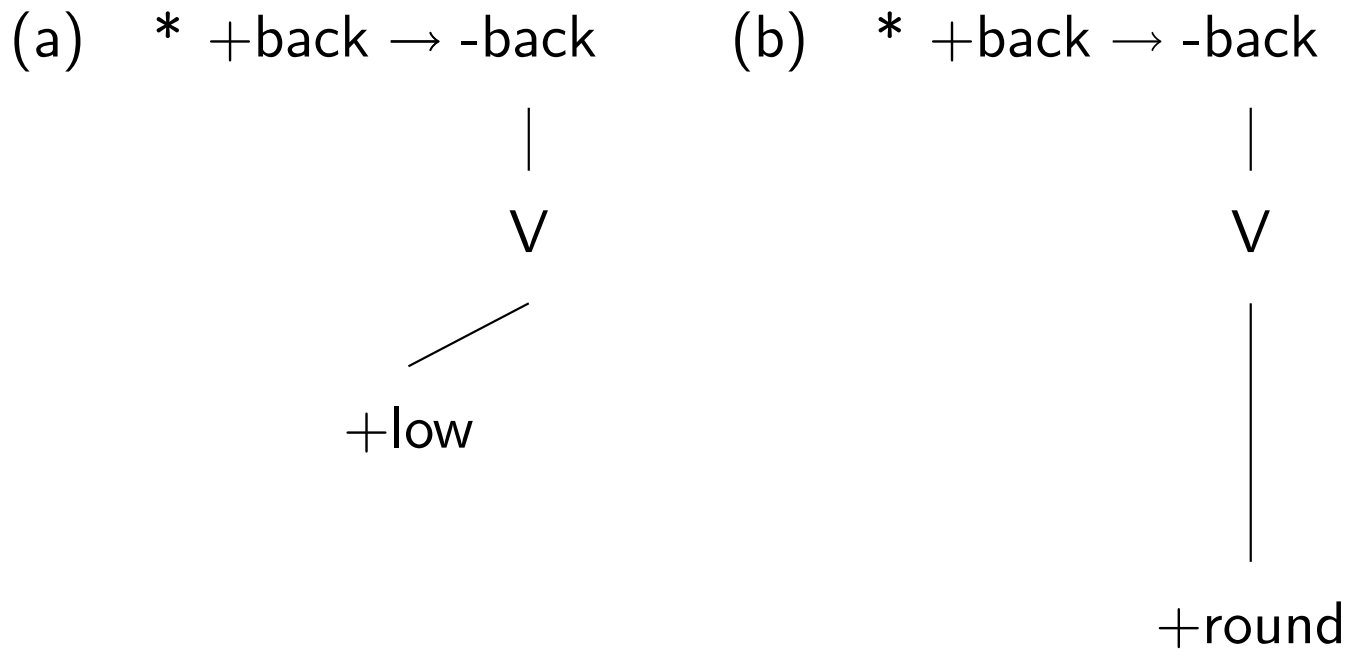
- Two harmonizing vowels in sequence are associated to a single back feature: [poutɑ] 'fine weather'
- Harmonizing vowels on either side of a transparent vowel are associated to the same back feature: [ruvetɑ] 'start'
- The transparent vowel is associated to a different back feature **on the same tier**

Transparent Vowels: Finnish

- Set of Finnish FSCs forbid +round or +low vowels from being associated to a -back feature that succeeds a +back feature

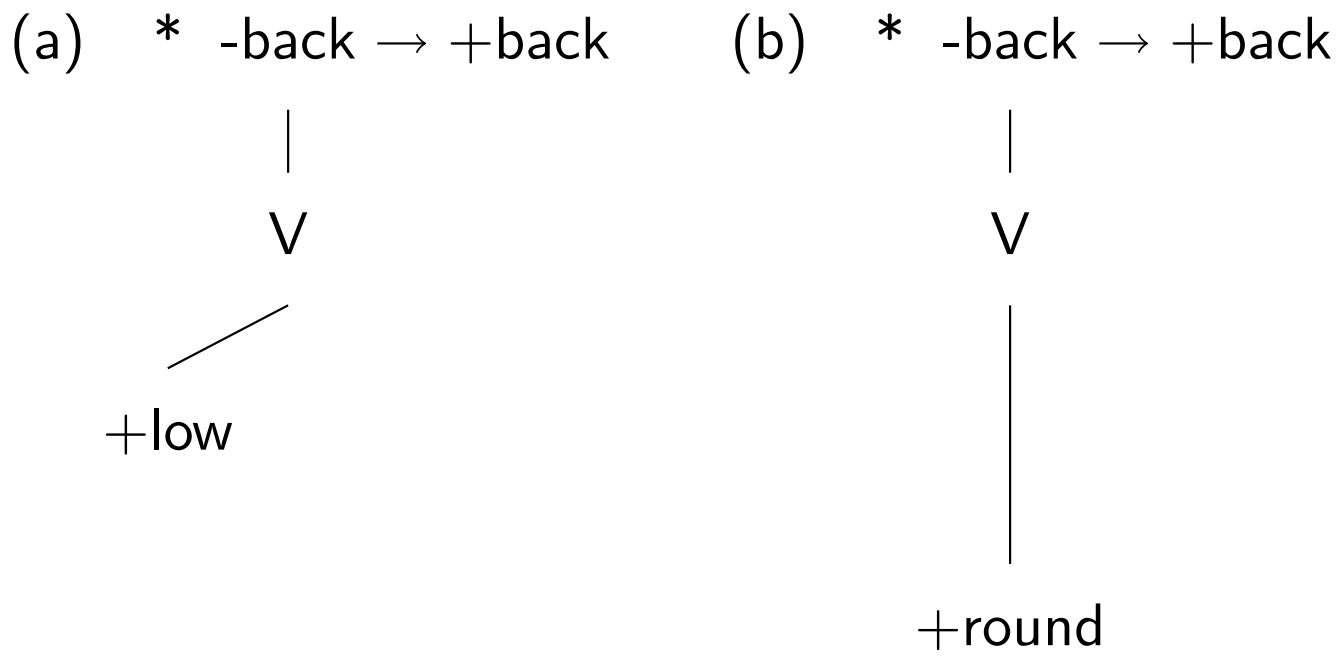
(21) Finnish FSCs



Transparent Vowels: Finnish

- and forbid +round or +low vowels from being associated to a -back feature that precedes a +back feature

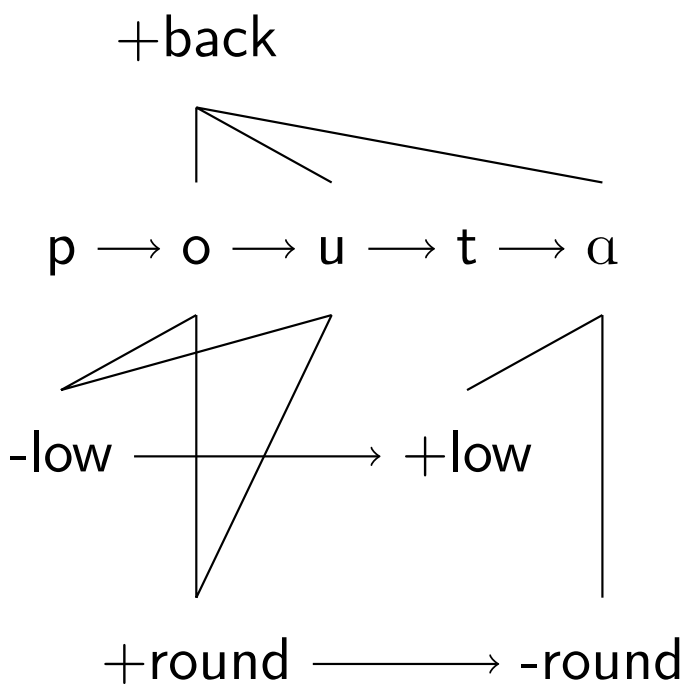
(22) Finnish FSCs



Transparent Vowels: Finnish

- A fully harmonic word does not violate any Finnish FSCs

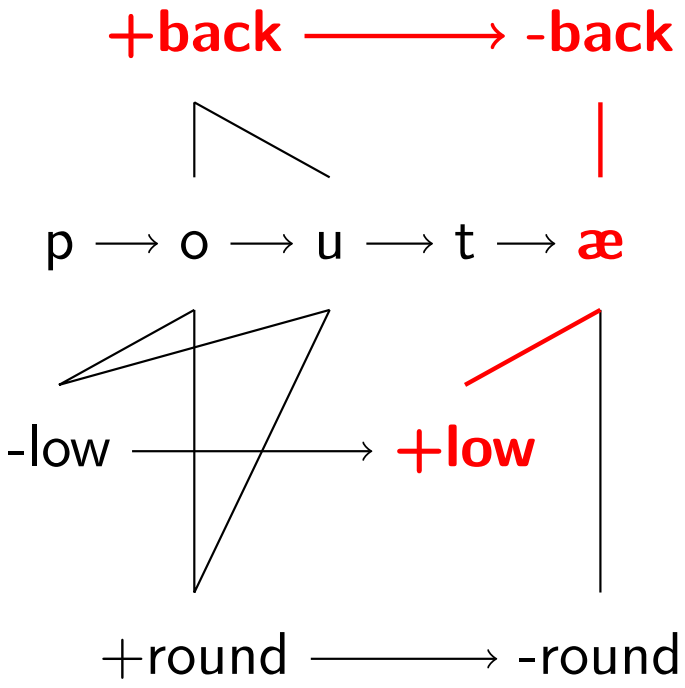
(23) [pouta] 'fine weather'



Transparent Vowels: Finnish

- A disharmonic word is ungrammatical because it contains the forbidden structure of (21a)

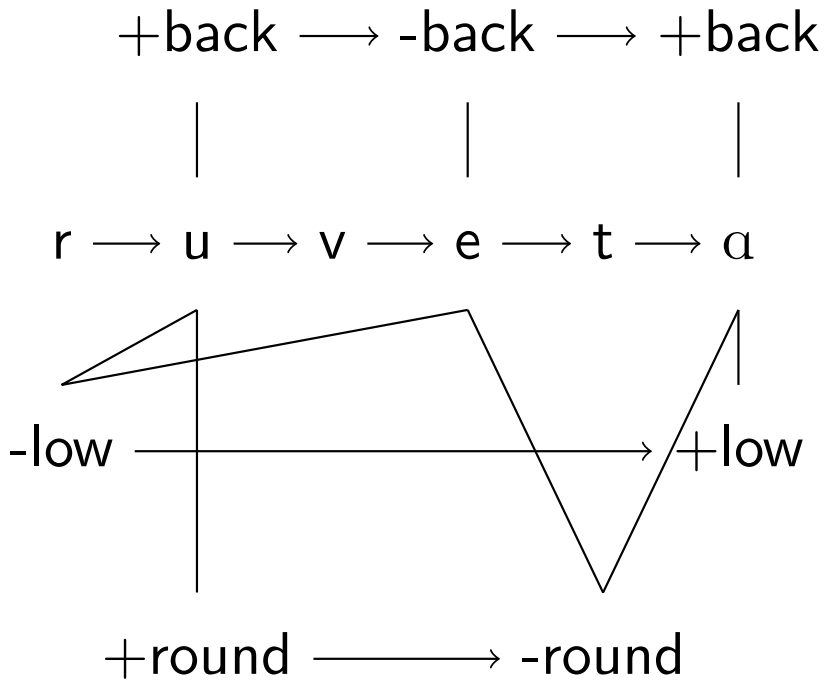
(24) Ungrammatical disharmonic word



Transparent Vowels: Finnish

- Transparent vowels [i, iː, e, eː] are associated to a feature *on each feature tier*

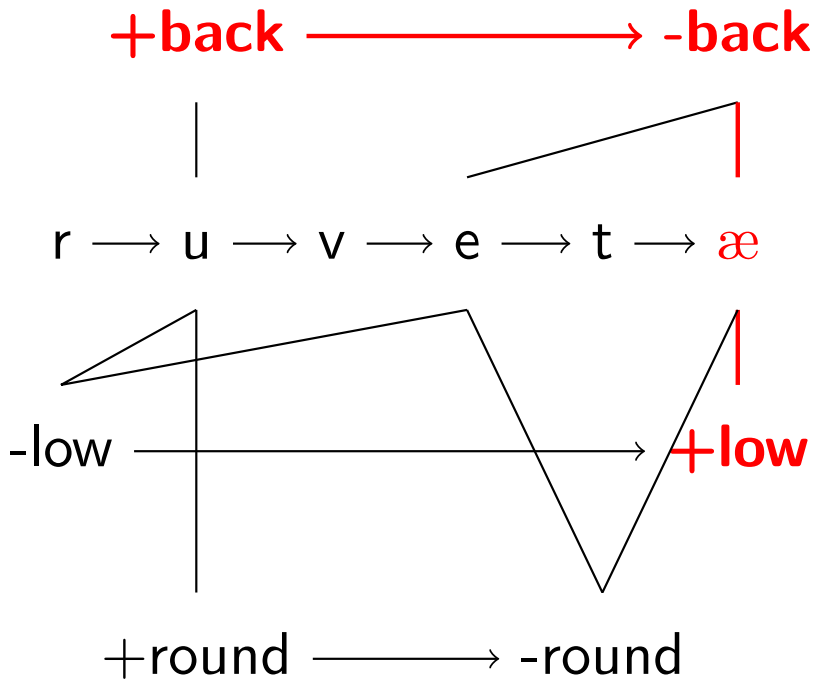
(25) [ruvetɑ] 'start'



Transparent Vowels: Finnish

- A disharmonic word with a transparent vowel is ungrammatical because it contains the forbidden structure of (21a)

(26) Ungrammatical word with transparent vowel



Agreement is local

Agreemnt ARs consist of...

- multiple iterations of the same feature, with a different intervening feature on the same tier

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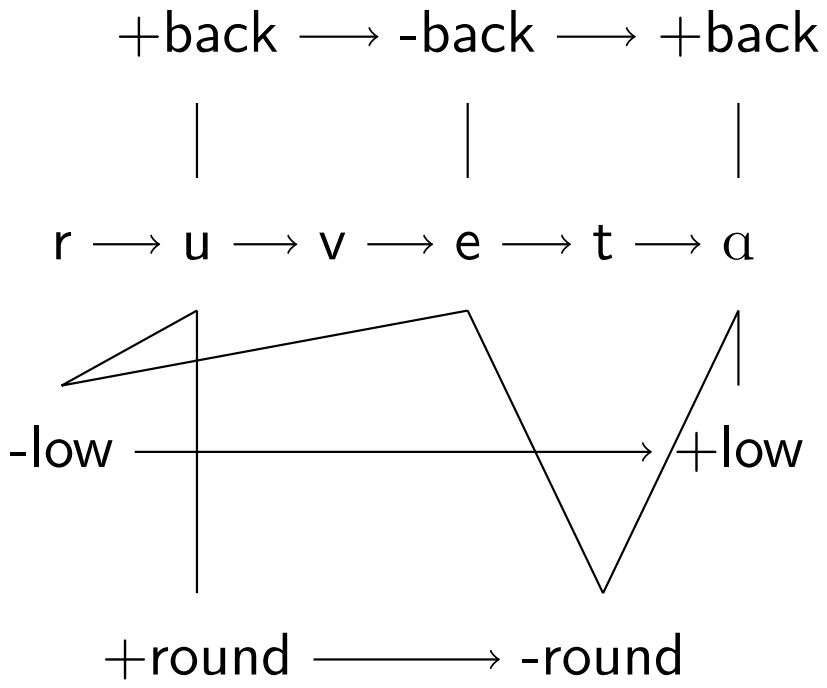
Agreemnt ARs consist of...

- multiple iterations of the same feature, with a different intervening feature on the same tier
- successor relation between assimilating and intervening features

Agreement is local

- Transparent vowels associated to a feature *on each feature tier*

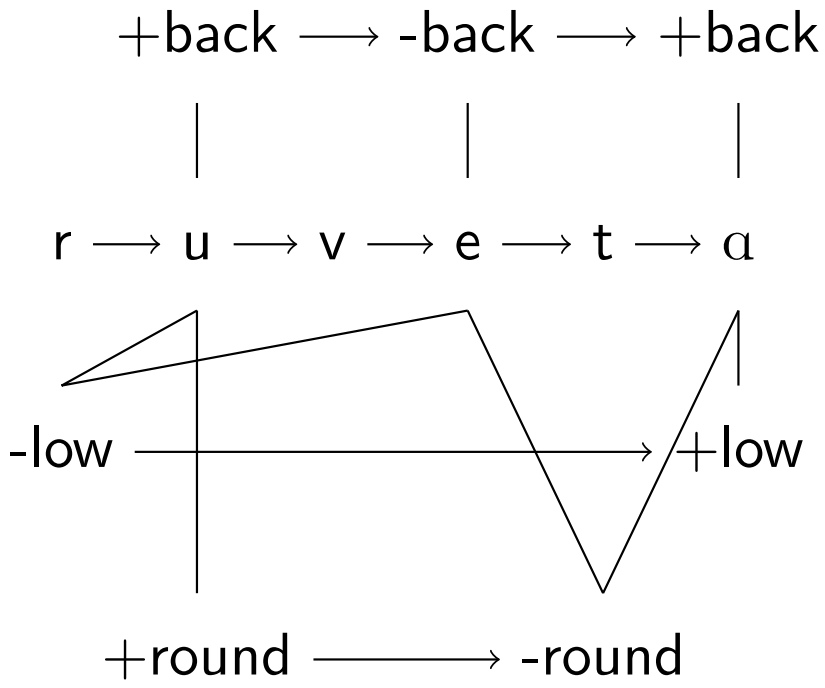
(27) [ruveta] 'start'



Agreement is local

- Transparent vowels associated to a feature *on each feature tier*
- ARs are local because of successor relation between features on each tier

(28) [ruveta] 'start'



Discussion

Well-formed surface ARs of vowel harmony are local

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- ARs of vowel harmony utilize successor and association relations

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Well-formed surface ARs of vowel harmony are local

- ARs of vowel harmony utilize successor and association relations
- FSCs capture attested vowel harmony patterns that use neutral vowels: Akan, Finnish
- Transparent vowels do not require underspecification on the surface

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ARs can also represent boundaries

- FSCs can capture morphologically-conditioned harmony: morpheme boundaries on feature tiers in Turkish

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ARs can also represent boundaries

- FSCs can capture morphologically-conditioned harmony: morpheme boundaries on feature tiers in Turkish
- FSCs over multi-tiered ARs can also capture an unattested pattern: sour grapes

Future Work

- Are multi-tiered ARs too powerful?

Future Work

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- Can multi-tiered ARs be restricted further to exclude unattested patterns?

Thank you

- QP chair- Adam Jardine
- QP committee- Bruce Tesar, Simon Charlow

References

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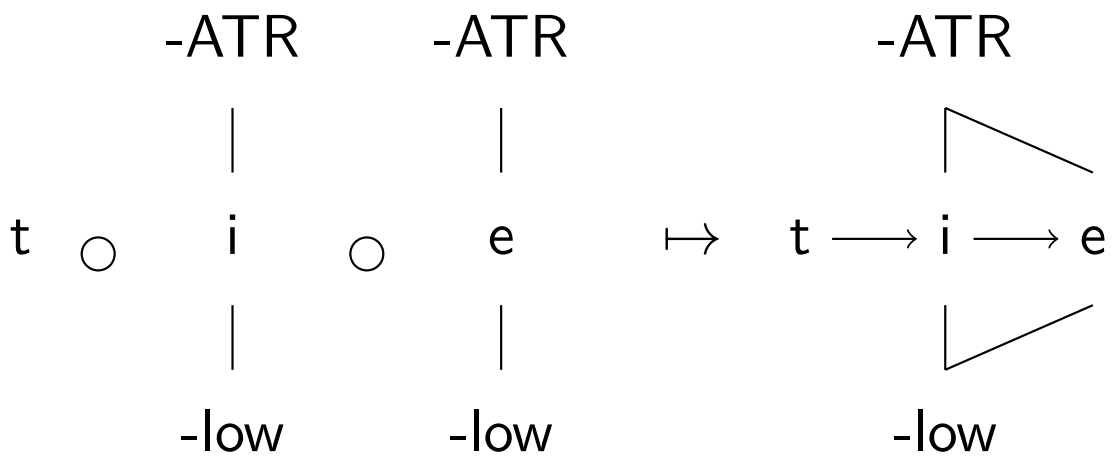
Appendix

Concatenation

- NCC and OCP derived by concatenation operation ($\circ$) (Jardine & Heinz, 2015)
  - Concatenation merges autosegmental graph primitives, like (1)

(29) Concatenation of adjacent autosegmental graph primitives



Forbidden Substructure Grammar

- Previous work applied logical descriptions of formal languages to phonological well formedness constraints (Heinz et al., 2011; Rogers et al., 2013)
- Forbidden substructure grammar generates a set of well-formed structures and rules out ill formed substructures, r_1 through r_n

(30) Forbidden substructure grammar (Jardine, 2017)
$\neg r_1 \wedge \neg r_2 \wedge \neg r_3 \wedge \ldots \wedge \neg r_n$