An introduction to phonological representations

EGG 2017, Olomouc

The representation of vowels

- Chomsky and Halle's (1968: ch. 7)

- [+sonorant]: '…vocal tract cavity configuration in which spontaneous voicing is possible.'

- [+vocalic]: 'oral cavity in which the most radical constriction does not exceed that of high vowels i and u…'

- [+consonantal]: 'radical obstruction in the midsagittal region of the vocal tract', 'obstruction must be at least as as norrow as that found in fricative consonants…'

- [+tense]/[+Advanced Tongue Root]: '…produced with a deliberate, accurate, maximally distinct gesture that involves considerable muscular effort…'

The representation of vowels

TABLE 1. *The major class features*

	sonorant	consonantal	vocalic
voiced vowels	+	−	+
voiceless vowels	+	−	−
glides (I): *w*, *y*	+	−	−
glides (II): *h*, ʔ	+	−	−
liquids	+	+	+
nasal consonants	+	+	−
nonnasal consonants	−	+	−

The representation of vowels

Carr (1993: 64)

(10)

	i	ɪ	e	ɛ	a	ɑ	ɔ	o	ʊ	u	ɯ	y	ø	œ	ɐ	ə	ɨ	ʉ
high	+	+	−	−	−	−	−	−	+	+	+	+	−	−	−	−	+	+
low	−	−	−	−	+	+	−	−	−	−	−	−	−	−	+	−	−	−
ATR	+	−	+	−	+	−	−	+	−	+	+	+	+	−	−	−	+	+
back	−	−	−	−	−	+	+	+	+	+	+	−	−	−	−	−	−	−
front	+	+	+	+	+	−	−	−	−	−	−	+	+	+	−	−	−	−
round	−	−	−	−	−	−	+	+	+	+	−	+	+	+	−	−	−	+

The representation of vowels

State all of the features which are changed in each of the following rules:

i. p → f
ii. t → ŋ
iii. o → w
iv. k → s
v. s → t
vi. a → i

The representation of vowels

Assume a segmental inventory composed of: [ʕ k t d s z n p f b i u e o a w h]. Indicate what feature or features characterize the following classes of sounds.

i. ʕ k u o a w
ii. f p k h
iii. f p b t s d z n
iv. ʕ u o w a b d z n i e
v. i z n e d

The representation of vowels

- the aim of such a system was to capture all natural classes of sounds that constitute **inputs** of alternations

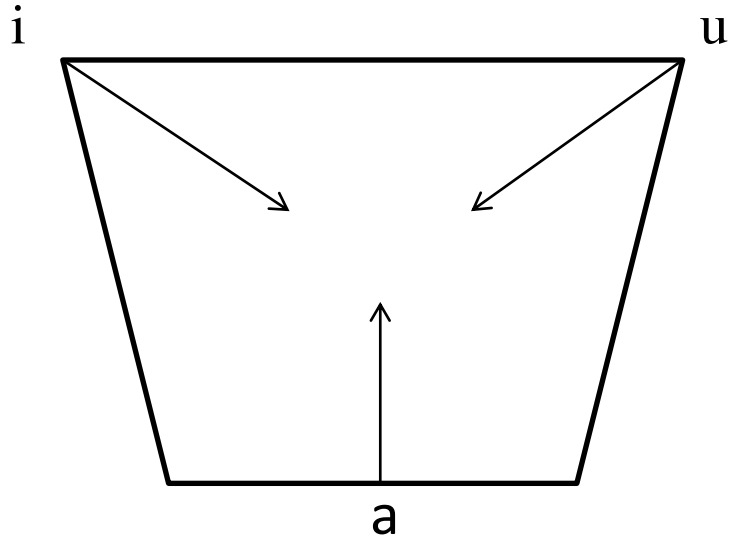
- the [+/- Feature] or **binary** feature approaches were not interested in the shape of vocalic inventories

- neither were they interested in the natural classes of segments that constitute **outputs** of alternations

The representation of vowels

- Vowel reduction: vowels alternate depending on whether they are stressed or not

- **centripetal** vowel reduction

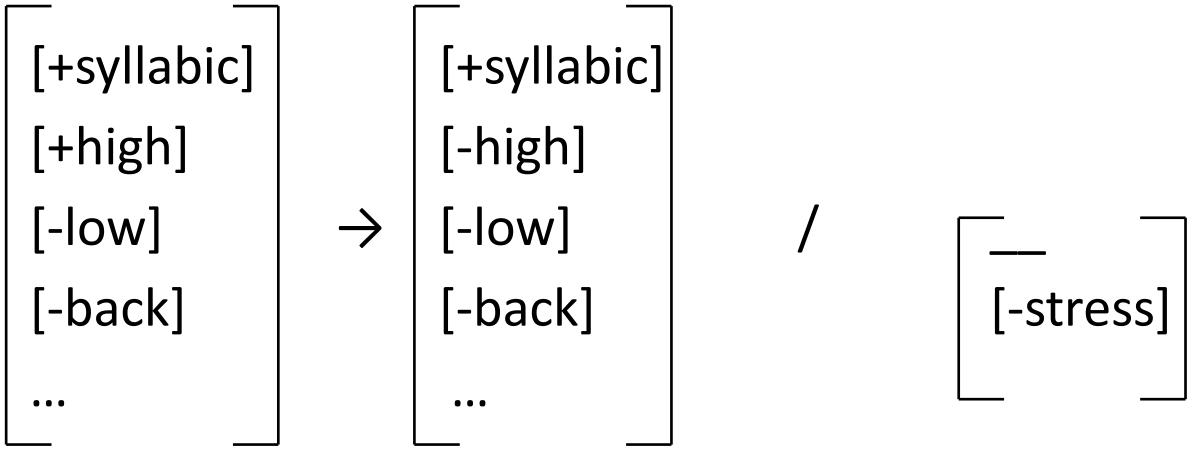


The representation of vowels

Full vowel	**Reduced vowel**
ph/əʊ/tograph	ph/ə/tography
phot/ɒ/graphy	phot/ə/graph
acc/uː/se	acc/ʊ/sation or acc/ə/sation
m/e/dicine	m/ə/dicinal
myst/iː/rious	mist/ə/ry or mist/ɸ/ry

The representation of vowels

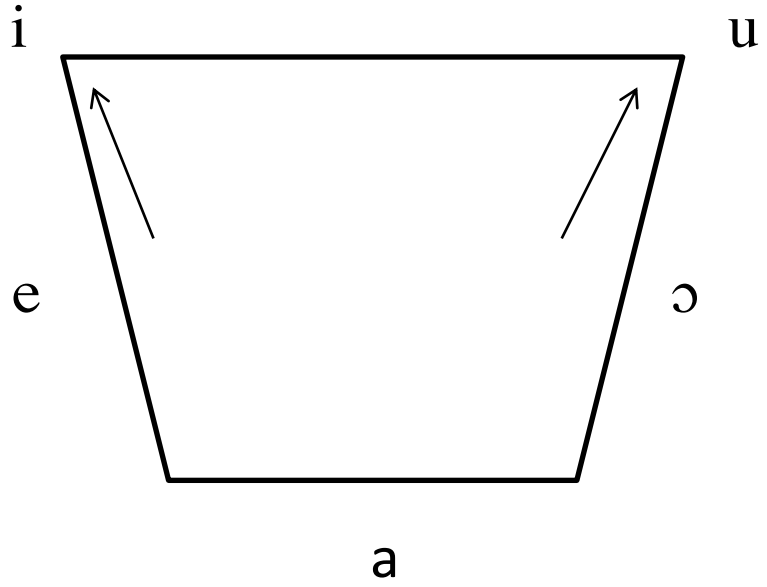
/iː/ → /ə/



The representation of vowels

- Vowel reduction: vowels alternate depending on whether they are stressed or not

- **centrfugal** vowel reduction



The representation of vowels

Luiseño

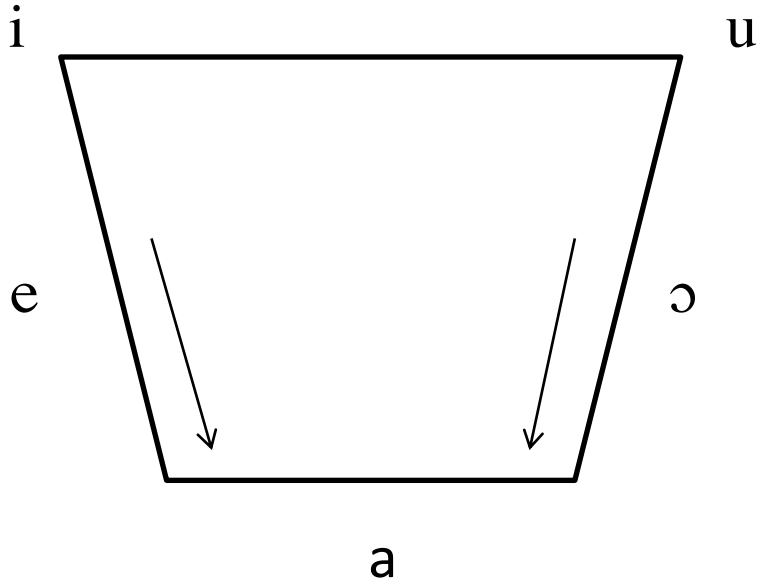
Strong	*i*	*e*	*a*	*o*	*u*
Weak	*i*		*a*	*u*	

cóka	'to limp'	*cukáʃkas*	'limping'
hédin	'will open'	*hidíki*	'to uncover'
capómkat	'liar'	*cápumkatum*	'liars'
máha	'to stop'	*mahámhaʃ*	'slow'
kúmit	'smoke'	*kumíkmiʃ*	'smoke coloured'
ʂúkat	'deer'	*páʂukat*	'elk'
takítkiʃ	'straight'	*tákiʃ*	'pottery stone'

The representation of vowels

- Vowel reduction: vowels alternate depending on whether they are stressed or not

- **centrfugal** vowel reduction (second type)



The representation of vowels

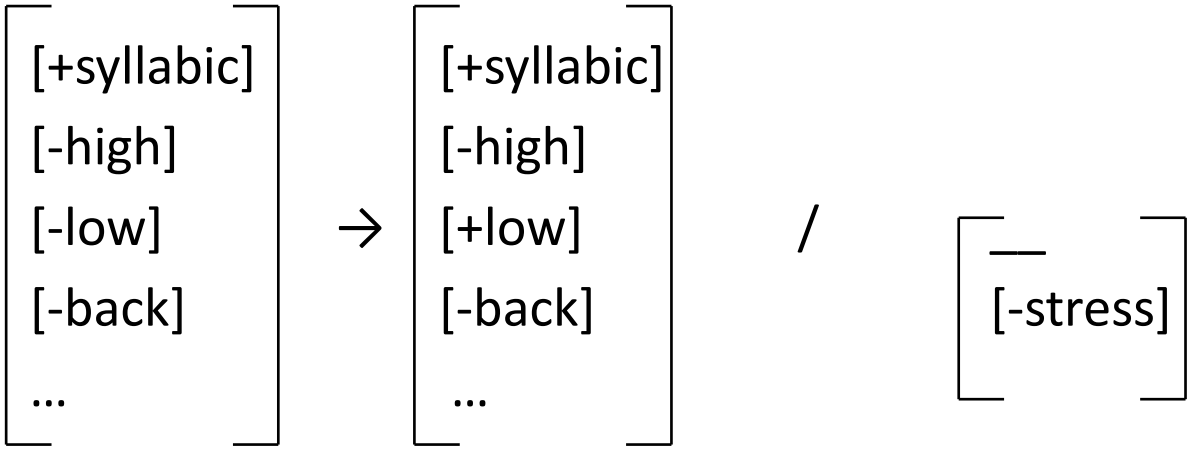
Belorussian

Strong	*i*	*e*	*a*	*o*	*u*
Weak	*i*		*a*		*u*

nóɣi	'legs'	*nayá*	'leg'
kól	'pole (nom.)'	*kalá*	'pole (gen.)'
vʲósnɨ	'spring (gen.)'	*vʲasná*	'spring (nom.)
mʲót	'honey (nom.)'	*mʲadóvɨ*	'honey (adj.)'
ʃépt	'whisper'	*ʃaptátsʲ*	'to whisper'
réki	'rivers'	*raká*	'river'
spʲétsʲ	'to ripen'	*paspʲávatsʲ*	'to mature'
klʲéj	'glue'	*klʲajónka*	'oil-cloth'

The representation of vowels

/e/ → /a/



The representation of vowels

(a) Bulgarian

Strong	*i*	*e*	*a*	*o*	*u*
Weak	*i*		*ə*	*u*	

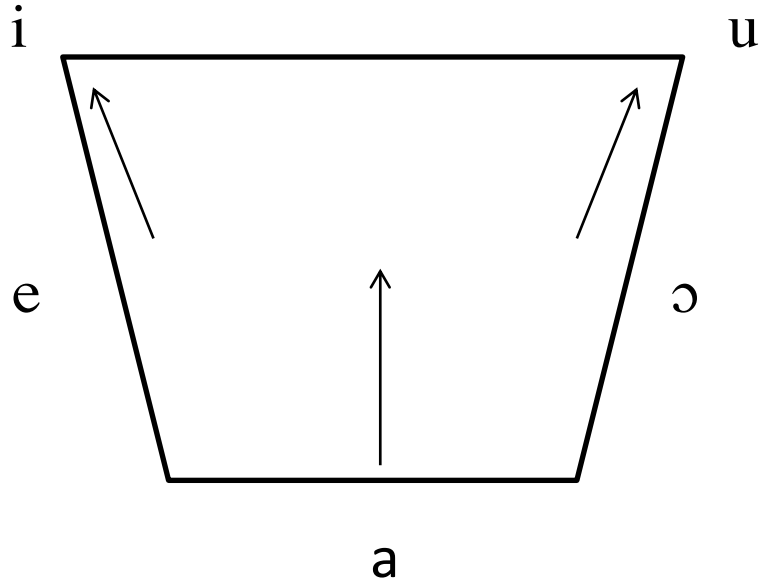
(b)

róguf	'of horn'	*rugát*	'horned'
ónzi	'that (masc.)'	*unázi*	'that (fem.)'
sélu	'village'	*silá*	'villages'
rábutə	'work'	*rəbótnik*	'worker'
grát	'city'	*grədéts*	'town'

The representation of vowels

- Vowel reduction: vowels alternate depending on whether they are stressed or not

- **centrfugal** and **centripetal** reduction in Bulgarian

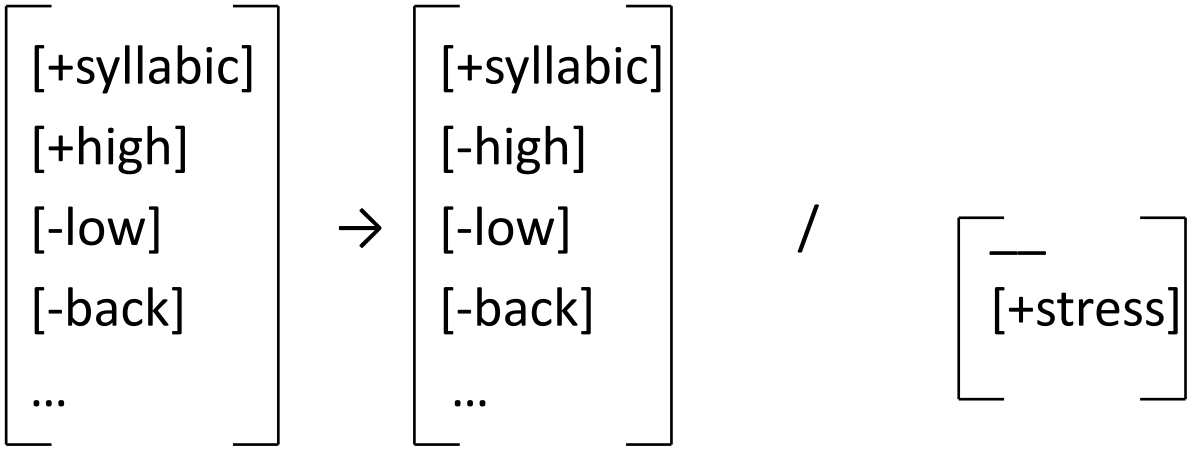


The representation of vowels

- in an SPE binary feature system several issues repain unaddressed
- What role does the stress play?
- Why are corner vowels or the shwa good output for reduction?

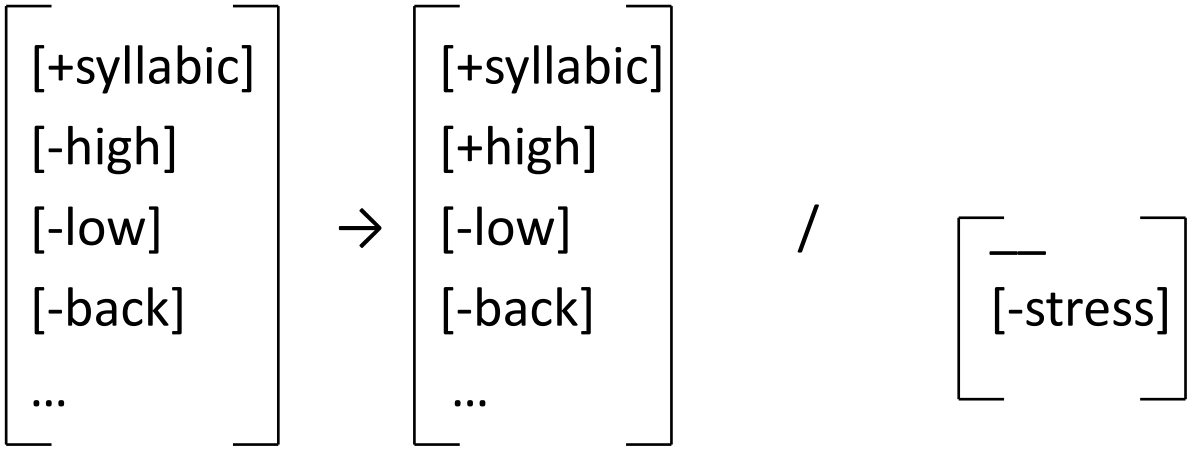
The representation of vowels

/iː/ → /ə/



The representation of vowels

/ə/ → /iː/



The representation of vowels

- Element Theory (Kaye, Lowenstamm and Vergnsaud 1990, Harris 1994, Backley 2010):
- Features are not binary but monovalent
- Vowels are composed of three features: |A|, |U| and |I|
- they are abstract, cognitive, atomic units which have certain acoustic correlates

The representation of vowels

- |I| - high value of F1, low value of F2
- in isolation realized as /i/

- |U| - low F1, low F2
- in isolation realized as /u/

- |A| - high F1, low F2
- in isolation realized as /a/

The representation of vowels

- the three elements were atomic, i.e. indivisible

- their status is confirmed by the fact that the smallest vocalic systems attested have three vowels (roughly /i/, /u/, /a/)

- elements are allowed to combine:

- |I.A| = /e/
- |U.A| = /o/
- |I.U| = /y/

- the phonetic implication is that /e/ will have lower F1 and/or higher F2 than /i/
- /o/ will have higher F1 than /u/ etc.

The representation of vowels

- the acoustic profile of /ə/ (F2= F1X3; F3=F1X5) is treated as the neutral carrier signal

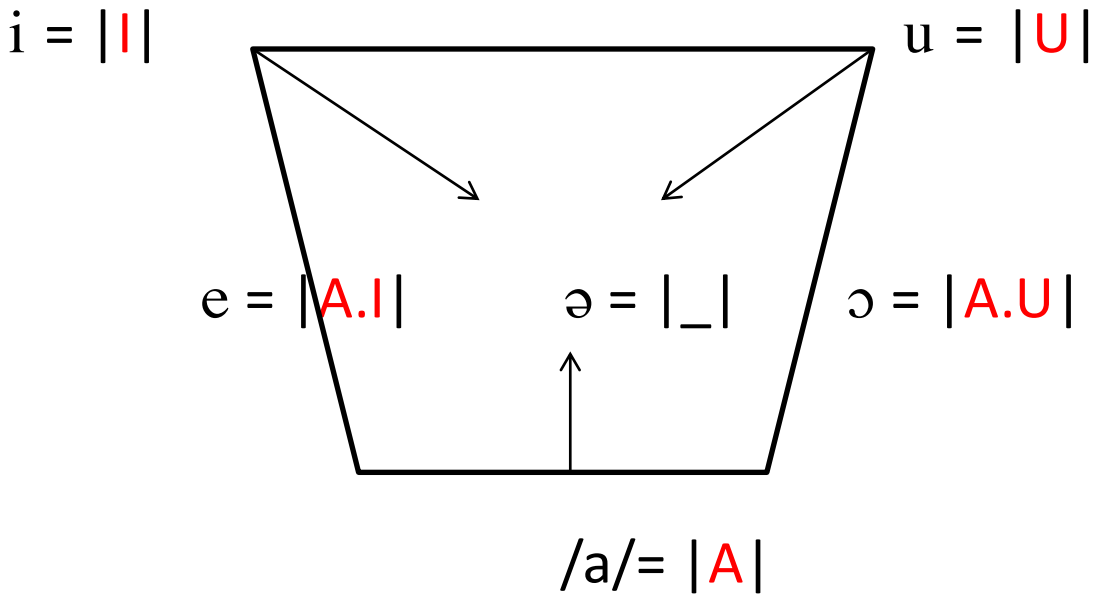
- /ə/ is represented as an empty expression (_)

- the Element Theory analysis of vowel reduction seems more promising than the [+/-F] appraoch

- centripetal reductions is represented as a deletion/delinking of all elements in an expression

The representation of vowels

- **centripetal** vowel reduction

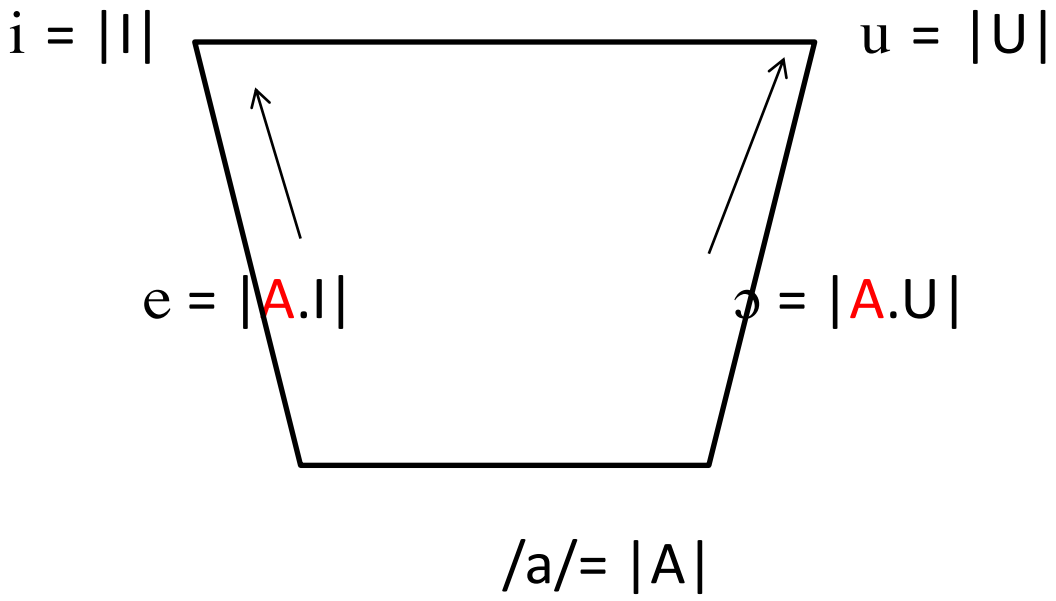


The representation of vowels

- centrifugal reductions is represented as a deletion/delinking of elements |I|, |U| or |A| in an expression

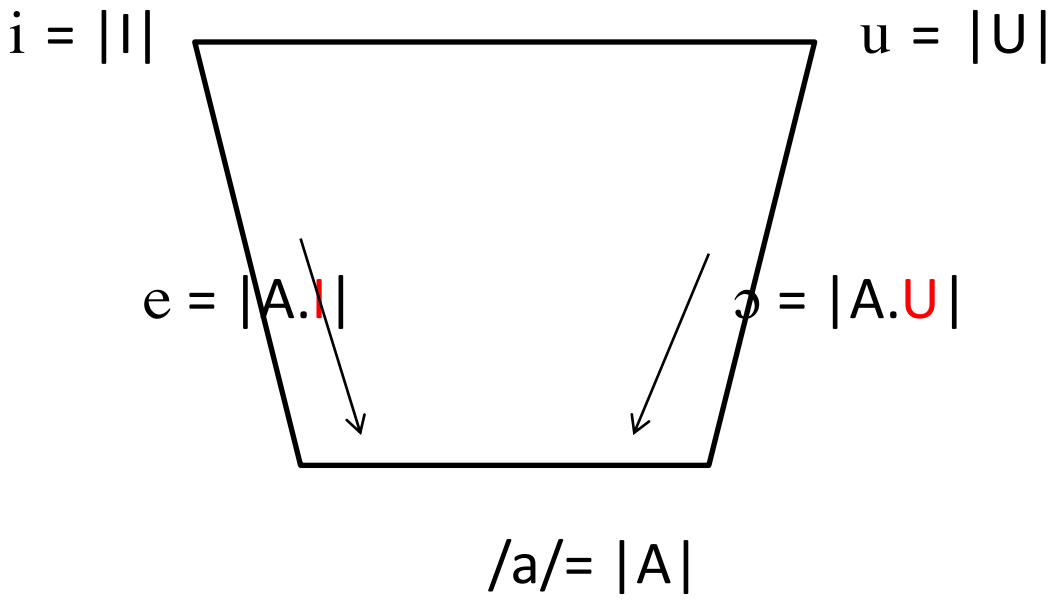
The representation of vowels

- **centripetal** vowel reduction (Luiseno-style)



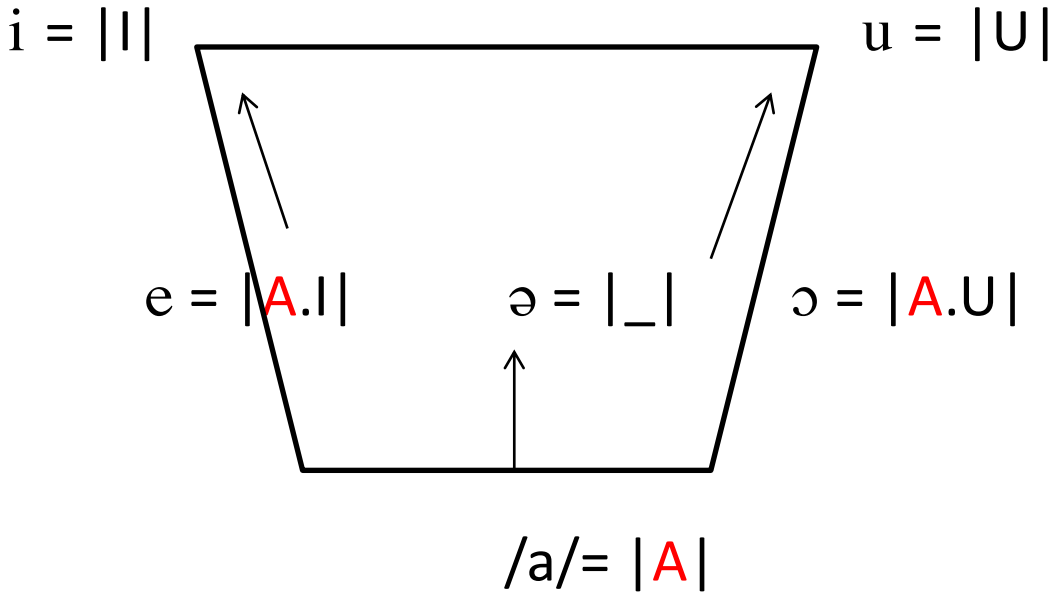
The representation of vowels

- **centripetal** vowel reduction (Bielorussian-style)



The representation of vowels

- **centripetal** and **centrifugal** vowel reduction (Bulgarian)



The representation of vowels

- problems with elements: metaphony in the dialects of Italian
- Metaphony: a process in which a vowel inherits properties of a different vowel in the same word
- in Element Theory, unlike in binary features theory, vowels /i/ and /u/ do not form a natural class
- in a binary feature approach both vowels share feature [+high], in ET no such property is predicted to exist and be active

The Dialect of Grado (Walker (2005))

(Metaphonic alternations: *e,o*→*i,u;* No metaphony for *ɛ, ɔ)*

a. [ATR]/e/o/

i. Class I/II adjectives and nouns:

	Singular	Plural	
Msc.	*'vero*	*'viri*	'true '
Msc.	*'negro*	*'nigri*	'negro'
Msc.	*'tempo*	*'timpi*	'time
Msc.	*'roso*	*'rusi*	'red'
Msc.	*'sordo*	*'surdi*	'deaf '
Msc.	*'tondo*	*'tundi*	'round'

ii. Class III Adjectives and Nouns:

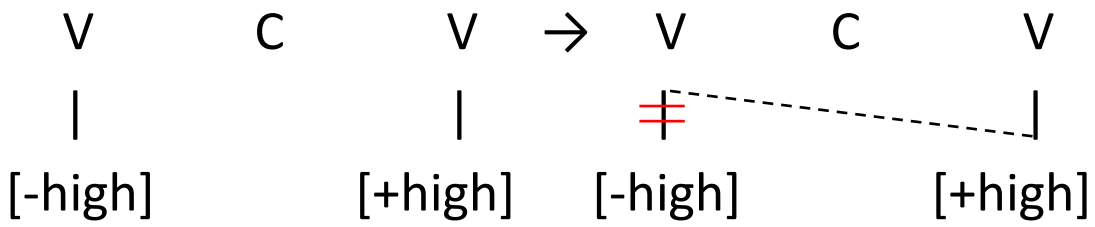
	Singular	Plural	
Masc.	*'fjor*	*'fjuri*	'flower'
Fm.	*a'mor*	*a'muri*	'love'

iii. Metaphonic alternations in the present singular of verbs:

'meto	*'kre-o*	*'romp-o*	1st
'mit-i	*'kri-i*	*'rump-i*	2nd
'met-e	*'kre-e*	*'rump-e*	3rd
'put'	'believe'	'break'	

The representation of vowels

- a natural analysis of such data is the spreading of feature [+high] from the following vowel to the preceding one



- no such analysis is available under ET

- as a matter of fact the metaphony data should not exist

- In sum: ET allows for a much more natural account of vowel reduction, while the binary feature framework allows for a much more natural account of metaphony