A hierarchical approach to variation and sound change

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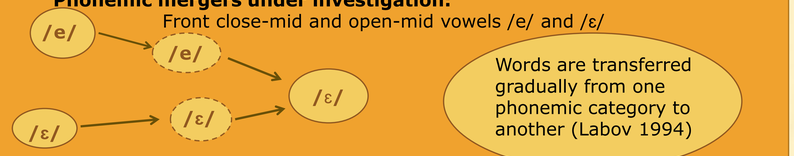
Background

Distinctions among mid vowels are not stable across languages and leading to merger or near-merger (Clements 2006).

Collapse of phonological distinction between stressed close-mid and open-mid vowels

Phonemic mergers under investigation:

Front close-mid and open-mid vowels /e/ and /ɛ/



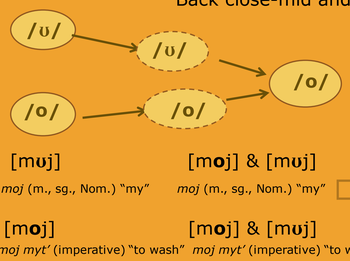
Words are transferred gradually from one phonemic category to another (Labov 1994)

[nʲ**é**kogda] *nékogda* "sometime"
[nʲ**ɛ́**kogda] *nékogda* "there is no time"

[nʲ**ɛ́**kogda] & [nʲ**é**kogda] *nékogda* "sometime"
[nʲ**é**kogda] & [nʲ**ɛ́**kogda] *nékogda* "there is no time"

[nʲ**ɛ́**kogda] *nékogda* "sometime" *nékogda* "there is no time"

Back close-mid and open-mid vowels /ʊ/ and /o/



The end result of such a change is that all instances of the input phoneme are replaced by the output phoneme (Warren, Maguire 2013)

[m**o**j] *moj* (m., sg., Nom.) "my"
[m**o**j] & [m**ʊ**j] *moj* (m., sg., Nom.) "my"
[m**o**j] *moj* (m., sg., Nom.) "my"
moj myt' (imperative) "to wash"
[m**o**j] *moj myt'* (imperative) "to wash"
[m**o**j] & [m**ʊ**j] *moj myt'* (imperative) "to wash"

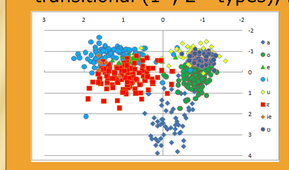
Observation in apparent time:

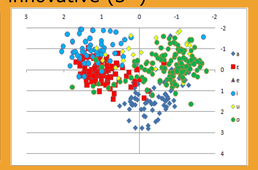
Investigation of consecutive stages of phonological change as presented in the speech of different age groups.

Location:
Villages of Kaj and Juzhaki,
Verhnekamskij district, Kirov Region,
300 km from Kirov
(North-East of European Russia),

10 speakers:
born between 1931 and 2000
Approximately one hour of recoding for each speaker

There are three types of idiolects:
transitional (1st, 2nd types), innovative (3rd)





Acoustic analysis of transitional vowel systems (speaker VSV, the dataset includes 971 vowels) & innovative vowel system (speaker AIA, the dataset includes 702 vowels). The data are normalized by Lobanov's vowel-extrinsic method.

Vowel space in innovative system is shrinked. Number of possible allophones of front and back mid vowels is reduced. As a result phonological contrasts are lost.

Multifarious data from:

- spontaneous speech
- production experiments (repetition of test items with open-mid and close-mid phonemes in a variety of positions)
- categorical perception experiments

A hierarchy of conditions on inter- and intra-speaker variation based on statistical analysis of competing realizations

Research questions

- What are the factors that condition a speakers' choices when two or more competing pronunciation variants are available?
- What are the mechanisms that account for the elimination of competing choices?

Phonemic merger in progress

From context-sensitive to context-independent merger

Reconstructed phonological system:

Consistent distinction between close-mid and open-mid vowel phonemes.

Front close-mid & open-mid phonemes

	CʲVC	CʲVCʲ
/e/	[ʲ**e**s] *les* "forest" [mʲ**é**sto] *mésto* "place"	[o ʲ**í**sʲe] *o lése* "about forest" [v mʲ**í**sʲtʲe] *v meste* "in the place"
/ɛ/	[konfʲ**ɛ**ta] *konféta* "candy" [intʲerʲ**é**snyj] *interésnyj* "interesting"	[o konfʲ**ɛ́**tʲe] *o konféte* "about candy" [intʲerʲ**é**snʲej] *interesnej* "more interesting"

Back close-mid & open-mid phonemes

	CVC, CVCʲ
/ʊ/	[k**ʊ**t] kot "cat " [bʊ́ʲʃe] *bol'še* "more"
/o/	[g**o**t] *god* "year" [b**o**ʲ] *bol'* "pain"

	CʲVC	CʲVCʲ
/e/	[e]	[i]
/ɛ/	[ɛ]	[ɛ]

	CVC	CVCʲ
/ʊ/	[ʊ]	[ʊ]
/o/	[o]	[o]

Current phonological systems

1st type
speakers ENP (1932), VSV (1933)

The historical distinction between phonemes /e/ & /ɛ/ collapsed both in CʲVC and in CʲVCʲ syllables. After the merger allophones of both historical phonemes were preserved in the vowel system as competing choices. Choices are driven by a variety of conditions and are probabilistic in nature.

	CʲVC	CʲVCʲ
/ɛ/	[ʲ**ɛ**s], [ʲ**e**s], [ʲ**ĩ**és], [ʲ**i**s] "forest" [mʲ**ɛ**sto], [mʲ**ĩ**ésto], [mʲ**é**sto] "place" [konfʲ**ɛ**ta], [konfʲ**é**ta], [konfʲ**ĩ**ẽta] "candy" [intʲerʲ**é**snyj], [intʲerʲ**é**snyj], [interʲ**í**snyj] "intersting"	[o ʲ**í**sʲe] [o ʲ**é**sʲe] "about forest" [v mʲ**é**sʲtʲe], [v mʲ**ĩ**esʲtʲe], [v mʲ**í**sʲtʲe] "in the place" [o konfʲ**ɛ́**tʲe], [o konfʲ**é**tʲe], [o konfʲ**ĩ**ẽtʲe] "about candy" [intʲerʲ**é**snʲej], [intʲerʲ**é**sʲnʲej] [intʲerʲ**í**sʲnʲej] "more intersting"

/o/	/ʊ/
[g**o**t] *god* "year" [t**ó**lstyj] *tólstyj* "fat" [k**ó**los] *kólos* "ear"	[k**ʊ**t] *kot* "cat" [st**ʊ**l] *stol* "table" [uk**ʊ́**l] *ukól* "injection"
/o/	
[b**o**ʲ] & [bʊʲ] *bol'* "pain" [bʊ́ʲʃe] & [bʊʲʃe] *bol'še* "more" [m**o**j] & [m**ʊ**j] *moj* (m., sg., Nom.) "my"	

The historical distinction between /ʊ/ & /o/ is found in a number of morphemes. A large number of morphemes underwent the process of /ʊ/& /o/ merger. After the merger allophones of both historical phonemes surface as competing choices subject to recently emerged factors of variation and probability rules.

2nd type
speakers AEN (1932), AMCH (1931), LICH (1956), GAM (1957) SPK (1991)

	CʲVC	CʲVCʲ
/ɛ/	[mʲ**é**sto], [mʲ**ĩ**ésto], [mʲ**é**sto] "place" [konfʲ**ɛ**ta], [konfʲ**é**ta], [konfʲ**ĩ**ẽta] "candy"	[v mʲ**é**sʲtʲe], [v mʲ**ĩ**esʲtʲe], [v mʲ**í**sʲtʲe] "in the place" [o konfʲ**ɛ́**tʲe], [o konfʲ**é**tʲe], [o konfʲ**ĩ**ẽtʲe] "about candy"

/o/
[g**o**t] *god* "year" [b**o**ʲ] & [bʊʲ] *bol'* "pain" [bʊ́ʲʃe] & [bʊʲʃe] *bol'še* "more" [k**o**t] *kot* "cat"

Hight distinctions within pairs /e/-/ɛ/ and /ʊ/-/o/ completely collapsed.
After the merger allophones of historical phonemes were preserved and surface as competing variants irrespective of etymology. Choices are affected by a variety of factors and may be probabilistically predicted.

3rd type
speakers TAM (1972), AIA (1996), SACH (2000)

Competing choices are ousted: open-mid vowels generalized across a number of previously relevant conditions (factors of variation).

Front mid phoneme

	CʲVC	CʲVCʲ
/ɛ/	[mʲ**ɛ**sto] "place" [konfʲ**ɛ**ta] "candy"	[v mʲ**ɛ**sʲtʲe] "in the place" [o konfʲ**ɛ**tʲe] (very rarely [o konfʲ**é**tʲe]) "about candy"

Back mid phoneme

/o/
[g**o**t] "year", [k**o**t] "cat", [b**o**ʲ] "pain", [b**ó**ʲʃe] (very rarely) [bʊʲʃe] "more"

A hierarchical approach

Where the choice between close-mid and open-mid vowels is available, it may be probabilistically predicted on the basis of the following factors

phrasal position
Prominent position is associated with the focus and is established on the basis of pitch countour. Prominent positions favour open-mid vowels. Non-prominent positions favour close-mid counterparts.
[zʲdʲ**ɛ**sʲ] *zdes'* "here" – prominent position; [zʲdʲ**e**sʲ] – non-prominent;

speaking style
Speakers more frequently choose open-mid vowels in read speech and close-mid vowels in spontaneous speech.
[vmʲ**ɛ**sʲtʲe] *vméste* "together"– read speech; [vmʲ**é**sʲtʲe] – spontaneous speech;

consonantal context

Front vowels:
Palatalized right context triggers higher vowels.
[hlʲ**ɛ**p] *xleb* "bread" – CʲVC; [o hlʲ**í**bʲe] *o xlébe* "about bread" - CʲVCʲ;

Back vowels:
Labial, lateral and velar environment show stronger preference for close–mid vowels.
[sel**ʊ́**] *sélo* "village" – after lateral; [vedr**ó**] vedró "bucket" - after post-alveolar

vowel duration
[vʲ**í**tʲer] *véter* "wind" – the higher vowel falls below the average duration of allophones of given phonemes; [vʲ**é**tʲer] – the lower vowel is above this value.

Relative magnitudes of factors

Front vowels:

Predictions	1st type (2 speakers)	2nd type (5 speakers)	3rd type (3 speakers)
All instances of morphemes with variation	32 morphemes (223 realizations)	40 morphemes (304 realizations)	5 morphemes 20 realizations
phrasal position	24 morphemes (171 realizations)	35 morphemes (215 realizations)	5 morhemes (18 realizations)
speaking style	8 morphemes (33 realizations)	21 morphemes (60 realizations)	2 morphemes (2 realizations)
context	5 morphemes (12 realizations)	14 morphemes (26 realizations)	0
duration	4 morphemes (6 realizations)	4 morphemes (5 realizations)	0

Back vowels:

Predictions	1st type (2 speakers)	2nd type (5 speakers)	3rd type (3 speakers)
All instances of morphemes with variation	15 morphemes (61 realizations)	15 morphemes (67realizations)	2 morphemes (14 realizations)
phrasal position	12 morphemes (51 realizations)	12 morphemes (49 relizations)	2 morphemes (12 realizations)
speaking style	5 morphemes (7 realizations)	6 morphemes (13 realizations)	2 morphemes (2 realizations)
context	3 morphemes (3 realizations)	2 morphemes (5 realizations)	0
duration	0	0	0

Results

- The vowel system of dialect of Kaj is moving from a situation where one phonological position allows alternative choices (1st, 2nd types) to a situation with a one-to-one relationship between the phonological position and the allophone (3rd type).
- The hierarchical approach allowed to establish the relative magnitude of factors conditioning variation in the transitional (1st, 2nd types) and in innovative idiolects (3rd type).
- The impact of these factors is being gradually diminished as younger speakers lose an ability to distinguish between them and generalize one pronunciation variant across a number of conditions.