

Investigating inter-speaker convergence through phonetic microvariation in paired data

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Investigating inter-speaker convergence through

phonetic microvariation in paired data

GULP Lablunch 3rd October 2019

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"Des savoirs & des talents"







TALK OUTLINE

> The project

- The quest for a convergence measuring method
- First attempt at GAMMs
- What's next?





I – The project PhD project: context, theoretical background and method





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PhD project (2017-2020):

- De la convergence interlocuteur au changement phonétique : accommodation linguistique et changement phonétique de l'anglais parlé à Glasgow
- Jointly supervised by Sylvie Hanote (Poitiers) and Jane Stuart-Smith (Glasgow)
- Funded by the French Ministry for Higher Education,
 Research and Innovation







- How do we look at sound change in progress?
- We traditionally use aggregates for each speaker, and compare speakers according to their age/gender/etc.





- How do we look at sound change in progress?
- We traditionally use aggregates for each speaker, and compare speakers according to their age/gender/etc.
- True story: each speaker's phonetic production is actually quite variable (Cukor-Avila & Bailey 2013).
- Can this constant microvariation relate to sound change?





- Short-term inter-speaker accommodation (Giles & Smith 1979) is thought to be the starting point of long-term community-level sound change (Trudgill 1986).
- We know about short-term (Pardo 2013) and mediumterm (Sonderegger 2012) speech accommodation.





Main research questions:

- Which patterns of speech accommodation can be identified/distinguished in spontaneous speech?
- How does accommodation within speakers in the short term relate to sound change in the long term?
- How is phonetic convergence constrained by linguistic, social and situational factors?





I – PROJECT : METHOD



Fine phonetic variation and sound change: A real-time study of Glaswegian

http://soundsofthecity.arts.gla.ac.uk/

Oct 2011-Sept 2014

The Leverhulme Trust

Decade of Recording	Old	Middle-aged	Young
	67-90	40-55	10-17
	(Decade of Birth)	(Decade of Birth)	(Decade of Birth)
1970s	4 f, 6 m (1890s)	7 f, 7 m (1920s)	4 f, 8 m (1960s)
1980s	6 f, 6 m (1900s)	4 f, 12 m (1930s)	2 f, 5 m (1970s)
1990s	6 f, 6 m (1910s)	6 f, 6 m (1940s)	6 f, 6 m (1980s)
2000s	6 f, 6 m (1920s)	6 f, 5 m (1950s)	6 f, 6 m (1990s)

Table 1: Real- and apparent-time structure of the main Glasgow corpus; an additional 6 speakers born in the 1890s and recorded in 1916/17 are also available. Recordings are predominantly of unprepared spontaneous speech from sociolinguistic surveys, oral histories and broadcast media.



Three variables of interest:

Variable	Type of variable	Consciousness
Vowel quality (F1 & F2)	Segmental	Above
Vowel length (SVLR)	Segmental	Below
Speech rate	Suprasegmental	Above

F1, F2 and vowel length extracted with LaBB-CAT/ISCAN
 for all lexically stressed tokens



Three variables of interest:

- Variation monitored for each speaker within conversation to measure short-term accommodation
- 'Traditional' Imer modelling used across the whole corpus to account for broader real and apparent time variation
- Trajectories, rate and speed of variation within minutes will be compared to change over time





Three variables of interest:

Variation monitored for each speaker within conversation to measure short-term accommodation ... But how?





II – How did people look at convergence? So much methodz





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Euclidian distances (Babel 2009, Ruch 2015)





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- Discriminant analysis (Delvaux & Soquet 2007)





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- Discriminant analysis (Delvaux & Soquet 2007)
- Moving averages (Tamminga *et al.*
- GAMMs (Sonderegger *et al.* 2017, Solanki 2017)



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- Euclidian distances (Babel 2009, Ruch 2015)
- Discriminant analysis (Delvaux & Soquet 2007)
- Moving averages (Tamminga et al. 2016)
- GAMMs (Sonderegger *et al.* 2
 Solanki 2017)
- Residuals linear plotting
 (Alexander 2018, Chevalier 2018)



- Back to GAMMs!
- Allows a dynamic perspective into time as a factor (unlike ED and DA)
- Allows controlling for factors in the modelling (unlike ED, DA and MA)
- Allows to measure the difference between smooths (unlike everything else?)



III – Applying GAMMs And getting colourful plots





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Corpus used: all peer-to-peer conversations in the corpus,
 i.e. 19 pairs or 38 speakers

	90	00
Μ	4 F + 4 M	6 F + 4 M
Y	4 F + 4 M	6 F + 6 M

 Speech rate deviation, vowel duration for all monophthongs, vowel quality for FLEECE, BOOT, COT



- Basic model run using the *mgcv* package in R (v3.6.1):
 bam(dependent variable ~ fixed or random effects
 + s(time, by = speaker)
- Plotting using *itsadug*





- Basic model run using the *mgcv* package in R (v3.6.1): bam(dependent variable ~ fixed or random effects + s(time, by = speaker)
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example for speech rate deviation, pair 00Mf1

00-M-f01 00-M-f02

plot_smooth

plot_diff Difference 00-M-f02 - 00-M-f01



1) Speech rate (deviation in syll/sec)

- bam(speech_rate_dev ~
 s(phone_begin, by = speaker_name), data = pair)
- > A <u>lot</u> of wigglyness within speakers
- All pairs have periods of significant difference between speakers





2) Vowel duration (in ms, log)

- bam(phone_logdurms ~ phone_label + follseg + nsyl +
 speech_rate_dev + logfreq +
 s(phone_begin, by = speaker_name), data = pair)
- There is variation within speakers but not as spiky as in speech rate
 - Most pairs have periods of significant difference between
 speakers (13 pairs out of 19)



3) F1 and F2 (one model per formant per vowel per pair; formant values have been Lobanov-normalized)

- bam(F2.normr ~ Preceding.POA + Following.POA +
 Target.duration.ms +
 s(phone_begin, by = speaker_name), data = pairvowel)
- There is some variation within speakers but very smooth
- Models were only run for 3 pairs (=18 models!):
 no consistence in significant difference periods in formant values within pairs

Focus on three pairs:

- **OOYf3**: overlapping periods of significant difference between speakers in speech rate and vowel duration
- 90Ym1: non-matching periods of significant difference between speakers in speech rate and vowel duration
- **OOMf2**: no difference between speakers in vowel duration but periods of significant difference in speech rate



Interaction 00Yf3 (overlapping divergence periods)



FLEECE (F1 and F2)









Difference 00-Y-f04 - 00-Y-f03



BOOT (F1 and F2)

Difference 00-Y-f04 - 00-Y-f03









COT (F1 and F2)









Difference 00-Y-f04 - 00-Y-f03



Interaction 90Ym1 (non-matching divergence periods)



Interaction 00Yf3 (differences in speech rate only)



What conclusions can be drawn from this?

- Various variables vary in a more varied way than others
- Divergence/convergence between for speakers for one variable doesn't mean divergence/convergence for other variables





IV – What's next? Help, I'm in my last year





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IV – INTO THE FUTURE

> Take a step back and look at the whole dataset together

> Two options here:

- Treat pairs as a random factor to compare microvariation trajectories by social factors (age, gender);
- or actually base the analysis of convergence/divergence patterns on pairs themselves?





IV – INTO THE FUTURE

- Extracting the whole corpus with ISCAN
- Adding other types of conversations, more interesting, more relevant, more promising, more harder
- Include additional factors and information for further quantitative and qualitative analysis





IV – INTO THE FUTURE

Write a thesis about all this





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Thank you for listening! * roars *



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