FRYSKE AKADEMY

Visible Consonants: a Tool for Visualizing and Normalizing Consonant Variation

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Introduction

- Visible Consonants is a web application that aims to combine user friendliness with maximum flexibility and functionality.
- Uses a live view, i.e. each time the user changes something in the settings, the plot shown in the viewer is immediately adjusted accordingly.
- Freely available at:

  `https://www.visibleconsonants.org/`

- The input file may include all kinds of consonantal measurements:
  - numerical, e.g. acoustic, articulatory, etc.;
  - categorical, e.g. voice, place of articulation, etc.
- Any number of sociolinguistic variables can be included, e.g. region, age group, etc.
- May include measurements for:
  - consonants;
  - any adjacent vowels, preceding and/or following the consonant.
- Scaling of frequency measures (bark, ERB, mel, etc.)
- Normalization with Labonov (1971), or 'rescaled' Lobanov: z-scores are scaled back to the scale of the non-normalized measurements by means of a linear regression analysis.
- Visualization of individual variables and factors, visualization of two dependent variables or more, contour graphs, temporal graphs (VC, VCV, CV).
- Panelling.

Data used for the graphs

- 160 teachers of Belgian and Netherlandic Dutch from eight regions pronounced fricatives.
- John Wells and Jill House pronounced the fricatives that are included in the IPA system.

1D graphs

- Visualization of individual variables and factors.
- Bar chart sor dot pots with 90%, 95% or 99% error bars.

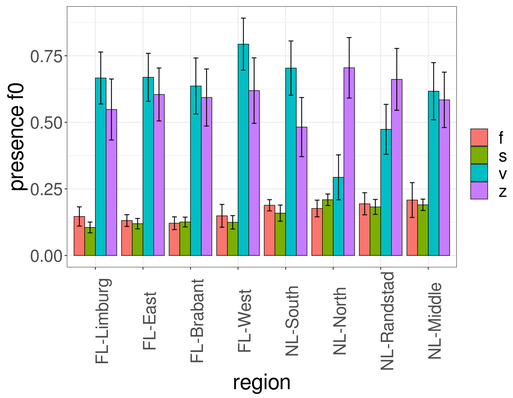

Figure 1:Extent of pitch found in in four fricatives and shown per region.

2D graphs

- Visualization of two dependent variables or more.
- Ellipses of 95% confidence intervals can be shown.
- Scaling and normalization individually per axis.

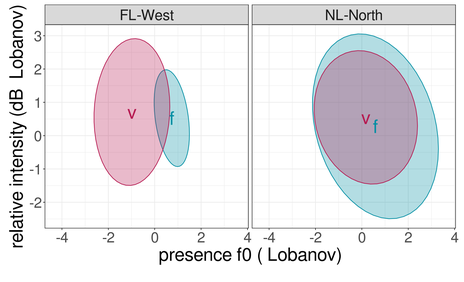

Figure 2:Relative intensity versus the extent of pitch in [f] and [v] and in two regions.

Contour graphs

- Especially for variables measured at multiple times, either in the consonant interval or in the preceding/following vowel interval.
- Smoothing of curves using spline function.

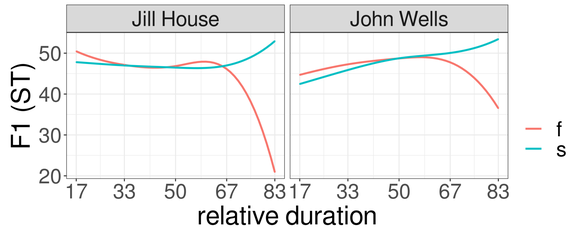

Figure 3:Smoothed F1 contours of Jill House and John Wells for [f] and [t] obtained on the basis of measurements at five time points.

Temporal graphs

- Visualization of the temporal organization of VC, VCV or CV sequences.
- Is adapted version of the type of graph that was introducted by Nooteboom (1972) and used as well by Wang & Van Heuven (2018).

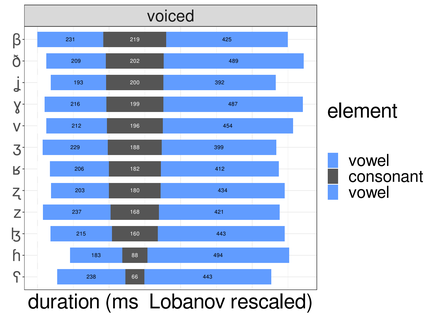

Figure 4:The voiced fricatives of the IPA system were pronounced in a [a]C[a] context by John Wells and Jill House. The durations of vowels and consonants are normalized with 'Lobanov rescaled.'

Additional Information

- Implemented in the programming language R. The user interface has been built using the packages `shiny` (developed by RStudio) and `shinyBS` and several other packages.
- Visible Consonants is a twin app of Visible Vowels which is available at:

  `https://www.visiblevowels.org/`

- Both apps are availale at:

  `https://www.visiblesounds.org/`

Acknowledgements

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References

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