Package 'phonR'

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Type Package

Title R tools for phoneticians and phonologists

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Depends mixtools, R (>= 2.10)

Description phonR is an R package for phoneticians and phonologists,including functions for normalization and plotting of vowels.

License GPL-3

URL https://github.com/drammock/phonR

BugReports https://github.com/drammock/phonR/issues

LazyLoad yes

LazyData yes

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R topics documented:

indo *Formant values for Indonesian vowels*

Description

This data set gives F1 and F2 values for five vowels of Standard Indonesian, as spoken by eight speakers (4 male, 4 female), measured from wordlist recordings.

Usage

```
indo
```

Format

A data frame of 1725 rows, with columns "subj", "gender", "vowel", "f1", and "f2".

normalizeVowels *Normalize formant values using a variety of algorithms*

Description

Transforms vowel formant data measured in Hertz using one of several normalization schemes commonly used in phonetic and sociolinguistic research. Returns an n-by-m matrix of n data points by m formants in ascending order, with fundamental frequency first (if present), except for method "wattfabricius" which only and always returns F1 and F2, regardless of whether f0 and F3 were supplied.

Usage

```
normalizeVowels(method, f0=NULL, f1=NULL, f2=NULL, f3=NULL,
vowel=NULL, grouping.factor=NULL)
```

Arguments

method	Normalization method to use. Possible values are "none", "bark", "mel", "erb", "log", "z"|"zscore"|"ztransform"|"lobanov", "logmean"|"nearey1", "nearey2", "s"|"scentroid"|"wattfabricius".
f0	Vector of f0 (fundamental frequency) values. Required for method "nearey2".
f1	Vector of F1 (first formant) values. Required for methods "nearey2", "wattfabricius".
f2	Vector of F2 (second formant) values. Required for methods "nearey2", "wattfabricius".
f3	Vector of F3 (third formant) values. Required for method "nearey2".

`vowel` Vector of vowel symbols. Required for method "wattfabricius", ignored for all other methods.

`grouping.factor` Vector of grouping factor values. If supplied, used to calculate group-intrinsic normalizations for methods "lobanov", "nearey1", "nearey2", and "wattfabricius".

Author(s)

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References

Glasberg, B. R., & Moore, B. C. J. 1990 "Derivation of auditory filter shapes from notched-noise data." *Hearing Research*, 47(1-2), 103-138. http://dx.doi.org/10.1016/0378-5955(90)90170-T

Lobanov, B. M. 1971 "Classification of Russian vowels spoken by different speakers." *The Journal of the Acoustical Society of America*, 49(2), 606-608. http://dx.doi.org/10.1121/1.1912396

McCloy, D. R. 2012 "Normalizing and plotting vowels with the phonR package." *Technical Reports of the UW Linguistic Phonetics Laboratory*. http://depts.washington.edu/phonlab/pubs/McCloy2012_phonR.pdf

Nearey, T. M. 1978 "Phonetic feature systems for vowels" (Doctoral dissertation, University of Alberta). Reprinted by the Indiana University Linguistics Club. http://www.ualberta.ca/~tnearey/Nearey1978_compressed.pdf

Stevens, S. S., & Volkmann, J. 1940 "The relation of pitch to frequency: A revised scale." *The American Journal of Psychology*, 53(3), pp. 329-353.

Traunmuller, H. 1990 "Analytical expressions for the tonotopic sensory scale." *The Journal of the Acoustical Society of America*, 88(1), 97-100. http://dx.doi.org/10.1121/1.399849

Watt, D., & Fabricius, A. H. 2002 "Evaluation of a technique for improving the mapping of multiple speakers' vowel spaces in the F1 ~ F2 plane." *Leeds Working Papers in Linguistics and Phonetics*, 9, 159-173.

Zwicker, E., & Terhardt, E. 1980 "Analytical expressions for critical-band rate and critical bandwidth as a function of frequency." *The Journal of the Acoustical Society of America*, 68(5), 1523-1525. http://dx.doi.org/10.1121/1.385079

See Also

`plotVowels`

Examples

```
data(indoVowelData)
bark <- normalizeVowels('bark', f1=indo$f1, f2=indo$f2)
wattfab <- normalizeVowels('wattfabricius', f1=indo$f1, f2=indo$f2,
           vowel=indo$vowel, grouping.factor=indo$subj)
```

plotVowels *Plot F1 and F2 values from separate vectors or from a data frame*

Description

Generates high-quality plots of provided formant values using either the default onscreen device (X11, Quartz, or Win32) or direct-to-file using R base graphics functions (PDF, SVG, JPG, PNG, TIFF, or BMP). Can also normalize values on-the-fly before plotting, through a call to `normalizeVowels`.

Usage

```
plotVowels(data=NULL, vowel=NULL, f1=NULL, f2=NULL, f3=NULL, f0=NULL,
grouping.factor=NULL, norm.method='none', match.unit=TRUE,
match.axes='absolute', points='text', means='text', points.alpha=0.5,
means.alpha=1, points.cex=0.6, means.cex=1.2, ignore.hidden=TRUE,
ellipses=TRUE, ellipse.alpha=0.3173, polygon=TRUE, poly.order=NULL,
poly.include=NULL, single.plot=TRUE, titles='auto', axis.titles='auto',
axis.cex=0.8, garnish.col='#666666FF', grayscale=FALSE,
vary.colors=!grayscale, vary.shapes=grayscale, vary.lines=grayscale,
legend=single.plot, output='screen', family='', pointsize=12,
units='in', width=6.5, height=6.5, res=72, asp=NULL)
```

Arguments

`data`	Optional data frame containing the values to be plotted. If `data` is specified, the values of `f0`, `f1`, `f2`, `f3`, `vowel`, and `grouping.factor` should be enclosed in quotes and should reference column names in `data`.
`vowel`	Vector (or column name in `data`) of vowel symbols. If `data` is specified and `vowel` is NULL, it looks for a column in `data` called "vowel". If `data` and `vowel` are both NULL, it looks for an object named vowel.
`f1`	Vector (or column name in `data`) of F1 values. If `data` is specified and `f1` is NULL, it looks for a column in `data` called "f1". If `data` and `f1` are both NULL, it looks for an object named f1.
`f2`	Vector (or column name in `data`) of F2 values. If `data` is specified and `f2` is NULL, it looks for a column in `data` called "f2". If `data` and `f2` are both NULL, it looks for an object named f2.
`f3`	Vector (or column name in `data`) of F3 values (required for normalization method "nearey2").
`f0`	Vector (or column name in `data`) of f0 values (required for normalization method "nearey2").
`grouping.factor`	Vector (or column from `data`) of grouping factor values. Allows for plotting data by color/shape/linestyle (if `single.plot` is TRUE), or separating to individual plots (if `single.plot` is FALSE).

norm.method	Normalization method to use to transform data before plotting. Possible values are "none", "bark", "mel", "erb", "log", "z"|"zscore"|"ztransform"|"lobanov", "logmean"|"nearey1", "nearey2", "s"|"scentroid"|"wattfabricius".
match.unit	If TRUE (and norm.method is not "none"), axis tickmarks will be in the normalized unit. If FALSE (and norm.method is not "none"), axis tickmark values will be in Hertz, with tickmark locations scaled according to the chosen normalization method.
match.axes	If "absolute", all plots have same bounds. If "relative", all plots span the same range, but may have different endpoints. If "none", extrema are calculated separately for each plot. Ignored (coerced to "absolute") if single.plot is TRUE.
points	If "text", plots vowel tokens with the character string given in vowel. If "shape", plots vowel tokens as geometric shapes. If "none", omits plotting the vowel tokens.
means	If "text", plots vowel means with the character string given in vowel. If "shape", plots vowel means as geometric shapes. If "none", omits plotting the vowel means.
points.alpha	Opacity of individual vowel points (permissible values between 0 and 1 inclusive.)
means.alpha	Opacity of vowel means (permissible values between 0 and 1 inclusive.)
points.cex	Size of individual vowel points relative to pointsize.
means.cex	Size of vowel means relative to pointsize.
ignore.hidden	If TRUE and if points is "none", plotting dimensions are calculated based only on means, (or ellipses, if present).
ellipses	If TRUE, plot an ellipse around each vowel mean tracing an equidensity contour of the bivariate normal distribution.
ellipse.alpha	Size of the ellipse [0,1] expressed as an alpha-level (i.e., 0.05 gives a 95% confidence ellipse). Defaults to alpha level of 0.3173 (an ellipse encompassing 68.27% of the data points, equivalent to plus-or-minus 1 standard deviation). Note that because this is an alpha level, HIGHER numbers give SMALLER ellipses.
polygon	If TRUE, draw a series of line segments connecting the vowel means, in the order given by poly.order.
poly.order	Vector of strings determining the order in which connecting lines are drawn for the vowel polygon. Should match the levels of the factor vowel. If there are values of vowel not included in poly.order, the function will do its best to recognize them and put them in a sensible order but polygon drawing results may be ugly.
poly.include	Indicates how many of the vowels in poly.order should be connected into a polygon. To exclude vowels from the polygon drawing, put them at the end of poly.order and provide a value for poly.include shorter than the length of poly.order.
single.plot	If TRUE, plot each value of the grouping factor on the same graph. If FALSE and output is "screen", result is an on-screen lattice plot. If FALSE and output is "pdf" or "jpg", result is a collection of separate PDF or JPG files (one per level of grouping.factor).

titles	If "auto", will auto-generate titles based on grouping.factor. If "none", titles are omitted. Also accepts a single string (all titles will be the same), or a vector of strings that matches the number of levels in grouping.factor.
axis.titles	If "auto", will auto-generate axis labels based on norm.method. Also accepts a two-element vector of strings (useful for cases where the F1 and F2 values passed to the function have already been normalized). Order of elements is F2 (horizontal) label before F1 (vertical) label.
axis.cex	Size of the axis numbers relative to pointsize.
garnish.col	Color for the axis lines, ticks, numbers, and labels.
grayscale	If TRUE, plot without color. Note that if grayscale is FALSE, graphs may still come out colorless if uniform.style is TRUE and there is only one group on the graph, because the first color plotted defaults to black.
vary.colors	If TRUE, vary token and mean colors by group. Defaults to the opposite value as grayscale. If both grayscale and vary.colors are TRUE, colors are shades of gray varying in equal luminance steps.
vary.shapes	If TRUE, vary token and mean shapes by group (when either points or means has the value "shape"). Defaults to same value as grayscale. Ignored if uniform.style is TRUE.
vary.lines	If TRUE, vary line style by group (when ellipses or polygon are TRUE). Defaults to same value as grayscale. Ignored if uniform.style is TRUE.
legend	If TRUE, prints a legend in the lower left corner of the graph. Also accepts the standard keyword values for the base graphics legend() command ("top", "topright", "right", "bottomright", "bottom", "bottomleft", "left", "topleft", "center").
output	Possible values are "screen", "pdf", "svg", "jpg", "tif", "png", "bmp".
family	Character string indicating the name of the font family to use for all text in the plot. If points='text' or means='text' and vowels includes non-ASCII unicode IPA symbols, be sure to specify a font that has glyphs at those codepoints. Note that font specification may fail if plotting to screen and then saving as PDF or Postscript from the onscreen plot window menu. To ensure PDF font fidelity, run plotVowels() with output='pdf' instead.
pointsize	Base size of font used for plotting.
units	Unit of plot dimensions: "in", "cm", "mm", or "px". Ignored when output is "screen".
width	Width of the plot. Ignored when output is "screen".
height	Height of the plot. Ignored when output is "screen".
res	Resolution of output in dots-per-inch. Ignored for screen or vector output formats (pdf, svg), defaults to 72dpi for raster formats.
asp	Aspect ratio for plot area. Default is NULL, which changes the aspect ratio to maximize use of the available plot area; if specified, must be a positive numeric value.

Author(s)

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References

McCloy, D. R. 2012 "Normalizing and plotting vowels with the phonR package." *Technical Reports of the UW Linguistic Phonetics Laboratory*. http://depts.washington.edu/phonlab/pubs/McCloy2012_phonR.pdf

See Also

normalizeVowels

Examples

```
data(indoVowelData)
plotVowels(vowel=indo$vowel, f1=indo$f1, f2=indo$f2, grouping.factor=
           indo$gender, norm.method='bark', match.unit=FALSE,
   poly.order=c('i','e','a','o','u'))
plotVowels(data=indo, grouping.factor='subj', single.plot=FALSE,
           match.axes='relative', points='none', means.cex=1.5,
   poly.order=c('i','e','a','o','u'))
```

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