Package 'baRulho'

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Type Package

Title Quantifying sound degradation

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Description Quantification of degradation of (animal) sounds.

License GPL (>= 2)

Imports pbapply, warbleR, utils, stats, seewave, tuneR

Depends R (>= 3.2.1)

LazyData TRUE

URL https://github.com/maRce10/baRulho

BugReports https://github.com/maRce10/baRulho/issues

NeedsCompilation no

Suggests

RoxygenNote 6.1.1

Repository CRAN

Language en-US

R topics documented:

baRulho *baRulho: quantifying sound degradation*

Description

'baRulho' is a package intended to quantify habitat-induced degradation of (animal) acoustic signals. Most functions are based on the metrics provided in Dabelsteen et al (1993).

Details

The main features of the package are:

- The use of loops to apply tasks through acoustic signals referenced in an extended selection table
- The comparison of signals playbacked and re-recorded at different distances

Most functions allow the parallelization of tasks, which distributes the tasks among several processors to improve computational efficiency.

License: GPL (>= 2)

Author(s)

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blur_ratio *Measure blur ratio*

Description

`blur_ratio` Measure blur ratio in signals referenced in a extended selection table.

Usage

```
blur_ratio(X, parallel = 1, pb = TRUE, method = 1,
 ssmooth = NULL, msmooth = NULL, output = "est")
```

Arguments

`X`	object of class 'selection_table', 'extended_selection_table' created by the function `selection_table` from the warbleR package.
`parallel`	Numeric. Controls whether parallel computing is applied. It specifies the number of cores to be used. Default is 1 (i.e. no parallel computing). If `NULL` (default) then the current working directory is used.

pb	Logical argument to control if progress bar is shown. Default is TRUE. It can also be set globally using the 'pb' option (see warbleR_options).
method	Numeric vector of length 1 to indicate the 'experimental design' for measuring envelope correlation. Two methods are available: • 1: compare all signals with their counterpart that was recorded at the closest distance to source (e.g. compare a signal recorded at 5m, 10m and 15m with its counterpart recorded at 1m). This is the default method. • 2: compare all signals with their counterpart recorded at the distance immediately before (e.g. a signal recorded at 10m compared with the same signal recorded at 5m, then signal recorded at 15m compared with same signal recorded at 10m and so on).
ssmooth	Numeric vector of length 1 determining the length of the sliding window used for a sum smooth for amplitude envelope calculation (used internally by env).
msmooth	Numeric vector of length 2 to smooth the amplitude envelope with a mean sliding window for amplitude envelope calculation. The first element is the window length (in number of amplitude values) and the second one the window overlap (used internally by env).
output	Character vector of length 1 to determine if an extended selection table ('est') or a data frame ('data.frame') is returned.

Details

Excess attenuation is the attenuation of a sound in excess of that due to spherical spreading as described by Dabelsteen et al 1993. The goal of the function is to measure the excess attenuation on signals in which a master playback has been re-recorded at different distances. The 'signal.id' column must be used to tell the function to only compare signals belonging to the same category (e.g. song-types). Two methods for calculating excess attenuation are provided

Value

Data frame similar to input data, but also includes a new column with the excess attenuation values.

Author(s)

Marcelo Araya-Salas (<marceloa27@gmail.com>) #' @references Dabelsteen, T., Larsen, O. N., & Pedersen, S. B. (1993). Habitat-induced degradation of sound signals: Quantifying the effects of communication sounds and bird location on blur ratio, excess attenuation, and signal-to-noise ratio in blackbird song. The Journal of the Acoustical Society of America, 93(4), 2206.

Examples

```
{
# First set temporary folder
# setwd(tempdir())

data("playback_est")

# using margin for noise and method 1
```

```
blur_ratio(X = playback_est)

# using margin for noise and method 2
blur_ratio(X = playback_est, method = 2)
}
```

---

env_cor *Measure amplitude envelope correlation*

Description

env_cor Measures amplitude envelope correlation in signals referenced in a extended selection table.

Usage

```
env_cor(X, parallel = 1, pb = TRUE, method = 1, cor.method = "pearson",
ssmooth = NULL, msmooth = NULL, output = "est")
```

Arguments

X	object of class 'selection_table', 'extended_selection_table' created by the function selection_table from the warbleR package.
parallel	Numeric. Controls whether parallel computing is applied. It specifies the number of cores to be used. Default is 1 (i.e. no parallel computing). If NULL (default) then the current working directory is used.
pb	Logical argument to control if progress bar is shown. Default is TRUE. It can also be set globally using the 'pb' option (see warbleR_options).
method	Numeric vector of length 1 to indicate the 'experimental design' for measuring envelope correlation. Two methods are available: • 1: compare all signals with their counterpart that was recorded at the closest distance to source (e.g. compare a signal recorded at 5m, 10m and 15m with its counterpart recorded at 1m). This is the default method. • 2: compare all signals with their counterpart recorded at the distance immediately before (e.g. a signal recorded at 10m compared with the same signal recorded at 5m, then signal recorded at 15m compared with same signal recorded at 10m and so on).
cor.method	Character string indicating the correlation coefficient to be applied ("pearson", "spearman", or "kendall", see cor).
ssmooth	Numeric vector of length 1 determining the length of the sliding window used for a sum smooth for amplitude envelope calculation (used internally by env).
msmooth	Numeric vector of length 2 to smooth the amplitude envelope with a mean sliding window for amplitude envelope calculation. The first element is the window length (in number of amplitude values) and the second one the window overlap (used internally by env).

output — Character vector of length 1 to determine if an extended selection table ('est', default) or a data frame ('data.frame') is returned.

Details

The correlation of amplitude envelopes is intended to measure the distortion of signals in the time domain. The goal of the function is to measure the envelope correlation on signals in which a master playback has been re-recorded at different distances. The 'signal.id' column must be used to indicate the function to only compare signals belonging to the same category (e.g. song-types). The function will then compared each signal type to its reference. Two methods for calculating envelope correlation are provided (see 'method' argument).

Value

Data frame or extended selection table (depending on 'output' argument) similar to input data, but also includes a new column with the amplitude envelope correlation coefficients.

Author(s)

Marcelo Araya-Salas (<marceloa27@gmail.com>)

Examples

```
{
# First set temporary folder
# setwd(tempdir())

data("playback_est")

# method 1
env_cor(X = playback_est)

# method 2
env_cor(X = playback_est, method = 2)
}
```

---

excess_att *Measure excess attenuation*

Description

excess_att Measure excess attenuation in signals referenced in a extended selection table.

Usage

```
excess_att(X, mar, parallel = 1, pb = TRUE, method = 1, eq.dur = FALSE,
noise.ref = "before", bp = NULL, wl = 10, output = "est")
```

Arguments

X	object of class 'selection_table', 'extended_selection_table' created by the function selection_table from the warbleR package.
mar	numeric vector of length 1. Specifies the margins adjacent to the start and end points of selection over which to measure noise.
parallel	Numeric. Controls whether parallel computing is applied. It specifies the number of cores to be used. Default is 1 (i.e. no parallel computing). If NULL (default) then the current working directory is used.
pb	Logical argument to control if progress bar is shown. Default is TRUE. It can also be set globally using the 'pb' option (see warbleR_options).
method	Numeric vector of length 1 to indicate the 'experimental design' for measuring excess attenuation. Two methods are available: • 1: compare all signals with their counterpart that was recorded at the closest distance to source (e.g. compare a signal recorded at 5m, 10m and 15m with its counterpart recorded at 1m). This is the default method. • 2: compare all signals with their counterpart recorded at the distance immediately before (e.g. a signal recorded at 10m compared with the same signal recorded at 5m, then signal recorded at 15m compared with same signal recorded at 10m and so on).
eq.dur	Logical. Controls whether the noise segment that is measured has the same duration than the signal (if TRUE, default FALSE). If TRUE then 'mar' argument is ignored.
noise.ref	Character with the name of the column that contains tags for "signal" and "noise". This can be used to apply the same noise reference to all signals in a sound file. Therefore, at least one "noise" selection for each sound file must be provided. Default is NULL.
bp	Numeric vector of length 2 giving the lower and upper limits of a frequency bandpass filter (in kHz). Default is NULL.
wl	A numeric vector of length 1 specifying the window length of the spectrogram for applying bandpass. Default is 10. Ignored if bp = NULL. Note that lower values will increase time resolution, which is more important for amplitude ratio calculations.
output	Character vector of length 1 to determine if an extended selection table ('est', default) or a data frame ('data.frame') is returned.

Details

Excess attenuation is the attenuation of a sound in excess of that due to spherical spreading as described by Dabelsteen et al (1993). The goal of the function is to measure the excess attenuation on signals in which a master playback has been re-recorded at different distances. The 'signal.id' column must be used to indicate which signals belonging to the same category (e.g. song-types). The function will then compared each signal type to its reference. Two methods for calculating excess attenuation are provided (see 'method' argument).

Value

Data frame or extended selection table (depending on 'output' argument) similar to input data, but also includes a new column with the excess attenuation values.

Author(s)

Marcelo Araya-Salas (<marceloa27@gmail.com>) #' @references Dabelsteen, T., Larsen, O. N., & Pedersen, S. B. (1993). Habitat-induced degradation of sound signals: Quantifying the effects of communication sounds and bird location on blur ratio, excess attenuation, and signal-to-noise ratio in blackbird song. The Journal of the Acoustical Society of America, 93(4), 2206.

Examples

```
{
# First set temporary folder
# setwd(tempdir())

data("playback_est")

# using margin for noise and method 1
excess_att(X = playback_est, mar = 0.05)

# using margin for noise and method 2
excess_att(X = playback_est, mar = 0.05, method = 2)
}
```

---

playback_est *Extended selection table with re-recorded playbacks*

Description

Recordings of *Phaethornis longirostris* (Long-billed Hermit) songs from different song types (column 'signal.id') that were playbacked and re-recorded at 4 distances (1m, 5m, 10m, 15m, column 'distance').

Usage

```
data(playback_est)
```

Format

Extended selection table object in the warbleR format, which contains annotations and acoustic data

Source

Marcelo Araya-Salas

xcorr_distortion *Measure spectrographic cross-correlation as a measure of signal distortion*

Description

xcorr_distortion Measures spectrographic cross-correlation as a measure of signal distortion in signals referenced in a extended selection table.

Usage

```
xcorr_distortion(X = NULL, parallel = 1, pb = TRUE, method = 1, cor.method = "pearson",
wl = 512, ovlp = 90, wn = 'hanning', output = "est")
```

Arguments

X	object of class 'selection_table', 'extended_selection_table' created by the function selection_table from the warbleR package.
parallel	Numeric. Controls whether parallel computing is applied. It specifies the number of cores to be used. Default is 1 (i.e. no parallel computing). If NULL (default) then the current working directory is used.
pb	Logical argument to control if progress bar is shown. Default is TRUE. It can also be set globally using the 'pb' option (see warbleR_options).
method	Numeric vector of length 1 to indicate the 'experimental design' for measuring envelope correlation. Two methods are available: • 1: compare all signals with their counterpart that was recorded at the closest distance to source (e.g. compare a signal recorded at 5m, 10m and 15m with its counterpart recorded at 1m). This is the default method. • 2: compare all signals with their counterpart recorded at the distance immediately before (e.g. a signal recorded at 10m compared with the same signal recorded at 5m, then signal recorded at 15m compared with same signal recorded at 10m and so on).
cor.method	Character string indicating the correlation coefficient to be applied ("pearson", "spearman", or "kendall", see cor).
wl	A numeric vector of length 1 specifying the window length of the spectrogram, default is 512.
ovlp	Numeric vector of length 1 specifying % of overlap between two consecutive windows, as in spectro. Default is 90. High values of ovlp slow down the function but produce more accurate results.
wn	A character vector of length 1 specifying the window name as in ftwindow.
output	Character vector of length 1 to determine if an extended selection table ('est', default) or a data frame ('data.frame') is returned.

Details

The spectrographic cross-correlation is intended to measure the distortion of signals in the frequency domain. The goal of the function is to measure the cross-correlation on signals in which a master playback has been re-recorded at different distances. The 'signal.id' column must be used to indicate the function to only compare signals belonging to the same category (e.g. song-types). The function will then compared each signal type to its reference. Two methods for calculating cross-correlation are provided (see 'method' argument). The function is a wrapper on warbleR's `xcorr` function.

Value

Data frame or extended selection table (depending on 'output' argument) similar to input data, but also includes a new column with the amplitude envelope correlation coefficients.

Author(s)

Marcelo Araya-Salas (<marceloa27@gmail.com>)

Examples

```
{
# First set temporary folder
# setwd(tempdir())

data("playback_est")

# method 1
xcorr_distortion(X = playback_est)

# method 2
xcorr_distortion(X = playback_est, method = 2)
}
```

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