Package 'regimeDetectionMeasures'

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Type Package

Title Calculate Measures for Detecting Ecological Regimes

Version 0.1.0

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Encoding UTF-8

LazyData true

Depends R (>= 3.1.2), dplyr, tidyr, ggplot2, PerformanceAnalytics, kedd

RoxygenNote 6.1.1

Description Calculate a suite of regime detection metrics for multivariate time series.

Suggests knitr,
rmarkdown

VignetteBuilder knitr

R topics documented:

`calculate_distanceTravelled` *Calculate the 'distance travelled' by a multivariable system through phase space.*

Description

Calculate the 'distance travelled' by the entire system. Also calculates the velocity and acceleration of the entire system over the time series.

Usage

```
calculate_distanceTravelled(dataInDist, derivs = T, print = T)
```

Arguments

dataInDist	A data frame containing the following columns: "Variable" is usually species identity; "Value" is the observed value (e.g. count, density) of the variable; "sortVar" is the variable along which distance is calculated (e.g., time). The example data set is munged such that the sortVar column is named time.
derivs	logical (default TRUE), calculates the velocity and acceleration of the distance travelled
print	logical (default TRUE), prints output to device

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calculate_EWS *Calculate the early warning signals*

Description

Outputs data frame 'ews'.

Usage

```
calculate_EWS(winData, winMove)
```

Arguments

winData	Used in calc_FisherInformation. Default = 2 data points
winMove	Proportion of data to be included in each moving window (0,1).
distances	A data frame of the distances and dervatives of distance travelled at each time point.

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calculate_FisherInformation *Fisher Information: three equations for calculating.*

Description

Fisher Information: three equations for calculating.

Usage

```
calculate_FisherInformation(dataInFI, min.window.dat = 2,
  fi.equation = "7.12")
```

Arguments

dataInFI	A subset of data for each moving window. These data will be used to calculate the Fisher Information
min.window.dat	The minimum number of observation points (e.g. time) within the moving window for Fisher Information to be calculated
fi.equation	Equations descirbed in Mayer et al. (2007)

References

Mayer, Audrey L., et al. "Applications of Fisher information to the management of sustainable environmental systems." Exploratory data analysis using Fisher information. Springer, London, 2007. 217-244.

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calculate_VI *Calculate the Variance Index*

Description

The Variance Index is the maximum eigenvalue of the variance covariance matrix, and is described in Brock et al. (2006).

Usage

```
calculate_VI(winData, fill = 0)
```

Arguments

winData	A data frame.
fill	Fill for missing data. Default = 0.

References

Brock, William A., and Stephen R. Carpenter. "Variance as a leading indicator of regime shift in ecosystem services." Ecology and Society 11.2 (2006).

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munge_orig_dat *Munge the Original Data Frame.*

Description

Munge the Original Data Frame.

Usage

```
munge_orig_dat(data = NULL, example = T, fill = NA)
```

Arguments

data	A data frame with ENTER DESCRIPTION
example	Loads and munges data when parameters data = NULL & Default = T, running the function will load and munge data from Spanbauer et al. 2014.
fill	Fills empty cells with this value. Default = NA. Consider using zero (0) as a fill if using species counts. Beware when using NA vs. zero. Default = 0

Value

Function returns a data frame in long format with columns specifying site name, time (or spatial unit), variable (e.g. species identity), and value (e.g. species count).

References

Spanbauer, Trisha L., et al. "Prolonged instability prior to a regime shift." PLoS One 9.10 (2014): e108936.

Examples

```
munge_orig_dat() # will not write an object to environment
newDf = munge_orig_dat() # save the object to environment
```

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plot_orig_data *Plot original data*

Description

This function plots variables as

Usage

```
plot_orig_data(data, example = FALSE, print = TRUE, xLabel = "time")
```

Arguments

data	A data frame.
example	Logical. Specify "TRUE" if you would like to use example data for demonstration.
print	print plots to device when print = T. Default print = T.
xLabel	Option to change the xLabel on resultant ggplot from "time" to ...

Value

Function returns a data frame in long format with columns specifying site name, time (or spatial unit), variable (e.g. species identity), and value (e.g. species count).

References

Spanbauer, Trisha L., et al. "Prolonged instability prior to a regime shift." PLoS One 9.10 (2014): e108936.

Examples

```
df <- munge_orig_dat()
plot_orig_data(df)
```

`plot_richness` *Plot species richness over time for the original data*

Description

This function plots the species richness over time as a function of the total unique variables within each time

Usage

```
plot_richness(data, example = FALSE, print = TRUE, xLabel = "time")
```

Arguments

`data`	The original data frame
`example`	Logical. If TRUE will use the paleodiatom data from Spanbauer et al. (2014), else will use input data.
`print`	print plots to device when print = T. Default print = T.
`xLabel`	Option to change the xLabel on resultant ggplot from "time" to ...

Value

Function returns a data frame in long format with columns specifying site name, time (or spatial unit), variable (e.g. species identity), and value (e.g. species count).

References

Spanbauer, Trisha L., et al. "Prolonged instability prior to a regime shift." PLoS One 9.10 (2014): e108936.

`plot_timeDiff` *Plot units of time elapsed between sampling points over the time series.*

Description

This function plots the amount of time that has elapsed since the last sampled unit time.

Usage

```
plot_timeDiff(data, example = FALSE, print = TRUE, xLabel = "time")
```

Arguments

data	The original data frame
example	Logical. If TRUE will use the paleodiatom data from Spanbauer et al. (2014), else will use input data.
print	print plots to device when print = T. Default print = T.

Value

Function returns a data frame in long format with columns specifying site name, time (or spatial unit), variable (e.g. species identity), and value (e.g. species count).

References

Spanbauer, Trisha L., et al. "Prolonged instability prior to a regime shift." PLoS One 9.10 (2014): e108936.

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rdm_window_analysis *Calculate the regime detection measured within a moving window.*

Description

This function is a wrapper for calculating various regime detection measures within a moving window.

Usage

```
rdm_window_analysis(dataInRDM, winMove = 0.25, min.window.dat = 2,
  fi.equation = "7.12", to.calc = c("VI", "FI", "EWS"), fill = 0)
```

Arguments

dataInRDM	A data frame with columns: sortVar: usually time or some spatial dimension; variable: usually species; value: observations about the variable (e.g., count)
winMove	The proportion of each time series to be included in the moving window. Default = 0.25 (or 25 percent of the observations).
min.window.dat	Used in calc_FisherInformation. Minimum # of data points in each window to include in calculations. Default = 2 data points
to.calc	Which measures to calculate. VI variance index. FI Fisher Information. EWS 1st through 4th moments, etc. Default = ALL measures.
fill	Used in the function _calculate_VI_. Fill value for missing data. Default = 0

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