Package 'intensity.analysis'

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Type Package

Title Intensity of Change for Comparing Categorical Maps from Sequential Intervals

Version 0.1.6

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Description Calculate metrics of change intensity for category, transition and interval levels in categorical maps from sequential intervals. For more information please consult: Aldwaik,Safaa Zakaria and Robert Gilmore Pontius Jr. (2012). ``Intensity analysis to unify measurements of size and stationarity of land changes by interval, category, and transition". Landscape and Urban Planning. 106, 103-114. <doi:10.1016/j.landurbplan.2012.02.010>.

License GPL (>= 2)

Depends R (>= 3.3.0), rgdal

Imports diffeR, raster, ggplot2, reshape2, graphics, grDevices, stats, utils

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LazyData true

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Suggests knitr, rmarkdown

VignetteBuilder knitr

Repository CRAN

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R topics documented:

`chkfilename` *Check the filename passed as an argument to be valid*

Description

Check the filename passed as an argument to be valid

Usage

```
chkfilename(filename, expand = FALSE)
```

Arguments

`filename`	a charachter string showing an optional directory and a required filename.
`expand`	A Boolean varable. If assigns as TRUE, it will expand a path name, for example by replacing a leading tilde by the user's home directory (if defined on that platform)

Details

`reqpar` function gets a character string. Trim the string and make sure its not empty. In case the user has provided a full path, the path is checked to be existant.

Value

The output is a charachter string to save an output.

CIA *Category level intensity analysis*

Description

Category level intensity analysis

Usage

```
CIA(crosstabulation, time.points, categories)
```

Arguments

crosstabulation	List of crosstabulation tables generated by multicrosstab function.
time.points	a charachter vector showing the time point of each raster layer in chronological order.
categories	A charachter vector showing the categories in the map. Order of categories decided bases on the equivalent IDs in the raster attribute table.

Details

Gets the list of crosstabulation tables, time points and categories vectors and returns a list of gain and loss metrics accompanied with relevant bar graphs.

Value

The output is a list of lists. Elements of the list include: gross.loss, gross.gain, loss.intensity, gain.intensity, Uniform.category.intensity, loss.behavior and gain.behavior.

Examples

```
raster_2005 <- raster::raster(system.file("external/RASTER_2005.RST", package="intensity.analysis"))
raster_2010 <- raster::raster(system.file("external/RASTER_2010.RST", package="intensity.analysis"))
raster_2012 <- raster::raster(system.file("external/RASTER_2012.RST", package="intensity.analysis"))
raster.layers <- list(raster_2005, raster_2010, raster_2012)
time.points <- c("2005","2010","2012")
categories <- c("Water","Trees","Impervious")
crosstabulation <- multicrosstab(raster.layers, time.points, categories)
CIA.output <- CIA(crosstabulation, time.points, categories)
```

CIA2csv *Output the result of Category level intensity analysis as csv.*

Description

Output the result of Category level intensity analysis as csv.

Usage

```
CIA2csv(CIA.output, time.points, categories, filename)
```

Arguments

CIA.output	Output list generated by CIA function.
time.points	a charachter vector showing the time point of each raster layer in chronological order.
categories	A charachter vector showing the categories in the map. Order of categories decided bases on the equivalent IDs in the raster attribute table.
filename	A charachter variable including an optional path and a required filename to where the user wants to store the csv output. If only the name of the file is provided, it will be stored in the working directory.

Details

Gets the output of CIA function and the path variable and generate a csv report called "CategoryLevelIntensityAnalysis.csv". The output will be stored in "CSVOutput" directory in path direction.

Value

The output is a CSV file.

Examples

```
raster_2005 <- raster::raster(system.file("external/RASTER_2005.RST", package="intensity.analysis"))
raster_2010 <- raster::raster(system.file("external/RASTER_2010.RST", package="intensity.analysis"))
raster_2012 <- raster::raster(system.file("external/RASTER_2012.RST", package="intensity.analysis"))
raster.layers <- list(raster_2005, raster_2010, raster_2012)
time.points <- c("2005","2010","2012")
categories <- c("Water","Trees","Impervious")
crosstabulation <- multicrosstab(raster.layers, time.points, categories)
CIA.output <- CIA(crosstabulation, time.points, categories)
filename <- file.path(normalizePath(tempdir(), winslash = "/"), "CIA.csv")
CIA2csv(CIA.output,time.points, categories, filename)
```

IIA *Interval level intensity analysis*

Description

Interval level intensity analysis

Usage

```
IIA(crosstabulation, time.points)
```

Arguments

`crosstabulation`	List of crosstabulation tables generated by `multicrosstab` function.
`time.points`	a charachter vector showing the time point of each raster layer in chronological order.

Details

Gets the list of crosstabulation tables, time points vector and returns a list of interval level metrics accompanied with relevant bar graphs.

Value

The output is a list of lists. Elements of the list include: change amount, uniform intensity of change and Uniform change all in all intervals.

Examples

```
raster_2005 <- raster::raster(system.file("external/RASTER_2005.RST", package="intensity.analysis"))
raster_2010 <- raster::raster(system.file("external/RASTER_2010.RST", package="intensity.analysis"))
raster_2012 <- raster::raster(system.file("external/RASTER_2012.RST", package="intensity.analysis"))
raster.layers <- list(raster_2005, raster_2010, raster_2012)
time.points <- c("2005","2010","2012")
categories <- c("Water","Trees","Impervious")
crosstabulation <- multicrosstab(raster.layers, time.points, categories)
IIA.output <- IIA(crosstabulation, time.points)
```

IIA2csv *Output the result of Interval level intensity analysis as csv.*

Description

Output the result of Interval level intensity analysis as csv.

Usage

```
IIA2csv(IIA.output, time.points, filename)
```

Arguments

IIA.output	Output list generated by IIA function.
time.points	a charachter vector showing the time point of each raster layer in chronological order.
filename	A charachter variable including an optional path and a required filename to where the user wants to store the csv output. If only the name of the file is provided, it will be stored in the working directory.

Details

Gets the output of IIA function and the path variable and generate a csv report called "Interval-LevelIntensityAnalysis.csv". The output will be stored in "CSVOutput" directory in path direction.

Value

The output is a CSV file.

Examples

```
raster_2005 <- raster::raster(system.file("external/RASTER_2005.RST", package="intensity.analysis"))
raster_2010 <- raster::raster(system.file("external/RASTER_2010.RST", package="intensity.analysis"))
raster_2012 <- raster::raster(system.file("external/RASTER_2012.RST", package="intensity.analysis"))
raster.layers <- list(raster_2005, raster_2010, raster_2012)
time.points <- c("2005","2010","2012")
categories <- c("Water","Trees","Impervious")
crosstabulation <- multicrosstab(raster.layers, time.points, categories)
IIA.output <- IIA(crosstabulation, time.points)
filename <- file.path(normalizePath(tempdir(), winslash = "/"), "IIA.csv")
IIA2csv(IIA.output,time.points, filename)
```

`intensity.analysis` *Intensity Analysis on categorical maps of the same geographical extent and resolution.*

Description

This package provides the methodology to analyze maps of categorical variables from several points in time for a single site considering cross-tabulation matrices, where each matrix summarizes the change in each time interval. There are three levels of analysis namely: interval, category and transition. Each level tests for tests for size and stationary of patterns across time intervals.For more information please consult: *Aldwaik,Safaa Zakaria and Robert Gilmore Pontius Jr. (2012). "Intensity analysis to unify measurements of size and stationarity of land changes by interval, category, and transition". Landscape and Urban Planning. 106, 103-114. <doi:10.1016/j.landurbplan.2012.02.010>.*

Details

intensity.analysis.

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`multicrosstab` *Generate crosstabulation table(s)*

Description

Generate crosstabulation table(s)

Usage

```
multicrosstab(raster.layers, time.points, categories)
```

Arguments

`raster.layers`	List of raster objects.
`time.points`	a charachter vector showing the time point of each raster layer in chronological order.
`categories`	A charachter vector showing the categories in the map. Order of categories decided bases on the equivalent IDs in the raster attribute table.

Details

Read categorical raster objects, checks their dimentionality, resolution and extent are a perfect match. Then the function returns a list consist of a crosstabulation table for each consequtive pair of raster layers.

Value

The output is a list of crosstabulation table(s). The length of the list is equal to the number of intervals.

Examples

```
raster_2005 <- raster::raster(system.file("external/RASTER_2005.RST", package="intensity.analysis"))
raster_2010 <- raster::raster(system.file("external/RASTER_2010.RST", package="intensity.analysis"))
raster_2012 <- raster::raster(system.file("external/RASTER_2012.RST", package="intensity.analysis"))
raster.layers <- list(raster_2005, raster_2010, raster_2012)
time.points <- c("2005","2010","2012")
categories <- c("Water","Trees","Impervious")
crosstabulation <- multicrosstab(raster.layers, time.points, categories)
```

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reqpar *Calculate the required parameters for intensity analysis*

Description

Calculate the required parameters for intensity analysis

Usage

```
reqpar(time.points)
```

Arguments

time.points	a charachter vector showing the time point of each raster layer in chronological order.

Details

reqpar function gets the time point and return a list containing required variables used in intensity analysis.

Value

The output is a list inclusing: a one element vector showing the number of intervals, a charachter vector showing the initial times for all intervals, a charachter vector showing the subsequent times for all intervals, an integer vector showing the duration of each interval and a charachter vector showing the label of each interval.

TIA *Transition level intensity analysis*

Description

Transition level intensity analysis

Usage

```
TIA(crosstabulation, time.points, categories)
```

Arguments

crosstabulation	List of crosstabulation tables generated by multicrosstab function.
time.points	a charachter vector showing the time point of each raster layer in chronological order.
categories	A charachter vector showing the categories in the map. Order of categories decided bases on the equivalent IDs in the raster attribute table.

Details

Gets the list of crosstabulation tables, time points and categories vectors and returns a list of gain and loss metrics accompanied with relevant bar graphs.

Value

The output is a list of lists. Elements of the list include: transition intensity, uniform transition, transition behavior for gain of a category. These metrics are calculated for each interval.

Examples

```
raster_2005 <- raster::raster(system.file("external/RASTER_2005.RST", package="intensity.analysis"))
raster_2010 <- raster::raster(system.file("external/RASTER_2010.RST", package="intensity.analysis"))
raster_2012 <- raster::raster(system.file("external/RASTER_2012.RST", package="intensity.analysis"))
raster.layers <- list(raster_2005, raster_2010, raster_2012)
time.points <- c("2005","2010","2012")
categories <- c("Water","Trees","Impervious")
crosstabulation <- multicrosstab(raster.layers, time.points, categories)
TIA.output <- TIA(crosstabulation, time.points, categories)
```

TIA2csv *Output the result of transition level intensity analysis as csv.*

Description

Output the result of transition level intensity analysis as csv.

Usage

```
TIA2csv(TIA.output, time.points, categories, filename)
```

Arguments

TIA.output	Output list generated by TIA function.
time.points	a charachter vector showing the time point of each raster layer in chronological order.
categories	A charachter vector showing the categories in the map. Order of categories decided bases on the equivalent IDs in the raster attribute table.
filename	A charachter variable including an optional path and a required filename to where the user wants to store the csv output. If only the name of the file is provided, it will be stored in the working directory.

Details

Gets the output of TIA function and the path variable and generate a csv report called "TransitionLevelIntensityAnalysis.csv". The output will be stored in "CSVOutput" directory in the path direction.

Value

The output is a CSV file.

Examples

```
raster_2005 <- raster::raster(system.file("external/RASTER_2005.RST", package="intensity.analysis"))
raster_2010 <- raster::raster(system.file("external/RASTER_2010.RST", package="intensity.analysis"))
raster_2012 <- raster::raster(system.file("external/RASTER_2012.RST", package="intensity.analysis"))
raster.layers <- list(raster_2005, raster_2010, raster_2012)
time.points <- c("2005","2010","2012")
categories <- c("Water","Trees","Impervious")
crosstabulation <- multicrosstab(raster.layers, time.points, categories)
TIA.output <- TIA(crosstabulation, time.points, categories)
filename <- file.path(normalizePath(tempdir(), winslash = "/"), "TIA.csv")
TIA2csv(TIA.output,time.points,categories, filename)
```

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