Package ‘OpenRepGrid’

May 16, 2023

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Type  Package
LazyLoad yes
Description  Analyze repertory grids, a qualitative-quantitative data collection technique devised by George A. Kelly in the 1950s. Today, grids are used across various domains ranging from clinical psychology to marketing. The package contains functions to quantitatively analyze and visualize repertory grid data.
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'perturbate.R' 'repgrid.r' 'repgrid-basicsops.r'
'repgrid-constructs.r' 'repgrid-elements.r' 'repgrid-output.r'
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Description

Simple concatenation of repgrid objects or list containing repgrid objects using the '+' operator.

Usage

```r
## S4 method for signature 'repgrid,repgrid'
e1 + e2

## S4 method for signature 'list,repgrid'
e1 + e2

## S4 method for signature 'repgrid,list'
e1 + e2
```

Arguments

`e1`, `e2` A repgrid object.

Details

Methods for "+" function.

Examples

```r
x <- bell2010
x + x
x + list(x,x)
list(x,x) + x
```
addAvgElement

Description

A new element is added to the grid. The scores are the arithmetic means across all selected elements.

Usage

addAvgElement(x, name = "avg", i, digits = Inf)

Arguments

- **x**: A repgrid object.
- **name**: Name of new element.
- **i**: Indexes of elements to be averaged across. Negative indexes can be used to exclude elements from the complete set. Duplicate indexes are allowed but a warning is issued.
- **digits**: Digits to round mean value to. By default no rounding is used (digits = Inf). Use digits = 0 to round to nearest integer, i.e. only using original integer rating scores.

Value

A repgrid object with additional new element.

Examples

addAvgElement(feixas2004, "others", i = 2:12)
addAvgElement(feixas2004, "others", i = 2:12, digits = 0) # integers

# excluding elements via negative indexes
addAvgElement(feixas2004, "others", i = c(-1,-13))

addConstruct

Add a new construct to an existing grid object.

Description

Add a new construct to an existing grid object.
addConstruct

Usage

addConstruct(
  x,
  l.name = NA,
  r.name = NA,
  scores = NA,
  l.preferred = NA,
  r.preferred = NA,
  l.emerged = NA,
  r.emerged = NA,
  position = NA,
  side = "pre"
)

Arguments

x repgrid object.

l.name Name of the left pole (character string).

r.name Name of the right pole (character string).

scores Numerical ratings for the new construct row (length must match number of elements in the grid).

l.preferred Is the left one the preferred pole? (logical).

r.preferred Is the right one the preferred pole? (logical).

l.emerged Is the left one the emergent pole? (logical).

r.emerged Is the right one the emergent pole? (logical).

position An integer at which row the construct will be added. TODO. Does not work properly.

side Not yet in use.

Value

repgrid object.

See Also

addElement

Examples

## Not run:

# show grid
bell2010
addConstruct(bell2010, "left pole", "pole right", c(3,1,3,2,5,4,6,3,7,1))

## End(Not run)
addElement  

Add an element to an existing grid.

Description

Add an element to an existing grid.

Usage

code
addElement(
  x,
  name = NA,
  scores = NA,
  abbreviation = NA,
  status = NA,
  position = NA,
  side = "pre"
)

description
Arguments

x  repgrid object.
name  Name of the new element (character string).
scores  Numerical ratings for the new element column (length must match number of constructs in the grid).
abbreviation  Abbreviation for element name.
status  Element status (not yet in use).
position  An integer at which column the element will be added. TODO: Does not work properly yet.
side  Not yet in use.

Value

repgrid object

See Also

addElement

Examples

## Not run:

bell2010
addElement(bell2010, "new element", c(1,2,5,4,3,6,5,2,7))
alignByIdeal

Align constructs using the ideal element to gain pole preferences.

Description

The direction of the constructs in a grid is arbitrary and a reflection of a scale does not affect the information contained in the grid. Nonetheless, the direction of a scale has an effect on inter-element correlations (Mackay, 1992) and on the spatial representation and clustering of the grid (Bell, 2010). Hence, it is desirable to follow a protocol to align constructs that will render unique results. A common approach is to align constructs by pole preference, i.e. aligning all positive and negative poles. This can e.g. be achieved using swapPoles. If an ideal element is present, this element can be used to identify the positive and negative pole. The function alignByIdeal will align the constructs accordingly. Note that this approach does not always yield definite results as sometimes ratings do not show a clear preference for one pole (Winter, Bell & Watson, 2010). If a preference cannot be determined definitely, the construct direction remains unchanged (a warning is issued in that case).

Usage

alignByIdeal(x, ideal, high = TRUE)

Arguments

- `x` repgrid object
- `ideal` Number of the element that is used for alignment (the ideal).
- `high` Logical. Whether to align the constructs so the ideal will have high ratings on the constructs (i.e. TRUE, default) or low ratings (FALSE). High scores will lead to the preference pole on the right side, low scores will align the preference pole on the left side.

Value

repgrid object with aligned constructs.

References

alignByLoadings

See Also

alignByLoadings

Examples

## Not run:

```
# original grid
feixas2004
alignByIdeal(feixas2004, 13) # aligned with preference pole on the right

# original grid
raeithel
alignByIdeal(raeithel, 3, high=FALSE) # aligned with preference pole on the left
```

## End(Not run)

alignByLoadings

Align constructs by loadings on first principal component.

Description

In case a construct loads negatively on the first principal component, the function `alignByLoadings` will reverse it so that all constructs have positive loadings on the first principal component (see details section for more).

Usage

```
alignByLoadings(x, trim = 20, index = TRUE)
```

Arguments

- `x`: repgrid object.
- `trim`: The number of characters a construct is trimmed to (default is 10). If NA no trimming is done. Trimming simply saves space when displaying the output.
- `index`: Whether to print the number of the construct (e.g. for correlation matrices). The default is TRUE.

Details

The direction of the constructs in a grid is arbitrary and a reflection of a scale does not affect the information contained in the grid. Nonetheless, the direction of a scale has an effect on inter-element correlations (Mackay, 1992) and on the spatial representation and clustering of the grid (Bell, 2010). Hence, it is desirable to follow a protocol to align constructs that will render unique results. A common approach is to align constructs by pole preference, but this information is not always accessible. Bell (2010) proposed another solution for the problem of construct alignment. As a unique protocol he suggests to align constructs in a way so they all have positive loadings on the first component of a grid PCA.
Value

An object of class `alignByLoadings` containing a list of calculations with the following entries:

- `cor.before` Construct correlation matrix before reversal
- `loadings.before` Loadings on PCs before reversal
- `reversed` Constructs that have been reversed
- `cor.after` Construct correlation matrix after reversal
- `loadings.after` Loadings on PCs after reversal

Note

Bell (2010) proposed a solution for the problem of construct alignment. As construct reversal has an effect on element correlation and thus on any measure that based on element correlation (Mackay, 1992), it is desirable to have a standard method for construct alignment independently from its semantics (preferred pole etc.). Bell (2010) proposes to align constructs in a way so they all have positive loadings on the first component of a grid PCA.

References


See Also

`alignByIdeal`

Examples

```r
# reproduction of the example in the Bell (2010)
# constructs aligned by loadings on PC 1
bell2010
alignByLoadings(bell2010)

# save results
a <- alignByLoadings(bell2010)

# modify printing of results
print(a, digits=5)

# access results for further processing
names(a)
a$cor.before
a$loadings.before
a$reversed
a$cor.after
a$loadings.after
```
bertin

Make Bertin display of grid data.

Description

One of the most popular ways of displaying grid data has been adopted from Bertin's (1974) graphical proposals, which have had an immense influence onto data visualization. One of the most appealing ideas presented by Bertin is the concept of the reorderable matrix. It is comprised of graphical displays for each cell, allowing to identify structures by eye-ball ing reordered versions of the data matrix (see Bertin, 1974). In the context of repertory grids, the display is made up of a simple colored rectangle where the color denotes the corresponding score. Bright values correspond to low, dark to high scores. For an example of how to analyze a Bertin display see e.g. Dick (2000) and Raeithel (1998).

Usage

bertin(
  x,
  colors = c("white", "black"),
  showvalues = TRUE,
  xlim = c(0.2, 0.8),
  ylim = c(0, 0.6),
  margins = c(0, 1, 1),
  cex.elements = 0.7,
  cex.constructs = 0.7,
  cex.text = 0.6,
  col.text = NA,
  border = "white",
  lheight = 0.75,
  id = c(T, T),
  cc = 0,
  cr = 0,
  cc.old = 0,
  cr.old = 0,
  col.mark.fill = "#FCF5A4",
  print = TRUE,
  ...
)

Arguments

x                    repgrid object.
colors               Vector. Two or more colors defining the color ramp for the bertin (default c("white", "black")).
showvalues           Logical. Whether scores are shown in bertin
xlim                 Vector. Left and right limits inner bertin (default c(.2, .8)).
ylim Vector. Lower and upper limits of inner bertin default(c(.0, .6)).
margins Vector of length three (default margins=c(0,1,1)). 1st element denotes the
left, 2nd the upper and 3rd the right margin in npc coordinates (i.e. 0 to zero).

cex.elements Numeric. Text size of element labels (default .7).
cex.constructs Numeric. Text size of construct labels (default .7).
cex.text Numeric. Text size of scores in bertin cells (default .7).
col.text Color of scores in bertin (default NA). By default the color of the text is chosen
according to the background color. If the background ist bright the text will be
black and vice versa. When a color is specified the color is set independent of
background.

border Border color of the bertin cells (default white).
lheight Line height for constructs.
id Logical. Whether to print id number for constructs and elements respectively
(default c(T,T)).
cc Numeric. Current column to mark.
cr Numeric. Current row to mark.
cc.old Numeric. Column to unmark.
cr.old Numeric. Row to unmark.
col.mark.fill Color of marked row or column (default "#FCF5A4").
print Print whole bertin. If FALSE only current and old row and column are printed.
... Optional arguments to be passed on to bertinBase.

Value
NULL just for the side effects, i.e. printing.

References

Gruyter.

Qualitative Sozialforschung / Forum: Qualitative Social Research, 1(2).

am Beispiel des Repertory Grid. Selbstorganisation, Kooperation, Zeichenprozess: Arbeiten zu
einer kulturwissenschaftlichen, anwendungsbezogenen Psychologie (pp. 209-254). Opladen: West-
deutscher Verlag.

Examples

## Not run:

bertin(feixas2004)
bertin(feixas2004, c("white", "darkblue"))
bertin(feixas2004, showvalues=F)
bertinCluster

Bertin display with corresponding cluster analysis.

Description

Element columns and constructs rows are ordered according to cluster criterion. Various distance measures as well as cluster methods are supported.

Usage

bertinCluster(
  x,
  dmethod = c("euclidean", "euclidean"),
  cmethod = c("ward", "ward"),
  p = c(2, 2),
  align = TRUE,
  trim = NA,
  type = c("triangle"),
  xsegs = c(0, 0.2, 0.7, 0.9, 1),
  ysegs = c(0, 0.1, 0.7, 1),
  x.off = 0.01,
  y.off = 0.01,
  cex.axis = 0.6,
  col.axis = grey(0.4),
  draw.axis = TRUE,
  ...
)

Arguments

x repgrid object.

dmethod The distance measure to be used. This must be one of "euclidean", "maximum", "manhattan", "canberra", "binary", or "minkowski". Default is "euclidean". Any unambiguous substring can be given (e.g. "euc" for "euclidean"). A vector of length two can be passed if a different distance measure for constructs and elements is wanted (e.g. c("euclidean", "manhattan")). This will apply euclidean distance to the constructs and manhattan distance to the elements. For additional information on the different types see ?dist.
The agglomeration method to be used. This should be (an unambiguous abbreviation of) one of "ward", "single", "complete", "average", "mcquitty", "median" or "centroid". Default is "ward". A vector of length two can be passed if a different cluster method for constructs and elements is wanted (e.g. c("ward", "euclidean")). This will apply ward clustering to the constructs and single linkage clustering to the elements. If only one of either constructs or elements is to be clustered the value NA can be supplied. E.g. to cluster elements only use c(NA, "ward").

The power of the Minkowski distance, in case "minkowski" is used as argument for dmethod. p can be a vector of length two if different powers are wanted for constructs and elements respectively (e.g. c(2,1)).

Whether the constructs should be aligned before clustering (default is TRUE). If not, the grid matrix is clustered as is. See Details section in function cluster for more information.

The number of characters a construct is trimmed to (default is 10). If NA no trimming is done. Trimming simply saves space when displaying the output.

Type of dendrogram. Either or "triangle" (default) or "rectangle" form.

Numeric vector of normal device coordinates (ndc i.e. 0 to 1) to mark the widths of the regions for the left labels, for the bertin display, for the right labels and for the vertical dendrogram (i.e. for the constructs).

Numeric vector of normal device coordinates (ndc i.e. 0 to 1) to mark the heights of the regions for the horizontal dendrogram (i.e. for the elements), for the bertin display and for the element names.

Horizontal offset between construct labels and construct dendrogram and (default is 0.01 in normal device coordinates).

Vertical offset between bertin display and element dendrogram and (default is 0.01 in normal device coordinates).

cex for axis labels, default is .6.

Color for axis and axis labels, default is grey(.4).

Whether to draw axis showing the distance metric for the dendrograms (default is TRUE).

additional parameters to be passed to function bertin.

A list of two hclust object, for elements and constructs respectively.

See Also

cluster

Examples

## Not run:

# default is euclidean distance and ward clustering
### applying different distance measures and cluster methods

# euclidean distance and single linkage clustering
bertinCluster(bell2010, cm="single")

# manhattan distance and single linkage clustering
bertinCluster(bell2010, dm="manhattan", cm="single")

# minkowksi distance with power of 2 = euclidean distance
bertinCluster(bell2010, dm="mink", p=2)

### using different methods for constructs and elements

# ward clustering for constructs, single linkage for elements
bertinCluster(bell2010, cm=c("ward", "single"))

# euclidean distance measure for constructs, manhattan
# distance for elements
bertinCluster(bell2010, dm=c("euclidean", "man"))

# minkowski metric with different powers for constructs and elements
bertinCluster(bell2010, dm="mink", p=c(2,1))

### clustering either constructs or elements only
# euclidean distance and ward clustering for constructs no
# clustering for elements
bertinCluster(bell2010, cm=c("ward", NA))

# euclidean distance and single linkage clustering for elements
# no clustering for constructs
bertinCluster(bell2010, cm=c(NA, "single"))

### changing the appearance
# different dendrogram type
bertinCluster(bell2010, type="rectangle")

# no axis drawn for dendrogram
bertinCluster(bell2010, draw.axis=F)

### passing on arguments to bertin function via ...
# grey cell borders in bertin display
bertinCluster(bell2010, border="grey")

# omit printing of grid scores, i.e. colors only
bertinCluster(bell2010, showvalues=FALSE)

### changing the layout
# making the vertical dendrogram bigger
bertinCluster(bell2010, xsegs=c(0, .2, .5, .7, 1))

# making the horizontal dendrogram bigger
bertinCluster(bell2010, ysegs=c(0, .3, .8, 1))

## End(Not run)
**bindConstructs**

**Description**

I.e. the constructs are combined to form one long grid. The grids must have the same set of elements and an identical scale range. The order of the elements may differ.

**Usage**

```
bindConstructs(..., index = FALSE)
```

**Arguments**

- `...` One or more repgrid objects or a list containing repgrid object.
- `index` TODO. Logical (default TRUE). Whether to add an index at the end of each construct name so it remains clear from which grid each construct came.

**Details**

This function can be used in order to analyze multiple grids as one 'big grid' (eg. Slater, 1977, chap. 11).

**Value**

repgrid object with concatenated constructs.

**References**


**Examples**

```
a <- randomGrid()
b <- randomGrid()
b@elements <- rev(a@elements)  # reverse elements
bindConstructs(a, b)
bindConstructs(a, b, a)

# using lists of repgrid objects
bindConstructs(a, list(a, b))
```
biplot2d  

Draw a two-dimensional biplot.

Description

The biplot is the central way to create a joint plot of elements and constructs. Depending on the parameters chosen it contains information on the distances between elements and constructs. Also the relative values the elements have on a construct can be read off by projection the element onto the construct vector. A lot of parameters can be changed rendering different types of biplots (ESA, Slater’s) and different looks (colors, text size). See the example section below to get started.

Usage

biplot2d(
  x,
  dim = c(1, 2),
  map.dim = 3,
  center = 1,
  normalize = 0,
  g = 0,
  h = 1 - g,
  col.active = NA,
  col.passive = NA,
  e.point.col = "black",
  e.point.cex = 0.9,
  e.label.col = "black",
  e.label.cex = 0.7,
  e.color.map = c(0.4, 1),
  c.point.col = "black",
  c.point.cex = 0,
  c.label.col = "black",
  c.label.cex = 0.7,
  c.color.map = c(0.4, 1),
  c.points.devangle = 91,
  c.labels.devangle = 91,
  c.points.show = TRUE,
  c.labels.show = TRUE,
  e.points.show = TRUE,
  e.labels.show = TRUE,
  inner.positioning = TRUE,
  outer.positioning = TRUE,
  c.labels.inside = FALSE,
  c.lines = TRUE,
  col.c.lines = grey(0.9),
  flipaxes = c(FALSE, FALSE),
  strokes.x = 0.1,
  strokes.y = 0.1,
offsetting = TRUE,
offset.labels = 0,
offset.e = 1,
axis.ext = 0.1,
mai = c(0.2, 1.5, 0.2, 1.5),
rect.margins = c(0.01, 0.01),
srt = 45,
cex.pos = 0.7,
xpd = TRUE,
unity = FALSE,
unity3d = FALSE,
scale.e = 0.9,
zoom = 1,
var.show = TRUE,
var.cex = 0.7,
var.col = grey(0.1),
...
)

Arguments

x repgrid object.
dim Dimensions (i.e. principal components) to be used for biplot (default is c(1,2)).
map.dim Third dimension (depth) used to map aesthetic attributes to (default is 3).
center Numeric. The type of centering to be performed. 0= no centering, 1= row mean centering (construct), 2= column mean centering (elements), 3= double-centering (construct and element means), 4= midpoint centering of rows (constructs). The default is 1 (row centering).
normalize A numeric value indicating along what direction (rows, columns) to normalize by standard deviations. 0 = none, 1 = rows, 2 = columns (default is 0).
g Power of the singular value matrix assigned to the left singular vectors, i.e. the constructs.
h Power of the singular value matrix assigned to the right singular vectors, i.e. the elements.
col.active Columns (elements) that are no supplementary points, i.e. they are used in the SVD to find principal components. default is to use all elements.
col.passive Columns (elements) that are supplementary points, i.e. they are NOT used in the SVD but projected into the component space afterwards. They do not determine the solution. Default is NA, i.e. no elements are set supplementary.
e.point.col Color of the element symbols. The default is "black". Two values can be entered that will create a color ramp. The values of map.dim are mapped onto the ramp. If only one color color value is supplied (e.g. "black") no mapping occurs and all elements will have the same color irrespective of their value on the map.dim dimension.
e.point.cex Size of the element symbols. The default is .9. Two values can be entered that will create a size ramp. The values of map.dim are mapped onto the ramp.
If only one color size value is supplied (e.g. .8) no mapping occurs and all elements will have the same size irrespective of their value on the map.dim dimension.

e.label.col  Color of the element label. The default is "black". Two values can be entered that will create a color ramp. The values of map.dim are mapped onto the ramp. If only one color color value is supplied (e.g. "black") no mapping occurs and all labels will have the same color irrespective of their value on the map.dim dimension.

e.label.cex  Size of the element labels. The default is .7. Two values can be entered that will create a size ramp. The values of map.dim are mapped onto the ramp. If only one color size value is supplied (e.g. .7) no mapping occurs and all labels will have the same size irrespective of their value on the map.dim dimension.

e.color.map  Value range to determine what range of the color ramp defined in e.color will be used for mapping the colors. Default is c(.4, ,1). Usually not important for the user.

c.point.col  Color of the construct symbols. The default is "black". Two values can be entered that will create a color ramp. The values of map.dim are mapped onto the ramp. If only one color color value is supplied (e.g. "black") no mapping occurs and all constructs will have the same color irrespective of their value on the map.dim dimension.

c.point.cex  Size of the construct symbols. The default is .8. Two values can be entered that will create a size ramp. The values of map.dim are mapped onto the ramp. If only one color size value is supplied (e.g. .8) no mapping occurs and all constructs will have the same size irrespective of their value on the map.dim dimension.

c.label.col  Color of the construct label. The default is "black". Two values can be entered that will create a color ramp. The values of map.dim are mapped onto the ramp. If only one color color value is supplied (e.g. "black") no mapping occurs and all labels will have the same color irrespective of their value on the map.dim dimension.

c.label.cex  Size of the construct labels. The default is .7. Two values can be entered that will create a size ramp. The values of map.dim are mapped onto the ramp. If only one color size value is supplied (e.g. .7) no mapping occurs and all labels will have the same size irrespective of their value on the map.dim dimension.

c.color.map  Value range to determine what range of the color ramp defined in c.color will be used for mapping. Default is c(.4, ,1). Usually not important for the user.

c.points.devangle  The deviation angle from the x-y plane in degrees. These can only be calculated if a third dimension map.dim is specified. Only the constructs that do not depart more than the specified degrees from the x-y plane will be printed. This facilitates the visual interpretation, as only vectors represented near the current plane are shown. Set the value to 91 (default) to show all vectors.

c.labels.devangle  The deviation angle from the x-y plane in degrees. These can only be calculated if a third dimension map.dim is specified. Only the labels of constructs that do not depart more than the specified degrees from the x-y plane will be printed. Set the value to 91 (default) to show all construct labels.
c.points.show  Whether the constructs are printed (default is TRUE). FALSE will suppress the printing of the constructs. To only print certain constructs a numeric vector can be provided (e.g. c(1:10)).

c.labels.show  Whether the construct labels are printed (default is TRUE). FALSE will suppress the printing of the labels. To only print certain construct labels a numeric vector can be provided (e.g. c(1:10)).

e.points.show  Whether the elements are printed (default is TRUE). FALSE will suppress the printing of the elements. To only print certain elements a numeric vector can be provided (e.g. c(1:10)).

e.labels.show  Whether the element labels are printed (default is TRUE). FALSE will suppress the printing of the labels. To only print certain element labels a numeric vector can be provided (e.g. c(1:10)).

inner.positioning  Logical. Whether to calculate positions to minimize overplotting of elements and construct labels (default is TRUE). Note that the positioning may slow down the plotting.

outer.positioning  Logical. Whether to calculate positions to minimize overplotting of construct labels on the outer borders (default is TRUE). Note that the positioning may slow down the plotting.

c.labels.inside  Logical. Whether to print construct labels next to the points. Can be useful during inspection of the plot (default FALSE).

c.lines  Logical. Whether construct lines from the center of the biplot to the surrounding box are drawn (default is FALSE).

col.c.lines  The color of the construct lines from the center to the borders of the plot (default is gray(.9)).

flipaxes  Logical vector of length two. Whether x and y axes are reversed (default is c(F,F)).

strokes.x  Length of outer strokes in x direction in NDC.

strokes.y  Length of outer strokes in y direction in NDC.

offsetting  Do offsetting? (TODO)

offset.labels  Offsetting parameter for labels (TODO).

offset.e  Offsetting parameter for elements (TODO).

axis.ext  Axis extension factor (default is .1). A bigger value will zoom out the plot.

mai  Margins available for plotting the labels in inch (default is c(.2, 1.5, .2, 1.5)).

rect.margins  Vector of length two (default is c(.07, .07)). Two values specifying the additional horizontal and vertical margin around each label.

srt  Angle to rotate construct label text. Only used in case offsetting=FALSE.

cex.pos  Cex parameter used during positioning of labels if prompted. Does usually not have to be changed by user.
biplot2d

- xpd: Logical (default is TRUE). Whether to extend text labels over figure region. Usually not needed by the user.
- unity: Scale elements and constructs coordinates to unit scale in 2D (maximum of 1) so they are printed more neatly (default TRUE).
- unity3d: Scale elements and constructs coordinates to unit scale in 3D (maximum of 1) so they are printed more neatly (default TRUE).
- scale.e: Scaling factor for element vectors. Will cause element points to move a bit more to the center. (but only if unity or unity3d is TRUE). This argument is for visual appeal only.
- zoom: Scaling factor for all vectors. Can be used to zoom the plot in and out (default 1).
- var.show: Show explained sum-of-squares in biplot? (default TRUE).
- var.cex: The cex value for the percentages shown in the plot.
- var.col: The color value of the percentages shown in the plot.
- ...: parameters passed on to come.

Details

For the construction of a biplot the grid matrix is first centered and normalized according to the prompted options.

Next, the matrix is decomposed by singular value decomposition (SVD) into

\[ X = UDV^T \]

The biplot is made up of two matrices

\[ X = GH^T \]

These matrices are construed on the basis of the SVD results.

\[ \hat{X} = UD^gD^hV^T \]

Note that the grid matrix values are only recovered and the projection property is only given if \( g + h = 1 \)

See Also

- Unsophisticated biplot: biplotSimple;
- 2D biplots: biplot2d, biplotEsa2d, biplotSlater2d;
- Pseudo 3D biplots: biplotPseudo3d, biplotEsaPseudo3d, biplotSlaterPseudo3d;
- Interactive 3D biplots: biplot3d, biplotEsa3d, biplotSlater3d;
- Function to set view in 3D: home.

Examples

```r
# Not run:
biplot2d(boeker) # biplot of boeker data
biplot2d(boeker, c.lines=T) # add construct lines
biplot2d(boeker, center=2) # with column centering
```
### biplot3d

**Draw grid in rgl (3D device).**

#### Description

The 3D biplot opens an interactive 3D device that can be rotated and zoomed using the mouse. A 3D device facilitates the exploration of grid data as significant proportions of the sum-of-squares are often represented beyond the first two dimensions. Also, in a lot of cases it may be of interest to explore the grid space from a certain angle, e.g. to gain an optimal view onto the set of elements under investigation (e.g. Raeithel, 1998).
biplot3d

Usage

biplot3d(
  x,
  dim = 1:3,
  labels.e = TRUE,
  labels.c = TRUE,
  lines.c = TRUE,
  lef = 1.3,
  center = 1,
  normalize = 0,
  g = 0,
  h = 1,
  col.active = NA,
  col.passive = NA,
  c.sphere.col = grey(0.4),
  c.cex = 0.6,
  c.text.col = grey(0.4),
  e.sphere.col = grey(0),
  e.cex = 0.6,
  e.text.col = grey(0),
  alpha.sphere = 0.05,
  col.sphere = "black",
  unity = FALSE,
  unity3d = FALSE,
  scale.e = 0.9,
  zoom = 1,
  ...
)

Arguments

x repgrid object.
dim Dimensions to display.
labels.e Logical. whether element labels are displayed.
labels.c Logical. whether construct labels are displayed.
lines.c Numeric. The way lines are drawn through the construct vectors. 0 = no lines, 1 = lines from constructs to outer frame, 2 = lines from the center to outer frame.
lef Construct lines extension factor
center Numeric. The type of centering to be performed. 0 = no centering, 1 = row mean centering (construct), 2 = column mean centering (elements), 3 = double-centering (construct and element means), 4 = midpoint centering of rows (constructs). Default is 1 (row centering).
normalize A numeric value indicating along what direction (rows, columns) to normalize by standard deviations. 0 = none, 1 = rows, 2 = columns (default is 0).
g Power of the singular value matrix assigned to the left singular vectors, i.e. the constructs.
biplot3d

h

Power of the singular value matrix assigned to the right singular vectors, i.e. the elements.

col.active

Columns (elements) that are no supplementary points, i.e. they are used in the SVD to find principal components. default is to use all elements.

col.passive

Columns (elements) that are supplementary points, i.e. they are NOT used in the SVD but projected into the component space afterwards. They do not determine the solution. Default is NA, i.e. no elements are set supplementary.

c.sphere.col

Color of construct spheres.

c.cex

Size of construct text.

c.text.col

Color for construct text.

e.sphere.col

Color of elements.

e.cex

Size of element labels.

e.text.col

Color of element labels.

alpha.sphere

Numeric. alpha blending of the surrounding sphere (default ".05").

col.sphere

Color of surrounding sphere (default "black").

unity

Scale elements and constructs coordinates to unit scale (maximum of 1) so they are printed more neatly (default TRUE).

unity3d

To come.

scale.e

Scaling factor for element vectors. Will cause element points to move a bit more to the center (but only if unity or unity3d is TRUE). This argument is for visual appeal only.

zoom

Not yet used. Scaling factor for all vectors. Can be used to zoom the plot in and out (default 1).

...

Parameters to be passed on.

References


See Also

Unsophisticated biplot: biplotSimple;
2D biplots: biplot2d, biplotEsa2d, biplotSlater2d;
Pseudo 3D biplots: biplotPseudo3d, biplotEsaPseudo3d, biplotSlaterPseudo3d;
Interactive 3D biplots: biplot3d, biplotEsa3d, biplotSlater3d;
Function to set view in 3D: home.
Examples

```r
## Not run:
biplot3d(boeker)
biplot3d(boeker, unity3d=T)

biplot3d(boeker, e.sphere.col="red", c.text.col="blue")
biplot3d(boeker, e.cex=1)
biplot3d(boeker, col.sphere="red")

biplot3d(boeker, g=1, h=1)  # INGRID biplot
biplot3d(boeker, g=1, h=1, center=4)  # ESA biplot

## End(Not run)
```

biplotEsa2d

Plot an eigenstructure analysis (ESA) biplot in 2D.

Description

The ESA is a special type of biplot suggested by Raeithel (e.g. 1998). It uses midpoint centering as a default. Note that the eigenstructure analysis is just a special case of a biplot that can also be produced using the `biplot2d` function with the arguments `center=4, g=1, h=1`. Here, only the arguments that are modified for the ESA biplot are described. To see all the parameters that can be changed see `biplot2d`.

Usage

```r
biplotEsa2d(x, center = 4, g = 1, h = 1, ...)
```

Arguments

- `x` repgrid object.
- `center` Numeric. The type of centering to be performed. 0= no centering, 1= row mean centering (construct), 2= column mean centering (elements), 3= double-centering (construct and element means), 4= midpoint centering of rows (constructs). Eigenstructure analysis uses midpoint centering (4).
- `g` Power of the singular value matrix assigned to the left singular vectors, i.e. the constructs. Eigenstructure analysis uses g=1.
- `h` Power of the singular value matrix assigned to the right singular vectors, i.e. the elements. Eigenstructure analysis uses h=1.
- `...` Additional parameters for be passed to `biplot2d`.
References

See Also
Unsophisticated biplot: biplotSimple;
2D biplots: biplot2d, biplotEsa2d, biplotSlater2d;
Pseudo 3D biplots: biplotPseudo3d, biplotEsaPseudo3d, biplotSlaterPseudo3d;
Interactive 3D biplots: biplot3d, biplotEsa3d, biplotSlater3d;
Function to set view in 3D: home.

Examples
## Not run:
# See examples in \code{\link{biplot2d}} as the same arguments
# can used for this function.
## End(Not run)

biplotEsa3d

Draw the eigenstructure analysis (ESA) biplot in rgl (3D device).

Description
The 3D biplot opens an interactive 3D device that can be rotated and zoomed using the mouse. A 3D device facilitates the exploration of grid data as significant proportions of the sum-of-squares are often represented beyond the first two dimensions. Also, in a lot of cases it may be of interest to explore the grid space from a certain angle, e.g. to gain an optimal view onto the set of elements under investigation (e.g. Raeithel, 1998). Note that the eigenstructure analysis just a special case of a biplot that can also be produced using the biplot3d function with the arguments center=4, g=1, h=1.

Usage
biplotEsa3d(x, center = 1, g = 1, h = 1, ...)

Arguments
x repgrid object.
center Numeric. The type of centering to be performed. 0= no centering, 1= row mean centering (construct), 2= column mean centering (elements), 3= double-centering (construct and element means), 4= midpoint centering of rows (constructs). Default is 4 (scale midpoint centering).
biplotEsaPseudo3d

\[ g \]

Power of the singular value matrix assigned to the left singular vectors, i.e. the constructs.

\[ h \]

Power of the singular value matrix assigned to the right singular vectors, i.e. the elements.

... Additional arguments to be passed to `biplot3d`.

See Also

- Unsophisticated biplot: `biplotSimple`
- 2D biplots: `biplot2d`, `biplotEsa2d`, `biplotSlater2d`
- Pseudo 3D biplots: `biplotPseudo3d`, `biplotEsaPseudo3d`, `biplotSlaterPseudo3d`
- Interactive 3D biplots: `biplot3d`, `biplotEsa3d`, `biplotSlater3d`
- Function to set view in 3D: `home`.

Examples

```r
## Not run:
biplotEsa3d(boeker)
biplotEsa3d(boeker, unity3d=T)

biplotEsa3d(boeker, e.sphere.col="red",
           c.text.col="blue")
biplotEsa3d(boeker, e.cex=1)
biplotEsa3d(boeker, col.sphere="red")
```

## End(Not run)

---

**biplotEsaPseudo3d**  
*Plot an eigenstructure analysis (ESA) in 2D grid with 3D impression (pseudo 3D).*

Description

The ESA is a special type of biplot suggested by Raeithel (e.g. 1998). It uses midpoint centering as a default. Note that the eigenstructure analysis is just a special case of a biplot that can also be produced using the `biplot2d` function with the arguments `center=4`, `g=1`, `h=1`. Here, only the arguments that are modified for the ESA biplot are described. To see all the parameters that can be changed see `biplot2d` and `biplotPseudo3d`.

Usage

```r
biplotEsaPseudo3d(x, center = 4, g = 1, h = 1, ...)
```
Arguments

- **x**: repgrid object.
- **center**: Numeric. The type of centering to be performed. 0 = no centering, 1 = row mean centering (construct), 2 = column mean centering (elements), 3 = double-centering (construct and element means), 4 = midpoint centering of rows (constructs). Eigenstructure analysis uses midpoint centering (4).
- **g**: Power of the singular value matrix assigned to the left singular vectors, i.e. the constructs. Eigenstructure analysis uses \( g = 1 \).
- **h**: Power of the singular value matrix assigned to the right singular vectors, i.e. the elements. Eigenstructure analysis uses \( h = 1 \).
- ... Additional parameters for be passed to `biplotPseudo3d`.

See Also

- Unsophisticated biplot: `biplotSimple`
- 2D biplots: `biplot2d`, `biplotEsa2d`, `biplotSlater2d`
- Pseudo 3D biplots: `biplotPseudo3d`, `biplotEsaPseudo3d`, `biplotSlaterPseudo3d`
- Interactive 3D biplots: `biplot3d`, `biplotEsa3d`, `biplotSlater3d`
- Function to set view in 3D: `home`.

Examples

```r
## Not run:
# See examples in \code{\link{biplotPseudo3d}} as the same arguments
# can used for this function.
## End(Not run)
```

`biplotPseudo3d` **See `biplotPseudo3d` for its use.** Draws a biplot of the grid in 2D with depth impression (pseudo 3D).

Description

This version is basically a 2D biplot. It only modifies color and size of the symbols in order to create a 3D impression of the data points. This function will call the standard `biplot2d` function with some modified arguments. For the whole set of arguments that can be used see `biplot2d`. Here only the arguments special to `biplotPseudo3d` are outlined.

Usage

```r
biplotPseudo3d(
  x,
  dim = 1:2,
  map.dim = 3,
  ...
)
```
e.point.col = c("white", "black"),
e.point.cex = c(0.6, 1.2),
e.label.col = c("white", "black"),
e.label.cex = c(0.6, 0.8),
e.color.map = c(0.4, 1),
c.point.col = c("white", "darkred"),
c.point.cex = c(0.6, 1.2),
c.label.col = c("white", "darkred"),
c.label.cex = c(0.6, 0.8),
c.color.map = c(0.4, 1),
...
)

Arguments
x repgrid object.
dim Dimensions (i.e. principal components) to be used for biplot (default is c(1,2)).
map.dim Third dimension (depth) used to map aesthetic attributes to (default is 3).
e.point.col Color(s) of the element symbols. Two values can be entered that will create a color ramp. The values of map.dim are mapped onto the ramp. The default is c("white", "black"). If only one color color value is supplied (e.g. "black") no mapping occurs and all elements will have the same color irrespective of their value on the map.dim dimension.
e.point.cex Size of the element symbols. Two values can be entered that will represents the lower and upper size of a range of cex the values of map.dim are mapped onto. The default is c(.6, 1.2). If only one cex value is supplied (e.g. .7) no mapping occurs and all elements will have the same size irrespective of their value on the map.dim dimension.
e.label.col Color(s) of the element labels. Two values can be entered that will create a color ramp. The values of map.dim are mapped onto the ramp. The default is c("white", "black"). If only one color color value is supplied (e.g. "black") no mapping occurs and all element labels will have the same color irrespective of their value on the map.dim dimension.
e.label.cex Size of the element labels. Two values can be entered that will represents the lower and upper size of a range of cex the values of map.dim are mapped onto. The default is c(.6, .8). If only one cex value is supplied (e.g. .7) no mapping occurs and all element labels will have the same size irrespective of their value on the map.dim dimension.
e.color.map Value range to determine what range of the color ramp defined in e.color will be used for mapping the colors. Default is c(.4, 1). Usually not important for the user.
c.point.col Color(s) of the construct symbols. Two values can be entered that will create a color ramp. The values of map.dim are mapped onto the ramp. The default is c("white", "darkred"). If only one color color value is supplied (e.g. "black") no mapping occurs and all elements will have the same color irrespective of their value on the map.dim dimension.
c.point.cex  Size of the construct symbols. Two values can be entered that will represent the lower and upper size of a range of cex the values of map.dim are mapped onto. The default is c(.6, 1.2). If only one cex value is supplied (e.g. .7) no mapping occurs and all elements will have the same size irrespective of their value on the map.dim dimension.

c.label.col  Color(s) of the construct labels. Two values can be entered that will create a color ramp. The values of map.dim are mapped onto the ramp. The default is c("white", "black"). If only one color value is supplied (e.g. "black") no mapping occurs and all construct labels will have the same color irrespective of their value on the map.dim dimension.

c.label.cex  Size of the construct labels. Two values can be entered that will represent the lower and upper size of a range of cex the values of map.dim are mapped onto. The default is c(.6, .9). If only one cex value is supplied (e.g. .7) no mapping occurs and all construct labels will have the same size irrespective of their value on the map.dim dimension.

c.color.map  Value range to determine what range of the color ramp defined in c.color will be used for mapping. Default is c(.4, ,1). Usually not important for the user.

See Also

Unsophisticated biplot: biplotSimple; 2D biplots: biplot2d, biplotEsa2d, biplotSlater2d; Pseudo 3D biplots: biplotPseudo3d, biplotEsaPseudo3d, biplotSlaterPseudo3d; Interactive 3D biplots: biplot3d, biplotEsa3d, biplotSlater3d; Function to set view in 3D: home.

Examples

```r
## Not run:
# biplot with 3D impression
biplotPseudo3d(boeker)
# Slater’s biplot with 3D impression
biplotPseudo3d(boeker, g=1, h=1, center=1)

# show 2nd and 3rd dim. and map 4th
biplotPseudo3d(boeker, dim=2:3, map.dim=4)

# change elem. colors
biplotPseudo3d(boeker, e.color=c("white", "darkgreen"))
# change con. colors
biplotPseudo3d(boeker, c.color=c("white", "darkgreen"))
# change color mapping range
biplotPseudo3d(boeker, c.colors.map=c(0, 1))

# set uniform con. text size
biplotPseudo3d(boeker, c.cex=1)
# change text size mapping range
biplotPseudo3d(boeker, c.cex=c(.4, 1.2))
```
## biplotSimple

A graphically unsophisticated version of a biplot.

### Description

It will draw elements and constructs vectors using similar arguments as `biplot2d`. It is a version for quick exploration used during development.

### Usage

```r
biplotSimple(
  x,
  dim = 1:2,
  center = 1,
  normalize = 0,
  g = 0,
  h = 1 - g,
  unity = T,
  col.active = NA,
  col.passive = NA,
  scale.e = 0.9,
  zoom = 1,
  e.point.col = "black",
  e.point.cex = 1,
  e.label.col = "black",
  e.label.cex = 0.7,
  c.point.col = grey(0.6),
  c.label.col = grey(0.6),
  c.label.cex = 0.6,
  ...
)
```

### Arguments

- **x**
  - repgrid object.
- **dim**
  - Dimensions (i.e. principal components) to be used for biplot (default is c(1, 2)).
- **center**
  - Numeric. The type of centering to be performed. 0= no centering, 1= row mean centering (construct), 2= column mean centering (elements), 3= double-centering (construct and element means), 4= midpoint centering of rows (constructs). The default is 1 (row centering).
- **normalize**
  - A numeric value indicating along what direction (rows, columns) to normalize by standard deviations. 0 = none, 1 = rows, 2 = columns (default is 0).
g  Power of the singular value matrix assigned to the left singular vectors, i.e. the constructs.

h  Power of the singular value matrix assigned to the right singular vectors, i.e. the elements.

unity Scale elements and constructs coordinates to unit scale in 2D (maximum of 1) so they are printed more neatly (default TRUE).

col.active Columns (elements) that are no supplementary points, i.e. they are used in the SVD to find principal components. default is to use all elements.

col.passive Columns (elements) that are supplementary points, i.e. they are NOT used in the SVD but projected into the component space afterwards. They do not determine the solution. Default is NA, i.e. no elements are set supplementary.

scale.e Scaling factor for element vectors. Will cause element points to move a bit more to the center. This argument is for visual appeal only.

zoom Scaling factor for all vectors. Can be used to zoom the plot in and out (default 1).

e.point.col Color of the element symbols (default is "black").

e.point.cex Size of the element symbol (default is 1.

e.label.col Color of the element labels (default is "black").

e.label.cex Size of the element labels (default is .7.

c.point.col Color of the construct lines (default is grey(.6).

c.label.col Color of the construct labels (default is grey(.6).

c.label.cex Size of the construct labels (default is .6.

... Parameters to be passed on to center() and normalize.

Value

repgrid object.

See Also

Unsophisticated biplot: biplotSimple;
2D biplots: biplot2d, biplotEsa2d, biplotSlater2d;
Pseudo 3D biplots: biplotPseudo3d, biplotEsaPseudo3d, biplotSlaterPseudo3d;
Interactive 3D biplots: biplot3d, biplotEsa3d, biplotSlater3d;
Function to set view in 3D: home.

Examples

```r
## Not run:
biplotSimple(boeker)
biplotSimple(boeker, unity=F)
biplotSimple(boeker, g=1, h=1)  # INGRID biplot
biplotSimple(boeker, g=1, h=1, center=4)  # ESA biplot
```
biplotSlater2d

Draws Slater's INGRID biplot in 2D.

Description

The default is to use row centering and no normalization. Note that Slater’s biplot is just a special case of a biplot that can be produced using the biplot2d function with the arguments center=1, g=1, h=1. The arguments that can be used in this function are the same as in biplot2d. Here, only the arguments that are set for Slater’s biplot are described. To see all the parameters that can be changed see biplot2d.

Usage

biplotSlater2d(x, center = 1, g = 1, h = 1, ...)

Arguments

x repgrid object.

center Numeric. The type of centering to be performed. 0= no centering, 1= row mean centering (construct), 2= column mean centering (elements), 3= double-centering (construct and element means), 4= midpoint centering of rows (constructs). Slater’s biplot uses 1 (row centering).

g Power of the singular value matrix assigned to the left singular vectors, i.e. the constructs.

h Power of the singular value matrix assigned to the right singular vectors, i.e. the elements.

... Additional parameters for be passed to biplot2d.

See Also

Unsophisticated biplot: biplotSimple;
2D biplots: biplot2d, biplotEsa2d, biplotSlater2d;
Pseudo 3D biplots: biplotPseudo3d, biplotEsaPseudo3d, biplotSlaterPseudo3d;
Interactive 3D biplots: biplot3d, biplotEsa3d, biplotSlater3d;
Function to set view in 3D: home.
Examples

## Not run:

```r
# See examples in \code{\link{biplot2d}} as the same arguments
# can used for this function.
```

## End(Not run)

---

**biplotSlater3d**  
*Draw the Slater's INGRID biplot in rgl (3D device).*

**Description**

The 3D biplot opens an interactive 3D device that can be rotated and zoomed using the mouse. A 3D device facilitates the exploration of grid data as significant proportions of the sum-of-squares are often represented beyond the first two dimensions. Also, in a lot of cases it may be of interest to explore the grid space from a certain angle, e.g. to gain an optimal view onto the set of elements under investigation (e.g. Raeithel, 1998). Note that Slater’s biplot is just a special case of a biplot that can be produced using the `biplot3d` function with the arguments `center=1, g=1, h=1`.

**Usage**

```r
biplotSlater3d(x, center = 1, g = 1, h = 1, ...)
```

**Arguments**

- `x`  
  repgrid object.

- `center`  
  Numeric. The type of centering to be performed. 0= no centering, 1= row mean centering (construct), 2= column mean centering (elements), 3= double-centering (construct and element means), 4= midpoint centering of rows (constructs). Default is 1 (row i.e. construct centering).

- `g`  
  Power of the singular value matrix assigned to the left singular vectors, i.e. the constructs.

- `h`  
  Power of the singular value matrix assigned to the right singular vectors, i.e. the elements.

- `...`  
  Additional arguments to be passed to `biplot3d`.

**See Also**

Unsophisticated biplot: `biplotSimple`;

2D biplots: `biplot2d, biplotEsa2d, biplotSlater2d`;

Pseudo 3D biplots: `biplotPseudo3d, biplotEsaPseudo3d, biplotSlaterPseudo3d`;

Interactive 3D biplots: `biplot3d, biplotEsa3d, biplotSlater3d`;

Function to set view in 3D: `home`. 
biplotSlaterPseudo3d

Examples

## Not run:

```r
biplotSlater3d(boeker)
biplotSlater3d(boeker, unity3d=T)

biplotSlater3d(boeker, e.sphere.col="red",
              c.text.col="blue")
biplotSlater3d(boeker, e.cex=1)
biplotSlater3d(boeker, col.sphere="red")
```

## End(Not run)

---

**biplotSlaterPseudo3d**  
*Draws Slater’s biplot in 2D with depth impression (pseudo 3D).*

**Description**

The default is to use row centering and no normalization. Note that Slater’s biplot is just a special case of a biplot that can be produced using the `biplotPseudo3d` function with the arguments `center=1, g=1, h=1`. Here, only the arguments that are modified for Slater’s biplot are described. To see all the parameters that can be changed see `biplot2d` and `biplotPseudo3d`.

**Usage**

```r
biplotSlaterPseudo3d(x, center = 1, g = 1, h = 1, ...)
```

**Arguments**

- `x` repgrid object.
- `center` Numeric. The type of centering to be performed. 0= no centering, 1= row mean centering (construct), 2= column mean centering (elements), 3= double-centering (construct and element means), 4= midpoint centering of rows (constructs). Slater’s biplot uses 1 (row centering).
- `g` Power of the singular value matrix assigned to the left singular vectors, i.e. the constructs.
- `h` Power of the singular value matrix assigned to the right singular vectors, i.e. the elements.
- `...` Additional parameters for be passed to `biplotPseudo3d`.

**See Also**

Unsophisticated biplot: `biplotSimple`;
2D biplots: `biplot2d, biplotEsa2d, biplotSlater2d`;
Pseudo 3D biplots: `biplotPseudo3d, biplotEsaPseudo3d, biplotSlaterPseudo3d`;
Interactive 3D biplots: `biplot3d, biplotEsa3d, biplotSlater3d`;
Function to set view in 3D: `home`.
Description

Centering of rows (constructs) and/or columns (elements).

Usage

center(x, center = 1, ...)

Arguments

x repgrid object.
center Numeric. The type of centering to be performed. 0 = no centering, 1 = row mean centering (construct), 2 = column mean centering (elements), 3 = double-centering (construct and element means), 4 = midpoint centering of rows (constructs), of the scale (default FALSE). Default is 1 (row centering).
...
Not evaluated.

Value

matrix containing the transformed values.

Note

If scale midpoint centering is applied no row or column centering can be applied simultaneously.
TODO: After centering the standard representation mode does not work any more as it remains unclear what color values to attach to the centered values.

Examples

## Not run:

center(bell2010) # no centering
center(bell2010, rows=T) # row centering of grid
center(bell2010, cols=T) # column centering of grid
center(bell2010, rows=T, cols=T) # row and column centering

## End(Not run)
Cluster analysis (of constructs or elements).

Description

cluster is a preliminary implementation of a cluster function. It supports various distance measures as well as cluster methods. More is to come.

align: Aligning will reverse constructs if necessary to yield a maximal similarity between constructs. In a first step the constructs are clustered including both directions. In a second step the direction of a construct that yields smaller distances to the adjacent constructs is preserved and used for the final clustering. As a result, every construct is included once but with an orientation that guarantees optimal clustering. This approach is akin to the procedure used in FOCUS (Jankowicz & Thomas, 1982).

Usage

cluster(
  x,
  along = 0,
  dmethod = "euclidean",
  cmethod = "ward",
  p = 2,
  align = TRUE,
  trim = NA,
  main = NULL,
  mar = c(4, 2, 3, 15),
  cex = 0,
  lab.cex = 0.8,
  cex.main = 0.9,
  print = TRUE,
  ...
)

Arguments

x repgrid object.

along Along which dimension to cluster. 1 = constructs only, 2 = elements only, 0 = both (default).

dmethod The distance measure to be used. This must be one of "euclidean", "maximum", "manhattan", "canberra", "binary" or "minkowski". Any unambiguous substring can be given. For additional information on the different types type ?dist.

zmethod The agglomeration method to be used. This should be (an unambiguous abbreviation of) one of "ward", "single", "complete", "average", "mcquitty", "median" or "centroid".

p The power of the Minkowski distance, in case "minkowski" is used as argument for dmethod.
align
Whether the constructs should be aligned before clustering (default is TRUE). If not, the grid matrix is clustered as is. See Details section for more information.

trim
the number of characters a construct is trimmed to (default is 10). If NA no trimming is done. Trimming simply saves space when displaying the output.

main
Title of plot. The default is a name indicating the distance function and cluster method.

mar
Define the plot region (bottom, left, upper, right).

cex
Size parameter for the nodes. Usually not needed.

lab.cex
Size parameter for the constructs on the right side.

cex.main
Size parameter for the plot title (default is .9).

print
Logical. Whether to print the dendrogram (default is TRUE).

... Additional parameters to be passed to plotting function from as.dendrogram. Type ?as.dendrogram for further information. This option is usually not needed, except if special designs are needed.

Value
Reordered repgrid object.

References

See Also
bertinCluster

Examples
## Not run:

cluster(bell2010)
cluster(bell2010, main="My cluster analysis") # new title
cluster(bell2010, type="t") # different drawing style
cluster(bell2010, dmethod="manhattan") # using manhattan metric
cluster(bell2010, cmethod="single") # do single linkage clustering
cluster(bell2010, cex=1, lab.cex=1) # change appearance
cluster(bell2010, lab.cex=.7, # advanced appearance changes
edgePar = list(lty=1:2, col=2:1))

## End(Not run)
Description

p-values are calculated for each branch of the cluster dendrogram to indicate the stability of a specific partition. clusterBoot will yield the same clusters as the cluster function (i.e. standard hierarchical clustering) with additional p-values. Two kinds of p-values are reported: bootstrap probabilities (BP) and approximately unbiased (AU) probabilities (see Details section for more information).

Usage

clusterBoot(
  x, 
  along = 1, 
  align = TRUE, 
  dmethod = "euclidean", 
  cmethod = "ward", 
  p = 2, 
  nboot = 1000, 
  r = seq(0.8, 1.4, by = 0.1), 
  seed = NULL, 
  ...
)

Arguments

x grid object

along Along which dimension to cluster. 1 = constructs, 2 = elements.

align Whether the constructs should be aligned before clustering (default is TRUE). If not, the grid matrix is clustered as is. See Details section for more information.

dmethod The distance measure to be used. This must be one of "euclidean", "maximum", "manhattan", "canberra", "binary" or "minkowski". Any unambiguous substring can be given. For additional information on the different types type ?dist.

cmethod The agglomeration method to be used. This should be (an unambiguous abbreviation of) one of "ward", "single", "complete", "average", "mcquitty", "median" or "centroid".

p Power of the Minkowski metric. Not yet passed on to pvclust!

nboot the number of bootstrap replications. The default is 1000.

r numeric vector which specifies the relative sample sizes of bootstrap replications. For original sample size \( n \) and bootstrap sample size \( n' \), this is defined as \( r = n'/n \).

seed Random seed for bootstrapping. Can be set for reproducibility (see set.seed). Usually not needed.

... Arguments to pass on to pvclust.
Details

In standard (hierarchical) cluster analysis the question arises which of the identified structures are significant or just emerged by chance. Over the last decade several methods have been developed to test structures for robustness. One line of research in this area is based on resampling. The idea is to resample the rows or columns of the data matrix and to build the dendrogram for each bootstrap sample (Felsenstein, 1985). The p-values indicates the percentage of times a specific structure is identified across the bootstrap samples. It was shown that the p-value is biased (Hillis & Bull, 1993; Zharkikh & Li, 1995). In the literature several methods for bias correction have been proposed. In clusterBoot a method based on the multiscale bootstrap is used to derive corrected (approximately unbiased) p-values (Shimodaira, 2002, 2004). In conventional bootstrap analysis the size of the bootstrap sample is identical to the original sample size. Multiscale bootstrap varies the bootstrap sample size in order to infer a correction formula for the biased p-value on the basis of the variation of the results for the different sample sizes (Suzuki & Shimodaira, 2006).

align: Aligning will reverse constructs if necessary to yield a maximal similarity between constructs. In a first step the constructs are clustered including both directions. In a second step the direction of a construct that yields smaller distances to the adjacent constructs is preserved and used for the final clustering. As a result, every construct is included once but with an orientation that guarantees optimal clustering. This approach is akin to the procedure used in FOCUS (Jankowicz & Thomas, 1982).

Value

A pvclust object as returned by the function pvclust

References


Examples

```r
## Not run:

# pvclust must be loaded
library(pvclust)
```
# p-values for construct dendrogram
s <- clusterBoot(boeker)
plot(s)
pvrect(s, max.only=FALSE)

# p-values for element dendrogram
s <- clusterBoot(boeker, along=2)
plot(s)
pvrect(s, max.only=FALSE)

## End(Not run)

---

**constructCor**

*Calculate correlations between constructs.*

**Description**

Different types of correlations can be requested: PMC, Kendall tau rank correlation, Spearman rank correlation.

**Usage**

```r
constructCor(
  x,
  method = c("pearson", "kendall", "spearman"),
  trim = 20,
  index = FALSE
)
```

**Arguments**

- **x** `repgrid` object.
- **method** A character string indicating which correlation coefficient is to be computed. One of "pearson" (default), "kendall" or "spearman", can be abbreviated. The default is "pearson".
- **trim** The number of characters a construct is trimmed to (default is 20). If NA no trimming occurs. Trimming simply saves space when displaying correlation of constructs with long names.
- **index** Whether to print the number of the construct.

**Value**

Returns a matrix of construct correlations.

**See Also**

`elementCor`
Examples

```r
# three different types of correlations
constructCor(mackay1992)
constructCor(mackay1992, method="kendall")
constructCor(mackay1992, method="spearman")

# format output
constructCor(mackay1992, trim=6)
constructCor(mackay1992, index=TRUE, trim=6)

# save correlation matrix for further processing
r <- constructCor(mackay1992)
r
print(r, digits=5)

# accessing the correlation matrix
r[1, 3]
```

`constructD`  
*Calculate Somers’ d for the constructs.*

Description

Somers’s d is an asymmetric association measure as it depends on which variable is set as dependent and independent. The direction of dependency needs to be specified.

Usage

`constructD(x, dependent = "columns", trim = 30, index = TRUE)`

Arguments

- `x`  
  repgrid object

- `dependent`  
  A string denoting the direction of dependency in the output table (as d is asymmetrical). Possible values are "columns" (the default) for setting the columns as dependent, "rows" for setting the rows as the dependent variable and "symmetric" for the symmetrical Somers’ d measure (the mean of the two directional values for code "columns" and "rows").

- `trim`  
  The number of characters a construct is trimmed to (default is 30). If NA no trimming occurs. Trimming simply saves space when displaying correlation of constructs with long names.

- `index`  
  Whether to print the number of the construct (default is TRUE).

Value

matrix of construct correlations.
Note

Thanks to Marc Schwartz for supplying the code to calculate Somers’ d.

References


Examples

```r
## Not run:
constructD(fbb2003) # columns as dependent (default)
constructD(fbb2003, "c") # row as dependent
constructD(fbb2003, "s") # symmetrical index

# suppress printing
d <- constructD(fbb2003, out=0, trim=5)
d

# more digits
constructD(fbb2003, dig=3)

# add index column, no trimming
constructD(fbb2003, col.index=TRUE, index=F, trim=NA)

## End(Not run)
```

---

**constructPca**

Principal component analysis (PCA) of inter-construct correlations.

Description

Various methods for rotation and methods for the calculation of the correlations are available. Note that the number of factors has to be specified. For more information on the PCA function itself type `?principal`.

Usage

```r
constructPca(
  x,
  nfactors = 3,
  rotate = "varimax",
  method = "pearson",
  trim = NA
)
```
constructPca

Arguments

\textbf{x} \quad \text{repgrid object.}

\textbf{nfactors} \quad \text{Number of components to extract (default is 3).}

\textbf{rotate} \quad \text{"none", "varimax", "promax" and "cluster" are possible rotations (default is none).}

\textbf{method} \quad \text{A character string indicating which correlation coefficient is to be computed. One of "pearson" (default), "kendall" or "spearman", can be abbreviated. The default is "pearson".}

\textbf{trim} \quad \text{The number of characters a construct is trimmed to (default is 7). If NA no trimming occurs. Trimming simply saves space when displaying correlation of constructs with long names.}

Value

Returns an object of class constructPca.

References


See Also

To extract the PCA loadings for further processing see \texttt{constructPcaLoadings}.

Examples

```r
## Not run:

constructPca(bell2010)

# data from grid manual by Fransella et al. (2003, p. 87)
# note that the construct order is different
constructPca(fbb2003, nfactors=2)

# no rotation
constructPca(fbb2003, rotate="none")

# use a different type of correlation (Spearman)
constructPca(fbb2003, method="spearman")

# save output to object
m <- constructPca(fbb2003, nfactors=2)
m

# different printing options
print(m, digits=5)
print(m, cutoff=.3)
```
constructPcaLoadings

## End(Not run)

### constructPcaLoadings

Extract loadings from PCA of constructs.

#### Usage

```r
constructPcaLoadings(x)
```

#### Arguments

- `x`: repgrid object. This object is returned by the function `constructPca`.

#### Value

A matrix containing the factor loadings.

#### Examples

```r
p <- constructPca(bell2010)
l <- constructPcaLoadings(p)
l[1,]
l[, 1]
l[1, 1]
```

### constructRmsCor

Root mean square (RMS) of inter-construct correlations.

#### Description

The RMS is also known as 'quadratic mean' of the inter-construct correlations. The RMS serves as a simplification of the correlation table. It reflects the average relation of one construct to all other constructs. Note that as the correlations are squared during its calculation, the RMS is not affected by the sign of the correlation (cf. Fransella, Bell & Bannister, 2003, p. 86).

#### Usage

```r
constructRmsCor(x, method = "pearson", trim = NA)
```
constructs

Arguments

x  repgrid object

method  A character string indicating which correlation coefficient is to be computed. One of "pearson" (default), "kendall" or "spearman", can be abbreviated. The default is "pearson".

trim  The number of characters a construct is trimmed to (default is NA). If NA no trimming occurs. Trimming simply saves space when displaying correlation of constructs with long names.

Value

dataframe of the RMS of inter-construct correlations

References


See Also

elementRmsCor, constructCor

Examples

# data from grid manual by Fransella, Bell and Bannister
constructRmsCor(fbb2003)
constructRmsCor(fbb2003, trim=20)

# modify output
r <- constructRmsCor(fbb2003)
print(r, digits=5)
# access calculation results
r[2, 1]

constructs  Get or replace construct poles

Description

Allows to get and set construct poles. Replaces the older functions getConstructNames, getConstructNames2, and eNames which are deprecated.
Usage

```r
constructs(x, collapse = FALSE, sep = " - ")

constructs(x, i, j) <- value

leftpoles(x)

leftpoles(x, position) <- value

rightpoles(x)

rightpoles(x, position) <- value
```

Arguments

- **x**: A repgrid object.
- **collapse**: Return vector with both poles instead.
- **sep**: Separator if `collapse = TRUE`, default is " - ".
- **i, j**: Row and column Index of repgrid matrix.
- **value**: Character vector of construct poles names.
- **position**: Index where to insert construct

Examples

```r
# shorten object name
x <- boeker

## get construct poles
constructs(x)  # both left and right poles
leftpoles(x)   # left poles only
rightpoles(x)
constructs(x, collapse = TRUE)

## replace construct poles
constructs(x)[1,1] <- "left pole 1"
constructs(x)[1,"leftpole"] <- "left pole 1"  # alternative
constructs(x)[1:3,2] <- paste("right pole", 1:3)
constructs(x)[1:3,"rightpole"] <- paste("right pole", 1:3)  # alternative
constructs(x)[4,1:2] <- c("left pole 4", "right pole 4")

l <- leftpoles(x)
leftpoles(x) <- sample(l)  # brind poles into random order
leftpoles(x)[1] <- "new left pole 1"  # replace name of first left pole

# replace left poles of constructs 1 and 3
leftpoles(x)[c(1,3)] <- c("new left pole 1", "new left pole 3")
```
**data-bell2010**  
*Grid data from Bell (2010).*

**Description**

Grid data originated (but is not shown in the paper) from a study by Haritos, Gindinis, Doan and Bell (2004) on element role titles. It was used to demonstrate the effects of construct alignment in Bell (2010, p. 46).

**References**


---

**data-bellmcgorry1992**  
*Grid data from Bell and McGorry (1992).*

**Description**

The grid data set is used in Bell’s technical report "Using SPSS to Analyse Repertory Grid Data" (1997, p. 6). Originally, the data comes from a study by Bell and McGorry (1992).

**References**


**data-boeker**  
*Grid data from Boeker (1996).*

**Description**
Grid data from a schizophrenic patient undergoing psychoanalytically oriented psychotherapy. The data was taken during the last stage of therapy (Boeker, 1996, p. 163).

**References**

---

**data-fbb2003**  
*Grid data from Fransella, Bell and Bannister (2003).*

**Description**
A dataset used throughout the book "A Manual for Repertory Grid Technique" (Fransella, Bell and Bannister, 2003, p. 60).

**References**

---

**data-feixas2004**  
*Grid data from Feixas and Saul (2004).*

**Description**
A description by the authors: "When Teresa, 22 years old, was seen by the second author (LAS) at the psychological services of the University of Salamanca, she was in the final year of her studies in chemical sciences. Although Teresa proves to be an excellent student, she reveals serious doubts about her self worth. She cries frequently, and has great difficulty in meeting others, even though she has a boyfriend who is extremely supportive. Teresa is anxiously hesitant about accepting a new job which would involve moving to another city 600 Km away from home." (Feixas & Saul, 2004, p. 77).

**References**
Pre- and post therapy dataset from Leach et al. (2001).

Description

Case as described by the authors: "Sarah, aged 32, was referred with problems of depression and sexual difficulties relating to childhood sexual abuse. She had three children and was living with her male partner. From the age of 9, her brother, an adult, had sexually abused Sarah. She attended a group for survivors of child sexual abuse and completed repertory grids prior to the group, immediately after the group and at 3- and 6-month follow-up." (Leach et al. 2001, p. 230).

Details

leach2001a is the pre-therapy, leach2001b is the post-therapy therapy dataset. The construct and elements are identical.

References


Grid data from Mackay (1992). Data set 'Grid C'.

Description

used in Mackay's paper on inter-element correlation (1992, p. 65).

References

<table>
<thead>
<tr>
<th>Data Set</th>
<th>Description</th>
<th>References</th>
</tr>
</thead>
</table>
**distance**

*Distance measures (between constructs or elements).*

**Description**

Various distance measures between elements or constructs are calculated.

**Usage**

```r
distance(
  x,
  along = 1,
  dmethod = "euclidean",
  p = 2,
  normalize = FALSE,
  trim = 20,
  index = TRUE,
  ...
)
```

**Arguments**

- `x`: repgrid object.
- `along`: Whether to calculate distance for 1 = constructs (default) or for 2 = elements.
- `dmethod`: The distance measure to be used. This must be one of "euclidean", "maximum", "manhattan", "canberra", "binary" or "minkowski". Any unambiguous substring can be given. For additional information on the different types type ?dist.
- `p`: The power of the Minkowski distance, in case "minkowski" is used as argument for `dmethod`.
- `normalize`: Use normalized distances. The distances are divided by the highest possible value given the rating scale for the grid, so all distances are in the interval [0,1].
- `trim`: The number of characters a construct or element is trimmed to (default is 20). If `NA` no trimming occurs. Trimming simply saves space when displaying correlation of constructs with long names.
- `index`: Whether to print the number of the construct or element in front of the name (default is `TRUE`). This is useful to avoid identical row names, which may cause an error.
- `...`: Additional parameters to be passed to function `dist`. Type `dist` for further information.

**Value**

`matrix` object.
Examples

## Not run:

```r
# between constructs
distance(bell2010, along = 1)
distance(bell2010, along = 1, normalize = TRUE)

# between elements
distance(bell2010, along = 2)

# several distance methods
distance(bell2010, dm = "man")  # manhattan distance
distance(bell2010, dm = "mink", p = 3)  # minkowski metric to the power of 3

# to save the results without printing to the console
d <- distance(bell2010, trim = 7)
d

# some more options when printing the distance matrix
print(d, digits = 5)
print(d, col.index = FALSE)
print(d, upper = FALSE)

# accessing entries from the matrix
d[1,3]
```

## End(Not run)

---

distanceHartmann 'Hartmann distance' (standardized Slater distances).

Description

Calculate Hartmann distance

Usage

```r
distanceHartmann(
  x,
  method = "paper",
  reps = 10000,
  prob = NULL,
  progress = TRUE,
  distributions = FALSE
)
```
Arguments

x  repgrid object.
method  The method used for distance calculation, one of "paper", "simulate", "new". "paper" uses the parameters as given in Hartmann (1992) for calculation. "simulate" (default) simulates a Slater distribution for the calculation. In a future version the time consuming simulation will be replaced by more accurate parameters for Hartmann distances than used in Hartmann (1992).
reps  Number of random grids to generate sample distribution for Slater distances (default is 10000). Note that a lot of samples may take a while to calculate.
prob  The probability of each rating value to occur. If NULL (default) the distribution is uniform. The number of values must match the length of the rating scale.
progress  Whether to show a progress bar during simulation (default is TRUE) (for method="simulate"). May be useful when the distribution is estimated on the basis of many quasis.

Details

Hartmann (1992) showed in a simulation study that Slater distances (see distanceSlater) based on random grids, for which Slater coined the expression quasis, have a skewed distribution, a mean and a standard deviation depending on the number of constructs elicited. He suggested a linear transformation (z-transformation) which takes into account the estimated (or expected) mean and the standard deviation of the derived distribution to standardize Slater distance scores across different grid sizes. 'Hartmann distances' represent a more accurate version of 'Slater distances'. Note that Hartmann distances are multiplied by -1. Hence, negative Hartmann values represent dissimilarity, i.e. a big Slater distance.

There are two ways to use this function. Hartmann distances can either be calculated based on the reference values (i.e. means and standard deviations of Slater distance distributions) as given by Hartmann in his paper. The second option is to conduct an instant simulation for the supplied grid size for each calculation. The second option will be more accurate when a big number of quasis is used in the simulation.

It is also possible to return the quantiles of the sample distribution and only the element distances considered 'significant' according to the quantiles defined.

Value

A matrix containing Hartmann distances. In the attributes several additional parameters can be found:

"arguments"  A list of several parameters including mean and sd of Slater distribution.
"quantiles"  Quantiles for Slater and Hartmann distance distribution.
"distributions"  List with values of the simulated distributions.
**Calculation**

The 'Hartmann distance' is calculated as follows (Hartmann 1992, p. 49).

\[
D = -1 \left( \frac{D_{slater} - M_c}{sd_c} \right)
\]

Where \( D_{slater} \) denotes the Slater distances of the grid, \( M_c \) the sample distribution’s mean value and \( sd_c \) the sample distribution’s standard deviation.

**References**


**See Also**

distanceSlater

**Examples**

```r
## Not run:

### basics ###
distanceHartmann(bell2010)
distanceHartmann(bell2010, method="simulate")
h <- distanceHartmann(bell2010, method="simulate")
h

# printing options
print(h)
print(h, digits=6)
# 'significant' distances only
print(h, p=c(.05, .95))

# access cells of distance matrix
h[1,2]

### advanced ###

# histogram of Slater distances and indifference region
h <- distanceHartmann(bell2010, distributions=TRUE)
l <- attr(h, "distributions")
hist(l$slater, breaks=100)
hist(l$hartmann, breaks=100)

## End(Not run)
```
distanceNormalized: Standardized inter-element distances' (power transformed Hartmann distances).

Description

Calculate power-transformed Hartmann distances.

Usage

distanceNormalized(
  x,
  reps = 1000,
  prob = NULL,
  progress = TRUE,
  distributions = TRUE
)

Arguments

x repgrid object.
reps Number of random grids to generate to produce sample distribution for Hartmann distances (default is 1000). Note that a lot of samples may take a while to calculate.
prob The probability of each rating value to occur. If NULL (default) the distribution is uniform. The number of values must match the length of the rating scale.
progress Whether to show a progress bar during simulation (default is TRUE) (for method="simulate"). May be useful when the distribution is estimated on the basis of many quasis.
distributions Whether to additionally return the values of the simulated distributions (Slater etc.) The default is FALSE as it will quickly boost the object size.

Details

Hartmann (1992) suggested a transformation of Slater (1977) distances to make them independent from the size of a grid. Hartmann distances are supposed to yield stable cutoff values used to determine 'significance' of inter-element distances. It can be shown that Hartmann distances are still affected by grid parameters like size and the range of the rating scale used (Heckmann, 2012). The function distanceNormalize applies a Box-Cox (1964) transformation to the Hartmann distances in order to remove the skew of the Hartmann distance distribution. The normalized values show to have more stable cutoffs (quantiles) and better properties for comparison across grids of different size and scale range.

The function distanceNormalize can also return the quantiles of the sample distribution and only the element distances considered 'significant' according to the quantiles defined.
Value

A matrix containing the standardized distances. Further data is contained in the object’s attributes:

"arguments" A list of several parameters including mean and sd of Slater distribution.
"quantiles" Quantiles for Slater, Hartmann and power transformed distance distributions.
"distributions" List with values of the simulated distributions, if distributions=TRUE.

Calculations

The ‘power transformed Hartmann distance’ are calculated as follows: The simulated Hartmann distribution is added a constant as the Box-Cox transformation can only be applied to positive values. Then a range of values for lambda in the Box-Cox transformation (Box & Cox, 1964) are tried out. The best lambda is the one maximizing the correlation of the quantiles with the standard normal distribution. The lambda value maximizing normality is used to transform Hartmann distances. As the resulting scale of the power transformation depends on lambda, the resulting values are z-transformed to derive a common scaling.

The code for the calculation of the optimal lambda was written by Ioannis Kosmidis.

References


See Also
distanceHartmann and distanceSlater.

Examples

```r
## Not run:
### basics ###
distanceNormalized(bell2010)
n <- distanceNormalized(bell2010)
n
# printing options
print(n)
```
distanceSlater

'Slater distances' (standardized Euclidean distances).

Description
Calculate Slater distance.

Usage
distanceSlater(x, trim = 20, index = TRUE)

Arguments

- **x**: repgrid object.
- **trim**: The number of characters a construct or element is trimmed to (default is 20). If NA no trimming occurs. Trimming simply saves space when displaying correlation of constructs with long names.
- **index**: Whether to print the number of the construct or element in front of the name (default is TRUE). This is useful to avoid identical row names, which may cause an error.

Details
The euclidean distance is often used as a measure of similarity between elements (see `distance`). A drawback of this measure is that it depends on the range of the rating scale and the number of constructs used, i.e. on the size of a grid.

An approach to standardize the euclidean distance to make it independent from size and range of ratings and was proposed by Slater (1977, pp. 94). The 'Slater distance' is the Euclidean distance divided by the expected distance. Slater distances bigger than 1 are greater than expected, lesser than 1 are smaller than expected. The minimum value is 0 and values bigger than 2 are rarely found. Slater
distances have been used to compare inter-element distances between different grids, where the grids do not need to have the same constructs or elements. Hartmann (1992) showed that Slater distance is not independent of grid size. Also the distribution of the Slater distances is asymmetric. Hence, the upper and lower limit to infer 'significance' of distance is not symmetric. The practical relevance of Hartmann's findings have been demonstrated by Schoeneich and Klapp (1998). To calculate Hartmann's version of the standardized distances see \texttt{distanceHartmann}

**Value**

A matrix with Slater distances.

**Calculation**

The Slater distance is calculated as follows. For a derivation see Slater (1977, p.94).

Let matrix $D$ contain the row centered ratings. Then

\[
P = D^T D
\]

and

\[
S = \text{tr}(P)
\]

The expected 'unit of expected distance' results as

\[
U = (2S/(m - 1))^{1/2}
\]

where $m$ denotes the number of elements of the grid. The standardized Slater distances is the matrix of Euclidean distances $E$ divided by the expected distance $U$.

\[
E/U
\]

**References**


**See Also**

\texttt{distanceHartmann}

**Examples**

\begin{verbatim}
distanceSlater(bell2010)
distanceSlater(bell2010, trim=40)
d <- distanceSlater(bell2010)
\end{verbatim}
```r
print(d)
print(d, digits=4)

# using Norris and Makhlouf-Norris (problematic) cutoffs
print(d, cutoffs=c(.8, 1.2))
```

### `elementCor`

*Calculate the correlations between elements.*

#### Description

Note that simple element correlations as a measure of similarity are flawed as they are not invariant to construct reflection (Mackay, 1992; Bell, 2010). A correlation index invariant to construct reflection is Cohen’s rc measure (1969), which can be calculated using the argument `rc=TRUE` which is the default option.

#### Usage

```
`elementCor(x, rc = TRUE, method = "pearson", trim = 20, index = TRUE)`
```

#### Arguments

- `x` repgrid object.
- `rc` Use Cohen’s rc which is invariant to construct reflection (see description above). It is used as the default.
- `method` A character string indicating which correlation coefficient is to be computed. One of "pearson" (default), "kendall" or "spearman", can be abbreviated. The default is "pearson".
- `trim` The number of characters a construct is trimmed to (default is 20). If NA no trimming occurs. Trimming simply saves space when displaying correlation of constructs with long names.
- `index` Whether to print the number of the construct.

#### Value

- matrix of element correlations

#### References

See Also

constructCor

Examples

```r
elementCor(mackay1992)  # Cohen's rc
elementCor(mackay1992, rc=FALSE)  # PM correlation
elementCor(mackay1992, rc=FALSE, method="spearman")  # Spearman correlation

# format output
elementCor(mackay1992, trim=6)

# save as object for further processing
r <- elementCor(mackay1992)
r

# change output of object
print(r, digits=5)
print(r, col.index=FALSE)
print(r, upper=FALSE)

# accessing elements of the correlation matrix
r[1,3]
```

---

**elementRmsCor**

Root mean square (RMS) of inter-element correlations.

**Description**

The RMS is also known as 'quadratic mean' of the inter-element correlations. The RMS serves as a simplification of the correlation table. It reflects the average relation of one element with all other elements. Note that as the correlations are squared during its calculation, the RMS is not affected by the sign of the correlation (cf. Fransella, Bell & Bannister, 2003, p. 86).

**Usage**

```r
elementRmsCor(x, rc = TRUE, method = "pearson", trim = NA)
```

**Arguments**

- `x` repgrid object.
- `rc` Whether to use Cohen’s rc which is invariant to construct reflection (see description above). It is used as the default.
- `method` A character string indicating which correlation coefficient to be computed. One of "pearson" (default), "kendall" or "spearman", can be abbreviated. The default is "pearson".
trim

Get or replace element names

Description

Allows to get and set element names. Replaces the older functions getElementNames, getElementNames2, and eNames which are deprecated.
Usage

```
elements(x)

elements(x, position) <- value
```

Arguments

- `x`: A repgrid object.
- `position`: Index where to insert element.
- `value`: Character vector of element names.

Examples

```
# copy Boeker grid to x
x <- boeker

## get element names
e <- elements(x)
e

## replace element names
elements(x) <- rev(e)  # reverse all element names
elements(x)[1] <- "Hannes"  # replace name of first element

# replace names of elements 1 and 3
elements(x)[c(1,3)] <- c("element 1", "element 3")
```

---

**gridlist**  
*Add repgrids into a gridlist*

Description

Add repgrids into a gridlist

Test or create object of class ‘gridlist’

Usage

```
gridlist(...)

is.gridlist(x)

as.gridlist(x)
```
grids_leave_n_out

Resample constructs

Description

The goal of resampling is to build variations of a single grid. Two variants are implemented: The first is the leave-n-out approach which builds all possible grids when dropping n constructs. The second is a bootstrap approach, randomly drawing n constructs from the grid.

Usage

grids_leave_n_out(x, n = 0)

grids_bootstrap(x, n = nrow(x), reps = 100, replace = TRUE)

Arguments

x  
A repgrid object.

n  
Number of constructs to drop or to sample in each generated grid.

reps  
Number of grids to generate.

replace  
Resample constructs with replacement?

Value

List of grids.

Examples

## All results for PVAFF index when one construct is left out
p <- indexPvaff(boeker)
l <- grids_leave_n_out(boeker, n = 1)
pp <- sapply(l, indexPvaff) # apply indexPvaff function to all grids
range(pp) # min and max PVAFF
hist(pp, xlab = "PVAFF values") # visualize
abline(v = p, col = "blue", lty = 2)
**home**

*Rotate the interactive 3D device to default views.*

---

**Description**

Rotate the interactive 3D device to a default viewpoint or to a position defined by theta and phi in Euler angles. Three default viewpoints are implemented rendering a view so that two axes span a plane and the third axis is pointing out of the screen.

**Usage**

```r
home(view = 1, theta = NULL, phi = NULL)
```

**Arguments**

- `view` Numeric. Specifying one of three default views. 1 = XY, 2=XZ and 3=YZ-plane.
- `phi` Numeric. Euler angle. Overrides view setting.

**Return**

NULL.

**See Also**

Interactive 3D biplots: `biplot3d`, `biplotSlater3d`, `biplotEsa3d`.

**Examples**

```r
## Not run:

biplot3d(boeker)
home(2)
home(3)
home(1)
home(theta=45, phi=45)

## End(Not run)
```
importExcel

Import grid data from an Excel file.

Description

You can define a grid using Microsoft Excel and by saving it as a .xlsx file. The .xlsx file has to be in a specified fixed format (see section Details).

Usage

importExcel(file, dir = NULL, sheetIndex = 1, min = NULL, max = NULL)

Arguments

- **file**: A vector of filenames including the full path if file is not in current working directory. The file suffix has to be .xlsx (used since Excel 2007).
- **dir**: Alternative way to supply the directory where the file is located (default NULL).
- **sheetIndex**: The number of the Excel sheet that contains the grid data.
- **min**: Optional argument (numeric, default NULL) for minimum rating value in grid.
- **max**: Optional argument (numeric, default NULL) for maximum rating value in grid.

Details

Excel file structure: The first row contains the minimum of the rating scale, the names of the elements and the maximum of the rating scale. Below every row contains the left construct pole, the ratings and the right construct pole.

```
 1 left pole 1 1 5 3 4 right pole 1
 1 left pole 2 3 1 1 3 right pole 2
 1 left pole 3 4 2 5 1 right pole 3
```

Note that the maximum and minimum value has to be defined using the min and max arguments if no values are supplied at the beginning and end of the first row. Otherwise the scaling range is inferred from the available data and a warning is issued as the range may be erroneous. This may effect other functions that depend on knowing the correct range and it is thus strongly recommended to set the scale range correctly.

Value

A single repgrid object in case one file and a list of repgrid objects in case multiple files are imported.
importGridcor

See Also

importGridcor, importGridstat, importScivesco, importGridsuite, importTxt

Examples

## Not run:

# Open Excel file delivered along with the package
g file <- system.file("extdata", "grid_01.xlsx", package = "OpenRepGrid")
rg <- importExcel(file)

# To see the structure of the Excel file try to open it as follows.
# Requires Excel to be installed.
system2("open", file)

# Import more than one Excel file
g files <- system.file("extdata", c("grid_01.xlsx", "grid_02.xlsx"), package = "OpenRepGrid")
rg <- importExcel(files)

## End(Not run)

---

importGridcor  Import GRIDCOR data files.

Description

Reads the file format that is used by the grid program GRIDCOR (Feixas & Cornejo, 2002).

Usage

importGridcor(file, dir = NULL)

Arguments

- **file**  filename including path if file is not in current working directory. File can also be a complete URL. The fileformat is .dat.

- **dir**  alternative way to supply the directory where the file is located (default NULL).

Value

a single repgrid object in case one file and a list of repgrid objects in case multiple files are imported.
importGridstat

Note

Note that the GRIDCOR data sets the minimum ratings scale range to 1. The maximum value can differ and is defined in the data file.

Also note that both Gridcor and Gridstat data files do have the same suffix .dat. Make sure not to mix them up.

References


See Also

importGridcor, importGridstat, importScivesco, importGridsuite, importTxt, importExcel

Examples

## Not run:

# supposing that the data file gridcor.dat is in the current directory
file <- "gridcor.dat"
rg <- importGridcor(file)

# specifying a directory (arbitrary example directory)
dir <- "/Users/markheckmann/data"
rg <- importGridcor(file, dir)

# using a full path
rg <- importGridcor("/Users/markheckmann/data/gridcor.dat")

## End(Not run)
importGridstat

Arguments

file Filename including path if file is not in current working directory. File can also be a complete URL. The file format is .dat.
dir Alternative way to supply the directory where the file is located (default NULL).
min Optional argument (numeric, default NULL) for minimum rating value in grid.
max Optional argument (numeric, default NULL) for maximum rating value in grid.

Value

A single repgrid object in case one file and a list of repgrid objects in case multiple files are imported.

Note

Note that the gridstat data format does not contain explicit information about the range of the rating scale used (minimum and maximum). By default the range is inferred by scanning the ratings and picking the minimal and maximal values as rating range. You can set the minimal and maximal value by hand using the min and max arguments or by using the setScale() function. Note that if the rating range is not set, it may cause several functions to not work properly. A warning will be issued if the range is not set explicitly when using the importing function.

The function only reads data from the latest GridStat version. The latest version allows the separation of the left and right pole by using one of the following symbols /:– (hyphen, colon and dash). Older versions may not separate the left and right pole. This will cause all labels to be assigned to the left pole only when importing. You may fix this by simply entering one of the construct separator symbols into the GridStat file between each left and right construct pole.

The third line of a GridStat file may contain a no labels statement (i.e. a line containing any string of 'NOLA', 'NO L', 'NoLa', 'No L', 'NoLa', 'No l', 'nola' or 'no l'). In this case only ratings are supplied, hence, default names are assigned to elements and constructs.

References


See Also

importGridcor, importGridstat, importScivesco, importGridsuite, importTxt, importExcel

Examples

## Not run:

# supposing that the data file gridstat.dat is in the current working directory
file <- "gridstat.dat"
rg <- importGridstat(file)

# specifying a directory (example)
dir <- "/Users/markheckmann/data"
importGridsuite

Description

Import Gridsuite data files.

Usage

importGridsuite(file, dir = NULL)

Arguments

file Filename including path if file is not in current working directory. File can also be a complete URL. The fileformat is .dat.
dir Alternative way to supply the directory where the file is located (default NULL).

Value

A single repgrid object in case one file and a list of repgrid objects in case multiple files are imported.

Note

The developers of Gridsuite have proposed to use an XML scheme as a standard exchange format for repertory grid data (Walter, Bacher & Fromm, 2004). This approach is also embraced by the OpenRepGrid package.

TODO: The element and construct IDs are not used yet. Thus, if the output should be in different order the current mechanism will cause false assignments.

References

http://www.gridsuite.de/

importScivesco

See Also

importGridcor, importGridstat, importScivesco, importGridsuite, importTxt, importExcel

Examples

```r
## Not run:

# supposing that the data file gridsuite.xml is in the current directory
file <- "gridsuite.xml"
rg <- importGridsuite(file)

# specifying a directory (arbitrary example directory)
dir <- "/Users/markheckmann/data"
rg <- importGridsuite(file, dir)

# using a full path
rg <- importGridsuite("/Users/markheckmann/data/gridsuite.xml")

## End(Not run)
```

---

**importScivesco**  
*Import sci:vesco data files.*

**Description**

Import sci:vesco data files.

**Usage**

```r
importScivesco(file, dir = NULL)
```

**Arguments**

- `file`  
  Filename including path if file is not in current working directory. File can also be a complete URL. The fileformat is .dat.

- `dir`  
  Alternative way to supply the directory where the file is located (default NULL).

**Value**

A single `repgrid` object in case one file and a list of `repgrid` objects in case multiple files are imported.
Note

Sci:Vesco offers the options to rate the construct poles separately or using a bipolar scale. The separated rating is done using the "tetralemma" field. The field is a bivariate plane on which each of the four (tetra) corners has a different meaning in terms of rating. Using this approach also allows ratings like: "both poles apply", "none of the poles apply" and all intermediate ratings can be chosen. This relaxes the bipolarity assumption often assumed in grid theory and allows for deviation from a strict bipolar rating if the constructs are not applied in a bipolar way. Using the tetralemma field for rating requires to analyze each construct separately though. This means we get a double entry grid where the emergent and contrast pole ratings might not simply be a reflection of on another. The tetralemma field is not yet supported and importing will fail. Currently only bipolar ratings are supported.

If a tetralemma field has been used for rating, OpenRepGrid will offer the option to transform the scores into "normal" grid ratings (i.e. restricted to bipolarity) by projecting the ratings from the bivariate tetralemma field onto the diagonal of the tetralemma field and thus forcing a bipolar rating type. This option is not recommended due to the fact that the conversion is susceptible to error when both ratings are near to zero.

TODO: For developers: The element IDs are not used yet. This might cause wrong assignments.

References


See Also

importGridcor, importGridstat, importScivesco, importGridsuite, importTxt, importExcel

Examples

```r
## Not run:
# supposing that the data file scivesco.scires is in the current directory
file <- "scivesco.scires"
rg <- importScivesco(file)

# specifying a directory (arbitrary example directory)
dir <- "/Users/markheckmann/data"
rg <- importScivesco(file, dir)

# using a full path
rg <- importScivesco("/Users/markheckmann/data/scivesco.scires")
```

```r
## End(Not run)
```
importTxt

Import grid data from a text file.

Description

If you do not have a grid program at hand you can define a grid using a standard text editor and by saving it as a .txt file. The .txt file has to be in a fixed format. There are three mandatory blocks each starting and ending with a predefined tag in uppercase letters. The first block starts with ELEMENTS and ends with END ELEMENTS and contains one element in each line. The other mandatory blocks contain the constructs and ratings (see below). In the block containing the constructs the left and right pole are separated by a colon (:). To define missing values use NA like in the example below. One optional block contains the range of the rating scale used defined by two numbers. The order of the blocks is arbitrary. All text not contained within the blocks is discarded and can thus be used for comments.

Usage

importTxt(file, dir = NULL, min = NULL, max = NULL)

Arguments

- **file**: A vector of filenames including the full path if file is not in current working directory. File can also be a complete URL. The file suffix has to be .txt.
- **dir**: Alternative way to supply the directory where the file is located (default NULL).
- **min**: Optional argument (numeric, default NULL) for minimum rating value in grid.
- **max**: Optional argument (numeric, default NULL) for maximum rating value in grid.

Details

--- .txt file ---

anything not contained within the tags will be discarded

ELEMENTS
element 1
element 2
element 3
END ELEMENTS

CONSTRUCTS
left pole 1 : right pole 1
left pole 2 : right pole 2
left pole 3 : right pole 3
left pole 4 : right pole 4
END CONSTRUCTS

RATINGS
Note that the maximum and minimum value has to be defined using the \texttt{min} and \texttt{max} arguments if no \texttt{RANGE} block is contained in the data file. Otherwise the scaling range is inferred from the available data and a warning is issued as the range may be erroneous. This may effect other functions that depend on knowing the correct range and it is thus strongly recommended to set the scale range correctly.

\textbf{Value}

A single \texttt{repgrid} object in case one file and a list of \texttt{repgrid} objects in case multiple files are imported.

\textbf{See Also}

\texttt{importGridcor}, \texttt{importGridstat}, \texttt{importScivesco}, \texttt{importGridsuite}, \texttt{importTxt}, \texttt{importExcel}

\textbf{Examples}

\begin{verbatim}
## Not run:

# supposing that the data file sample.txt is in the current directory
file <- "sample.txt"
rg <- importTxt(file)

# specifying a directory (arbitrary example directory)
dir <- "/Users/markheckmann/data"
gr <- importTxt(file, dir)

# using a full path
rg <- importTxt("/Users/markheckmann/data/sample.txt")

# importing more than one .txt file via R code
files <- c("sample.txt", "sample_2.txt")
gr <- importTxt(files)

## End(Not run)
\end{verbatim}
indexBias

Calculate 'bias' of grid as defined by Slater (1977).

Description

"Bias records a tendency for responses to accumulate at one end of the grading scale" (Slater, 1977, p.88).

Usage

indexBias(x, min = NULL, max = NULL, digits = 2)

Arguments

x repgrid object.

min, max Minimum and maximum grid scale values. Nor needed if they are set for the grid.

digits Numeric. Number of digits to round to (default is 2).

Value

Numeric.

Note

STATUS: Working and checked against example in Slater, 1977, p. 87.

References


See Also

indexVariability

Examples

indexBias(boeker)
indexBieri

Bieri’s index of cognitive complexity

Description

The index builds on the number of rating matches between pairs of constructs. It is the relation between the total number of matches and the possible number of matches.

Usage

indexBieri(x, deviation = 0)

Arguments

x A repgrid object.

deviation Maximal difference between ratings to be considered a match (default 0 = identical scores for a match).

Details

CAVEAT: The Bieri index will change when constructs are reversed.

Value

List of class indexBieri:

• grid: The grid used to calculate the index
• deviation The deviation parameter.
• matches_max Maximum possible number of matches across constructs.
• matches Total number of matches across constructs.
• constructs: Matrix with no. of matches for constructs.
• bieri: Bieri index (= matches / matches_max)

Examples

m <- indexBieri(boeker)

# several output options
print(m)
print(m, output = "IC") # construct matches

# extract the matrix of matches
m$constructs

# CAVEAT: Bieri's index changes when constructs are reversed
nr <- nrow(boeker)
l <- replicate(1000, swapPoles(boeker, sample(nr, sample(nr, 1)))))
Conflict measure for grids (Slade & Sheehan, 1979) based on correlations.

Description
Conflict measure as proposed by Slade and Sheehan (1979)

Usage
indexConflict1(x)

Arguments
x repgrid object.

Details
The first approach to mathematically derive a conflict measure based on grid data was presented by Slade and Sheehan (1979). Their operationalization is based on an approach by Lauterbach (1975) who applied the balance theory (Heider, 1958) for a quantitative assessment of psychological conflict. It is based on a count of balanced and imbalanced triads of construct correlations. A triad is imbalanced if one or all three of the correlations are negative, i.e. leading to contrary implications. This approach was shown by Winter (1982) to be flawed. An improved version was proposed by Bassler et al. (1992) and has been implemented in the function indexConflict2.

The table below shows when a triad made up of the constructs A, B, and C is balanced and imbalanced.

<table>
<thead>
<tr>
<th>cor(A,B)</th>
<th>cor(A,C)</th>
<th>cor(B,C)</th>
<th>Triad characteristic</th>
</tr>
</thead>
<tbody>
<tr>
<td>+</td>
<td>+</td>
<td>+</td>
<td>balanced</td>
</tr>
<tr>
<td>+</td>
<td>+</td>
<td>-</td>
<td>imbalanced</td>
</tr>
<tr>
<td>+</td>
<td>-</td>
<td>+</td>
<td>imbalanced</td>
</tr>
<tr>
<td>+</td>
<td>-</td>
<td>-</td>
<td>balanced</td>
</tr>
<tr>
<td>-</td>
<td>+</td>
<td>+</td>
<td>imbalanced</td>
</tr>
<tr>
<td>-</td>
<td>+</td>
<td>-</td>
<td>balanced</td>
</tr>
<tr>
<td>-</td>
<td>-</td>
<td>+</td>
<td>balanced</td>
</tr>
<tr>
<td>-</td>
<td>-</td>
<td>-</td>
<td>imbalanced</td>
</tr>
</tbody>
</table>

Value
A list with the following elements:
indexConflict2

<table>
<thead>
<tr>
<th>total</th>
<th>Total number of triads</th>
</tr>
</thead>
<tbody>
<tr>
<td>imbalanced</td>
<td>Number of imbalanced triads</td>
</tr>
<tr>
<td>prop.balanced</td>
<td>Proportion of balanced triads</td>
</tr>
<tr>
<td>prop.imbalanced</td>
<td>Proportion of imbalanced triads</td>
</tr>
</tbody>
</table>

References


See Also

indexConflict2 for an improved version of this measure; see indexConflict3 for a measure based on distances.

Examples

```r
indexConflict2(feixas2004)
indexConflict2(boeker)
```

---

**indexConflict2**  
Conflict measure for grids (Bassler et al., 1992) based on correlations.

**Description**

Conflict measure as proposed by Bassler et al. (1992).

**Usage**

```r
indexConflict2(x, crit = 0.03)
```

**Arguments**

- `x`  
  repgrid object.
- `crit`  
  Sensitivity criterion with which triads are marked as unbalanced. A bigger values will lead to less imbalanced triads. The default is 0.03. The value should be adjusted with regard to the researchers interest.
Details

The function calculates the conflict measure as devised by Bassler et al. (1992). It is an improved version of the ideas by Slade and Sheehan (1979) that have been implemented in the function `indexConflict1`. The new approach also takes into account the magnitude of the correlations in a trait to assess whether it is balanced or imbalanced. As a result, small correlations that are psychologically meaningless are considered accordingly. Also, correlations with a small magnitude, i.e. near zero, which may be positive or negative due to chance alone will no longer distort the measure (Bassler et al., 1992).

Description of the balance / imbalance assessment:

1. Order correlations of the triad by absolute magnitude, so that \( r_{\text{max}} > r_{\text{mdn}} > r_{\text{min}} \).
2. Apply Fisher's Z-transformation and division by 3 to yield values between 1 and -1.
3. Check whether the triad is balanced by assessing if the following relation holds:
   - If \( Z_{\text{max}}Z_{\text{mdn}} > 0 \), the triad is balanced if \( Z_{\text{max}}Z_{\text{mdn}} - Z_{\text{min}} \leq \text{crit} \). 
   - If \( Z_{\text{max}}Z_{\text{mdn}} < 0 \), the triad is balanced if \( Z_{\text{min}} - Z_{\text{max}}Z_{\text{mdn}} \leq \text{crit} \).

Personal remarks (MH)

I am a bit suspicious about step 2 from above. To divide by 3 appears pretty arbitrary. The r for a z-values of 3 is 0.9950548 and not 1. The r for 4 is 0.9993293. Hence, why not a value of 4, 5, or 6? Denoting the value to divide by with a, the relation for the first case translates into \( aZ_{\text{max}}Z_{\text{mdn}} \leq \frac{\text{crit}}{a} + Z_{\text{min}} \). a x Z_{\text{max}} x Z_{\text{mdn}} \leq \text{crit} + Z_{\text{min}}. This shows that a bigger value of a will make it more improbable that the relation will hold.

References


See Also

See `indexConflict1` for the older version of this measure; see `indexConflict3` for a measure based on distances instead of correlations.

Examples

```r
## Not run:

indexConflict2(bell2010)

x <- indexConflict2(bell2010)
print(x)
```
# show conflictive triads
print(x, output = 2)

# accessing the calculations for further use
x$total
x$imbalanced
x$prop.balanced
x$prop.imbalanced
x$triads.imbalanced

## End(Not run)

indexConflict3 Conflict or inconsistency measure for grids (Bell, 2004) based on distances.

Description

Conflict measure as proposed by Bell (2004).

Usage

indexConflict3(
  x,
  p = 2,
  e.out = NA,
  e.threshold = NA,
  c.out = NA,
  c.threshold = NA,
  trim = 20
)

Arguments

x repgrid object.

p The power of the Minkowski distance. p=2 (default) will result in euclidean distances, p=1 in city block distances.

e.out Numeric. A vector giving the indexes of the elements for which detailed stats (number of conflicts per element, discrepancies for triangles etc.) are prompted (default NA, i.e. no detailed stats for any element).

e.threshold Numeric. Detailed stats are prompted for those elements with a an attributable percentage to the overall conflicts higher than the supplied threshold (default NA).

c.out Numeric. A vector giving the indexes of the constructs for which detailed stats (discrepancies for triangles etc.) are prompted (default NA, i.e. no detailed stats).
c.threshold Numeric. Detailed stats are prompted for those constructs with a an attributable percentage to the overall conflicts higher than the supplied threshold (default NA).

trim The number of characters a construct (element) is trimmed to (default is 10). If NA no trimming is done. Trimming simply saves space when displaying the output.

Details

Measure of conflict or inconsistency as proposed by Bell (2004). The identification of conflict is based on distances rather than correlations as in other measures of conflict indexConflict1 and indexConflict2. It assesses if the distances between all components of a triad, made up of one element and two constructs, satisfies the "triangle inequality" (cf. Bell, 2004). If not, a triad is regarded as conflictive. An advantage of the measure is that it can be interpreted not only as a global measure for a grid but also on an element, construct, and element by construct level making it valuable for detailed feedback. Also, differences in conflict can be submitted to statistical testing procedures.

Status: working; output for euclidean and manhattan distance checked against Gridstat output. TODO: standardization and z-test for discrepancies; Index of Conflict Variation.

Value

A list (invisibly) containing containing:

- potential number of potential conflicts
- actual count of actual conflicts
- overall percentage of conflictive relations
- e.count number of involvements of each element in conflictive relations
- e.perc percentage of involvement of each element in total of conflictive relations
- e.count number of involvements of each construct in conflictive relation
- c.perc percentage of involvement of each construct in total of conflictive relations
- e.stats detailed statistics for prompted elements
- c.stats detailed statistics for prompted constructs
- e.threshold threshold percentage. Used by print method
- c.threshold threshold percentage. Used by print method
- enames trimmed element names. Used by print method
- cnames trimmed construct names. Used by print method

output

For further control over the output see print.indexConflict3.

References

See Also

See `indexConflict1` and `indexConflict2` for conflict measures based on triads of correlations.

Examples

```r
## Not run:

# calculate conflicts
indexConflict3(bell2010)

# show additional stats for elements 1 to 3
indexConflict3(bell2010, e.out = 1:3)

# show additional stats for constructs 1 and 5
indexConflict3(bell2010, c.out = c(1,5))

# finetune output
## change number of digits
x <- indexConflict3(bell2010)
print(x, digits = 4)

## omit discrepancy matrices for constructs
x <- indexConflict3(bell2010, c.out = 5:6)
print(x, discrepancies = FALSE)

## End(Not run)
```

indexDilemma

Detect implicative dilemmas (conflicts).

Description

Implicative Dilemmas

Usage

```r
indexDilemma(
  x,
  self = 1,
  ideal = ncol(x),
  diff.mode = 1,
  diff.congruent = NA,
  diff.discrepant = NA,
  diff.poles = 1,
  r.min = 0.35,
  exclude = FALSE,
```
indexDilemma

digits = 2,
show = FALSE,
output = 1,
index = TRUE,
trim = 20
)

Arguments

x repgrid object.
self Numeric. Index of self element.
ideal Numeric. Index of ideal self element.
diff.mode Numeric. Method adopted to classify construct pairs into congruent and discrepant. With \text{diff.mode}=1, the minimal and maximal score difference criterion is applied. With \text{diff.mode}=0 the Mid-point rating criterion is applied. Default is \text{diff.mode}=1.
diff.congruent Is used if \text{diff.mode}=1. Maximal difference between element ratings to define construct as congruent (default \text{diff.congruent}=1). Note that the value needs to be adjusted by the user according to the rating scale used.
diff.discrepant Is used if \text{diff.mode}=1. Minimal difference between element ratings to define construct as discrepant (default \text{diff.discrepant}=3). Note that the value needs to be adjusted by the user according to the rating scale used.
diff.poles Not yet implemented.
r.min Minimal correlation to determine implications between constructs.
exclude Whether to exclude the elements self and ideal self during the calculation of the inter-construct correlations. (default is FALSE).
digits Numeric. Number of digits to round to (default is 2).
show Whether to additionally plot the distribution of correlations to help the user assess what level is adequate for \text{r.min}.
output The type of output to return.
index Whether to print index numbers in front of each construct (default is TRUE).
trim The number of characters a construct (element) is trimmed to (default is 20). If \text{NA} no trimming is done. Trimming simply saves space when displaying the output.

Details

Implicative dilemmas are closely related to the notion of conflict. An implicative dilemma arises when a desired change on one construct is associated with an undesired implication on another construct. E. g. a timid subject may want to become more socially skilled but associates being socially skilled with different negative characteristics (selfish, insensitive etc.). Hence, he may anticipate that becoming less timid will also make him more selfish (cf. Winter, 1982). As a consequence, the subject will resist to the change if the negative presumed implications will threaten the patients identity and the predictive power of his construct system. From this stance the resistance
to change is a logical consequence coherent with the subjects construct system (Feixas, Saul, & Sanchez, 2000). The investigation of the role of cognitive dilemma in different disorders in the context of PCP is a current field of research (e.g. Feixas & Saul, 2004, Dorough et al. 2007).

The detection of implicative dilemmas happens in two steps. First the constructs are classified as being 'congruent' or 'discrepant'. Secondly, the correlation between a congruent and discrepant construct pair is assessed if it is big enough to indicate an implication.

**Classifying the construct**

To detect implicit dilemmas the construct pairs are first identified as 'congruent' or 'discrepant'. The assessment is based on the rating differences between the elements 'self' and 'ideal self'. A construct is 'congruent' if the construction of the 'self' and the preferred state (i.e. ideal self) are the same or similar. A construct is discrepant if the construction of the 'self' and the 'ideal' is dissimilar.

There are two popular accepted methods to identify congruent and discrepant constructs:

1. "Scale Midpoint criterion" (cf. Grice 2008)
2. "Minimal and maximal score difference" (cf. Feixas & Saul, 2004)

"Scale Midpoint criterion" (cf. Grice 2008)

As reported in the Idiogrid (v. 2.4) manual: "[..] The Scale Midpoint uses the scales as the 'dividing line' for discrepancies; for example, if the actual element is rated above the midpoint, then the discrepancy exists (and vice versa). If the two selves are the same as the actual side of the scale, then a discrepancy does not exist". As an example: Assuming a scoring range of 1-7, the midpoint score will be 4, we then look at self and ideal-self scoring on any given construct and we proceed as follow:

- If the scoring of Self AND Ideal Self are both < 4: construct is "Congruent"
- If the scoring of Self AND Ideal Self are both > 4: construct is "Congruent"
- If the scoring of Self is < 4 AND Ideal Self is > 4 (OR vice versa): construct is "discrepant"
- If scoring Self OR Ideal Self = 4 then the construct is NOT Discrepant and it is "Undifferentiated"

"Minimal and maximal score difference criterion" (cf. Feixas & Saul, 2004)

This other method is more conservative and it is designed to minimize Type I errors by a) setting a default minimum correlation between constructs of \( r = .34 \); b) discarding cases where the ideal Self and self are neither congruent or discrepant; c) discarding cases where ideal self is "not oriented", i.e. scored at the midpoint.

E.g. suppose the element 'self' is rated 2 and 'ideal self' 5 on a scale from 1 to 6. The ratings differences are 5-2 = 3. If this difference is smaller than e.g. 1 the construct is 'congruent', if it is bigger than 3 it is 'discrepant'.

The values used to classify the constructs 'congruent' or 'discrepant' can be determined in several ways (cf. Bell, 2009):

1. They are set 'a priori'.
2. They are implicitly derived by taking into account the rating differences to the other constructs. (Not yet implemented)
The value mode is determined via the argument `diff.mode`. If no 'a priori' criteria to determine whether the construct is congruent or discrepant is supplied as an argument, the values are chosen according to the range of the rating scale used. For the following scales the defaults are chosen as:

<table>
<thead>
<tr>
<th>Scale</th>
<th>'A priori' criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 2</td>
<td>-&gt; con: &lt;=0 disc: &gt;=1</td>
</tr>
<tr>
<td>1 2 3</td>
<td>-&gt; con: &lt;=0 disc: &gt;=2</td>
</tr>
<tr>
<td>1 2 3 4</td>
<td>-&gt; con: &lt;=0 disc: &gt;=2</td>
</tr>
<tr>
<td>1 2 3 4 5</td>
<td>-&gt; con: &lt;=1 disc: &gt;=3</td>
</tr>
<tr>
<td>1 2 3 4 5 6</td>
<td>-&gt; con: &lt;=1 disc: &gt;=3</td>
</tr>
<tr>
<td>1 2 3 4 5 6 7</td>
<td>-&gt; con: &lt;=1 disc: &gt;=4</td>
</tr>
<tr>
<td>1 2 3 4 5 6 7 8</td>
<td>-&gt; con: &lt;=1 disc: &gt;=5</td>
</tr>
<tr>
<td>1 2 3 4 5 6 7 8 9</td>
<td>-&gt; con: &lt;=2 disc: &gt;=5</td>
</tr>
<tr>
<td>1 2 3 4 5 6 7 8 9 10</td>
<td>-&gt; con: &lt;=2 disc: &gt;=6</td>
</tr>
</tbody>
</table>

**Defining the correlations**
As the implications between constructs cannot be derived from a rating grid directly, the correlation between two constructs is used as an indicator for implication. A large correlation means that one construct pole implies the other. A small correlation indicates a lack of implication. The minimum criterion for a correlation to indicate implication is set to .35 (cf. Feixas & Saul, 2004). The user may also choose another value. To get a an impression of the distribution of correlations in the grid, a visualization can be prompted via the argument `show`. When calculating the correlation used to assess if an implication is given or not, the elements under consideration (i.e. self and ideal self) can be included (default) or excluded. The options will cause different correlations (see argument `exclude`).

**Example of an implicative dilemma**
A depressive person considers herself as 'timid' and wished to change to the opposite pole she defines as 'extraverted'. This construct is called discrepant as the construction of the 'self' and the desired state (e.g. described by the 'ideal self') on this construct differ. The person also considers herself as 'sensitive' (preferred pole) for which the opposite pole is 'selfish'. This construct is congruent, as the person construes herself as she would like to be. If the person now changed on the discrepant construct from the undesired to the desired pole, i.e. from timid to extraverted, the question can be asked what consequences such a change has. If the person construes being timid and being sensitive as related and that someone who is extraverted will not be timid, a change on the first construct will imply a change on the congruent construct as well. Hence, the positive shift from timid to extraverted is presumed to have a undesired effect in moving from sensitive towards selfish. This relation is called an implicative dilemma. As the implications of change on a construct cannot be derived from a rating grid directly, the correlation between two constructs is used as an indicator of implication.

**Value**
List object of class `indexDilemma`, containing the result from the calculations.
Author(s)

Mark Heckmann, Alejandro García, Diego Vitali

References


See Also

print.indexDilemma, plot.indexDilemma

Examples

```r
id <- indexDilemma(boeker, self = 1, ideal = 2)
id

# adjust minimal correlation
indexDilemma(boeker, self = 1, ideal = 2, r.min = .5)

# adjust congruence and discrepancy ranges
indexDilemma(boeker, self = 1, ideal = 2, diff.congruent = 0, diff.discrepant = 4)

# print options (see ?print.indexDilemma for help)
print(id, output = "D")  # dilemmas only
print(id, output = "OD")  # overview and dilemmas

# plot dilemmas as network graph (see ?plot.indexDilemma for help)
# set a seed for reproducibility
plot(id, layout = "rows")
plot(id, layout = "circle")
plot(id, layout = "star")
```
**Description**

A Dilemmatic Construct (DC) is one where the ideal element is rated on the scale midpoint. This means, the person cannot decide which of the poles is preferable. Such constructs are called "dilemmatic". For example, on a rating scale from 1 to 7, a rating of 4 on the ideal element means that the construct is dilemmatic. By definition, DCs can only emerge in scales with an uneven number of rating options, i.e. 5-point scale, 7-point scale etc. However, the function makes it possible to allow for a deviation from the midpoint, to still count as dilemmatic. This is useful if the grid uses a large rating scale, e.g. from 0 to 100 or a visual analog scale, as some grid administration programs do. In this case you may want to set ratings, for example, between 45 and 55 as close enough to the midpoint to indicate that both poles are equally desirable.

**Usage**

```r
indexDilemmatic(x, ideal, deviation = 0, warn = TRUE)
```

**Arguments**

- `x` A repgrid object.
- `ideal` Index of ideal element.
- `deviation` The maximal deviation from the scale midpoint for an ideal rating to be considered dilemmatic (default = 0). For scales larger than a 17-point rating scale a warning is raised, if deviation is 0 (see details).
- `warn` Show warnings?

**Value**

List of class indexDilemmatic:

- `ideal`: Name of the ideal element.
- `n_constructs`: Number of grid’s constructs.
- `scale`: Minimum and maximum of grid rating scale.
- `midpoint`: Midpoint of rating scale.
- `lower,upper`: Lower and upper value to for a rating to be considered in the midpoint range.
- `midpoint_range`: Midpoint range as interval.
- `n_dilemmatic`: Number of dilemmatic constructs.
- `perc_dilemmatic`: Percentage of constructs which are dilemmatic.
- `i_dilemmatic`: Index of dilemmatic constructs.
- `dilemmatic_constructs`: Labels of dilemmatic constructs.
- `summary`: Summary dataframe.
Examples

```r
dc <- indexDilemmatic(feixas2004, ideal = 13)
dc

# control the output
print(dc, output = "S")  # Summary
print(dc, output = "D")  # Details
```

---

**indexIntensity**

**Intensity index**

Description

Calculate intensity index.

Usage

```r
indexIntensity(x, rc = FALSE, trim = 30)
```

Arguments

- `x` repgrid object.
- `rc` Whether to use Cohen’s `rc` for the calculation of inter-element correlations. See `elementCor` for further explanations of this measure.
- `trim` The number of characters a construct is trimmed to (default is 30). If `NA` no trimming occurs. Trimming simply saves space when displaying correlation of constructs or elements with long names.

Details

The Intensity index has been suggested by Bannister (1960) as a measure of the amount of construct linkage. Bannister suggested that the score reflects the degree of organization of the construct system under investigation (Bannister & Mair, 1968). The index resulted from his and his colleagues work on construction systems of patient suffering schizophrenic thought disorder. The concept of intensity has a theoretical connection to the notion of "tight" and "loose" construing as proposed by Kelly (1991). While tight constructs lead to unvarying prediction, loose constructs allow for varying predictions. Bannister hypothesized that schizophrenic thought disorder is linked to a process of extremely loose construing leading to a loss of predictive power of the subject’s construct system. The Intensity score as a structural measure is thought to reflect this type of system disintegration (Bannister, 1960).

Implementation as in the Gridcor program and explained on the corresponding help pages: "...the sum of the squared values of the correlations of each construct with the rest of the constructs, averaged by the total number of constructs minus one. This process is repeated with each element, and the overall Intensity is calculated by averaging the intensity scores of constructs and elements." [https://www.ub.edu/terdep/pag/man11.html](https://www.ub.edu/terdep/pag/man11.html). Currently the total is calculated as the unweighted average of all single scores (for elements and construct).
Value

An object of class indexIntensity containing a list with the following elements:

- **c.int**: Intensity scores by construct.
- **e.int**: Intensity scores by element.
- **c.int.mean**: Average intensity score for constructs.
- **e.int.mean**: Average intensity score for elements.
- **total.int**: Total intensity score.

Development

TODO: Results have not been tested against other programs’ results.

References


Examples

```r
indexIntensity(bell2010)
indexIntensity(bell2010, trim = NA)

# using Cohen's rc for element correlations
indexIntensity(bell2010, rc = TRUE)

# save output
x <- indexIntensity(bell2010)
x

# printing options
print(x, digits=4)

# accessing the objects' content
x$c.int
x$e.int
x$c.int.mean
x$e.int.mean
x$total.int
```
indexPolarization

Polarization (percentage of extreme ratings)

Description

Polarization is the percentage of extreme ratings, e.g. the values 1 and 7 for a grid with a 7-point ratings scale.

Usage

indexPolarization(x, deviation = 0)

Arguments

x
A repgrid object.

deviation
The maximal deviation from the end of the rating scale for values to be considered an 'extreme' rating. By default only values that lie directly on ends of the ratings scales are considered 'extreme' (default = 0).

Value

List of class indexPolarization:

- scale: Minimum and maximum of grid rating scale.
- lower, upper: Lower and upper value to decide which ratings are considered extreme.
- polarization_total: Grid’s overall polarization.
- polarization_constructs: Polarization per construct.
- polarization_elements: Polarization per element.

Examples

p <- indexPolarization(boeker)
p

# control the output
print(p, output = "T") # total polarization
print(p, output = "C") # construct polarization
print(p, output = "E") # element polarization
indexPvaff

Percentage of Variance Accounted for by the First Factor (PVAFF)

Description

The PVAFF is used as a measure of cognitive complexity. It was introduced in an unpublished PhD thesis by Jones (1954, cit. Bonarius, 1965). To calculate it, the 'first factor' two different methods may be used. One applies principal component analysis (PCA) to the construct centered raw data (default), the second applies SVD to the construct correlation matrix. The PVAFF reflects the amount of variation that is accounted for by a single linear component. If a single latent component is able to explain the variation in the grid, the cognitive complexity is said to be low. In this case the construct system is regarded as 'simple' (Bell, 2003).

Usage

indexPvaff(x, method = 1)

Arguments

x repgrid object.

method Method to compute PVAFF: 1 = PCA is applied to raw data with centered constructs (default), 2 = SVD of construct correlation matrix.

References


James, R. E. (1954). Identification in terms of personal constructs (Unpublished doctoral thesis). Ohio State University, Columbus, OH.

Examples

indexPvaff(bell2010)
indexSelfConstruction  

**Self construction profile**

**Description**

TBD

**Usage**

```r
indexSelfConstruction(
  x,
  self,
  ideal,
  others = c(-self, -ideal),
  method = "euclidean",
  p = 2,
  normalize = TRUE,
  round = FALSE
)
```

**Arguments**

- `x`  
  A repgrid object.

- `self`  
  Numeric. Index of self element.

- `ideal`  
  Numeric. Index of ideal element.

- `others`  
  Numeric. Index(es) of self related "other" elements (e.g. father, friend).

- `method`  
  The distance or correlation measure:
  - Distances: euclidean, manhattan, maximum, canberra, binary, minkowski
  - Correlations: pearson, kendall, spearman

- `p`  
  The power of the Minkowski distance, in case minkowski is used as argument for method, otherwise it is ignored.

- `normalize`  
  Normalize values?

- `round`  
  Round average rating scores for 'others' to closest integer?

**Value**

List object of class `indexSelfConstruction`, containing the results from the calculations:

- `grid`: Reduced grid with self, ideal and others
- `method_type`: method type (correlation or distance)
- `method`: correlation or distance method used
- `self_element`: name of the self element
- `ideal_element`: name of the ideal element
indexVariability

- other_elements: name(s) of other elements
- self_ideal: measure between self and ideal
- self_others: measure between self and others
- ideal_others: measure between ideal and others

Author(s)

Mark Heckmann, José Antonio González Del Puerto

References

TBD

Examples

# using distance measures
indexSelfConstruction(boeker, 1, 2, c(3:11), method = "euclidean")
indexSelfConstruction(boeker, 1, 2, c(3:11), method = "manhattan")
indexSelfConstruction(boeker, 1, 2, c(3:11), method = "minkowski", p = 3)

# using correlation measures
indexSelfConstruction(boeker, 1, 2, c(3:11), method = "pearson")
indexSelfConstruction(boeker, 1, 2, c(3:11), method = "spearman")

# using not-normalized distances
indexSelfConstruction(boeker, 1, 2, c(3:11), method = "euclidean", normalize = FALSE)

# printing the results (biplot only works with)
cp <- indexSelfConstruction(boeker, 1, 2, c(3:11))
cp$grid # grid with self, ideal and others
biplot2d(cp$grid, center = 4) # midpoint centering

indexVariability  Calculate 'variability' of a grid as defined by Slater (1977).

Description

Variability records a tendency for the responses to gravitate towards both end of the gradings scale. (Slater, 1977, p.88).

Usage

indexVariability(x, min = NULL, max = NULL, digits = 2)

Arguments

x  repgrid object.
min, max  Minimum and maximum grid scale values. Not needed if they are set for the grid.
digits  Numeric. Number of digits to round to (default is 2).
Value

Numeric.

Note

STATUS: working and checked against example in Slater, 1977, p.88.

References


See Also

`indexBias`

Examples

`indexVariability(boeker)`

---

```r
is.repgrid(x)
```

Description

Test if object has class `repgrid`

Usage

`is.repgrid(x)`

Arguments

- `x` Any object.
left

Move construct or element in grid to the left, right, up or down.

Description

Move element in grid to the right.

Usage

left(x, pos = 0)
right(x, pos = 0)
up(x, pos = 0)
down(x, pos = 0)

Arguments

x repgrid object.
pos Row (column) number of construct (element) to be moved leftwards, rightwards, upwards or downwards. The default is 0. For indexes outside the range of the grid no moving is done.

Value

repgrid object.
repgrid object
repgrid object
repgrid object

Examples

## Not run:
x <- randomGrid()
left(x, 2)  # 2nd element to the left
right(x, 1)  # 1st element to the right
up(x, 2)  # 2nd construct upwards
down(x, 1)  # 1st construct downwards

## End(Not run)

makeRepgrid

*Make a new repgrid object.*

**Description**

The function creates a repgrid object from scratch. A number of parameters have to be defined in order to make a new grid (see parameters).

**Usage**

```r
makeRepgrid(args)
```

**Arguments**

- `args` Arguments needed for the construction of the grid (list). These include `name` followed by a vector containing the element names. `l.name` followed by a vector with the left construct poles. `r.name` followed by a vector with the right construct poles. `scores` followed by a vector containing the rating scores row wise.

**Value**

`NULL`

**Examples**

```r
## Not run:

# make list object containing the arguments
args <- list( name=c("element_1", "element_2", "element_3", "element_4"), 
        l.name=c("left_1", "left_2", "left_3"),
        r.name=c("right_1", "right_2", "right_3"),
        scores=c( 1,0,1,0, 
       1,1,1,0, 
       1,0,1,0 ) )
# make grid object
x <- makeRepgrid(args)
x

## End(Not run)
```
matches  

Number of matches in ratings

Description

Count the number of matches, i.e. (near) identical ratings between two elements or constructs. Matches are used as the basis for the calculation of grid indexes.

Usage

matches(x, deviation = 0, diag.na = TRUE)

Arguments

- **x**: A `repgrid` object.
- **deviation**: Maximal difference between ratings to be considered a match (default 0 = only identical rating scores are a match). Especially useful for long rating scale (e.g. 0 to 100).
- **diag.na**: Whether to set the diagonal of the matrices to NA (default is TRUE).

Value

A list of class `org.matches` with:

- **grid**: The grid used to calculate the matches.
- **deviation**: The deviation parameter.
- **max_constructs**: Maximum possible number of matches across constructs.
- **max_elements**: Maximum possible number of matches across elements.
- **total_constructs**: Total number of matches across constructs.
- **total_elements**: Total number of matches across elements.
- **constructs**: Matrix with no. of matches for constructs.
- **elements**: Matrix with no. of matches for elements.

Examples

```r
m <- matches(boeker)

# several output options
print(m, index = FALSE, names = FALSE, upper = FALSE)
print(m, output = "C")  # construct matches
print(m, output = "E")  # element matches

# extract the matrices
m$constructs
m$elements
```
midpoint  

*Midpoint of the grid rating scale*

**Description**
Midpoint of the grid rating scale

**Usage**

```
midpoint(x)
```

**Arguments**

- `x` repgrid object.

**Value**
Midpoint of scale.

**Examples**

```
midpoint(bell2010)
```

normalize  

*Normalize rows or columns by its standard deviation.*

**Description**
Normalize rows or columns by its standard deviation.

**Usage**

```
normalize(x, normalize = 0, ...)
```

**Arguments**

- `x` matrix
- `normalize` A numeric value indicating along what direction (rows, columns) to normalize by standard deviations. 0 = none, 1 = rows, 2 = columns (default is 0).
- `...` Not evaluated.

**Value**
Not yet defined TODO!
Examples

```r
## Not run:
x <- matrix(sample(1:5, 20, rep=T), 4)
normalize(x, 1)  # normalizing rows
normalize(x, 2)  # normalizing columns
## End(Not run)
```

---

OpenRepGrid

**OpenRepGrid**: an *R* package for the analysis of repertory grids.

---

Description

The **OpenRepGrid** package provides tools for the analysis of repertory grid data. The repertory grid is a method devised by George Alexander Kelly in his seminal work "The Psychology of Personal Constructs" published in 1955. The repertory grid has been used in and outside the context of Personal Construct Psychology (PCP) in a broad range of fields. For an introduction into the technique see e.g. Fransella, Bell and Bannister (2003).

Note

To get started with **OpenRepGrid** visit the project’s home under openrepgrid.org. On this site you will find tutorials, explanation about the theory, the analysis methods and the corresponding R code.

To see the preferable citation of the **OpenRepGrid** package, type `citation("OpenRepGrid")` into the R console.

Disclaimer: Note that the package is distributed under the GPL 2 license. It is work in progress and is continuously being improved by hopefully numerous contributors. It may contain bugs and errors. There is no warranty whatsoever for the program.

Author(s)

**OpenRepGrid** is maintained by Mark Heckmann. Other contributors: Alejandro García, Diego Vitali. Researchers interested in contributing to the package are welcome.

The **OpenRepGrid** code is hosted on GitHub. The GitHub site provides additional information and allows to file bug reports or feature requests. Bug reports can also be emailed to the package maintainer or issued on openrepgrid.org under section *Suggestions/Issues*. The package maintainer is Mark Heckmann <heckmann(dot)mark(at)gmail(dot)com>.

References


OpenRepGrid-overview

See Also

Useful links:

- https://github.com/markheckmann/OpenRepGrid


Description

This documentation page contains an overview over the package functions ordered by topics. The best place to start learning OpenRepGrid will be the package website https://openrepgrid.org though.

Functions sorted by topic

Manipulating grids

Manipulating grids

- left: Move construct(s) to the left
- right: Move construct(s) to the right
- up: Move construct(s) upwards
- down: Move construct(s) downwards

Loading and saving data

- importGridcor: Import GRIDCOR data files
- importGridstat: Import Gridstat data files
- importGridsuite: Import Gridsuite data files
- importScivesco: Import sci:vesco data files
- importTxt: Import grid data from a text file
- saveAsTxt: Save grid in a text file

Analyzing constructs

Descriptive statistics of constructs
- Construct correlations
- Distance
- Root mean square of inter-construct correlations
- Somers’ D
- Principal component analysis (PCA) of construct correlation matrix
- Cluster analysis of constructs

Analyzing elements

Visual representation
**Bertin plots**

*bertain*  
Make Bertin display of grid data

*bertainCluster*  
Bertin display with corresponding cluster analysis

**Biplots**

*biplot2d*  
Draw a two-dimensional biplot

*biplotEsa2d*  
Plot an eigenstructure analysis (ESA) biplot in 2D

*biplotSlater2d*  
Draws Slater’s INGRID biplot in 2D

*biplotPseudo3d*  
See ‘biplotPseudo3d’ for its use. Draws a biplot of the grid in 2D with depth impression (pseudo 3D)

*biplotEsaPseudo3d*  
Plot an eigenstructure analysis (ESA) in 2D grid with 3D impression (pseudo 3D)

*biplotSlaterPseudo3d*  
Draws Slater’s biplot in 2D with depth impression (pseudo 3D)

*biplot3d*  
Draw grid in rgl (3D device)

*biplotEsa3d*  
Draw the eigenstructure analysis (ESA) biplot in rgl (3D device)

*biplotSlater3d*  
Draw the Slater’s INGRID biplot in rgl (3D device)

*biplotSimple*  
A graphically unsophisticated version of a biplot

**Index measures**

*indexConflict1*  
Conflict measure for grids (Slade & Sheehan, 1979) based on correlations

*indexConflict2*  
Conflict measure for grids (Bassler et al., 1992) based on correlations

*indexConflict3*  
Conflict or inconsistency measure for grids (Bell, 2004) based on distances

*indexDilemma*  
Detect implicative dilemmas (conflicts)

*indexIntensity*  
Intensity index

*indexPvaff*  
Percentage of Variance Accounted for by the First Factor (PV AFF)

*indexBias*  
Calculate 'bias' of grid as defined by Slater (1977)

*indexVariability*  
Calculate 'variability' of a grid as defined by Slater (1977)

**Special features**

*alignByIdeal*  
Align constructs using the ideal element to gain pole preferences

*alignByLoadings*  
Align constructs by loadings on first principal component

*reorder2d*  
Order grid by angles between construct and/or elements in 2D
Settings

OpenRepGrid uses several default settings e.g. to determine how many construct characters to display by default when displaying a grid. The function settings can be used to show and change these settings. Also it is possible to store the settings to a file and load the settings file to restore the settings.

settings Show and modify global settings for OpenRepGrid
settingsSave Save OpenRepGrid settings to file
settingsLoad Load OpenRepGrid settings from file

Grid datasets

OpenRepGrid already contains some ready to use grid data sets. Most of the datasets are taken from the literature. To output the data simply type Type the name of the dataset to the console and press enter.

Single grids

bell2010 Grid data from a study by Haritos et al. (2004) on role titles; used for demonstration of construct alignment.
bellmcgorry1992 Grid from a psychotic patient used in Bell (1997, p. 6). Data originated from a study by Bell and McGorry.
boeker Grid from a seventeen year old female schizophrenic patient undergoing last stage of psychoanalytic psychotherapy (Boeker, 1996, p. 163).
fbb2003 Dataset used in A manual for Repertory Grid Technique (Fransella, Bell, & Bannister, 2003b, p. 60).
leach2001a, leach2001b Pre- (a) and post-therapy (b) dataset from sexual child abuse survivor (Leach, Freshwater, Aldridge, & Sunderland, 2001, p. 227).
raeithel Grid data to demonstrate the use of Bertin diagrams (Raeithel, 1998, p. 223). The context of its administration is unknown.
slater1977a Drug addict grid dataset from (Slater, 1977, p. 32).
slater1977b Grid dataset (ranked) from a seventeen year old female psychiatric patient (Slater, 1977, p. 110) showing depression, anxiety and self-mutilation.

Multiple grids

NOT YET AVAILABLE

Functions for developers

OpenRepGrid: internal functions overview for developers.

Below you find a guide for developers: these functions are usually not needed by the casual user. The internal functions have a twofold goal 1) to provide means for advanced numerical grid analysis and 2) to facilitate function development. The function for these purposes are internal, i.e. they are not visible in the package documentation. Nonetheless they do have a documentation that can be accesses in the same way as for other functions. More in the details section.
Functions for advanced grid analysis

The package provides functions to facilitate numerical research for grids. These comprise the generation of random data, permutation of grids etc. to facilitate Monte Carlo simulations, batch analysis of grids and other methods. With R as an underlying framework, the results of grid analysis easily lend themselves to further statistical processing and analysis within R. This is one of the central advantages for researchers compared to other standard grid software. The following table lists several functions for these purposes.

```
randomGrid
randomGrids
permuteConstructs
permuteGrid
quasiDistributionDistanceSlater
```

Modules for function development

Beside the advanced analysis feature the developer’s functions comprise low-level modules to create new functions for grid analysis. Though the internal structure of a repgrid object in R is simple (type e.g. `str(bell2010, 2)` to get an impression), it is convenient to not have to deal with access on this level. Several function like e.g. `getElementNames` are convenient wrappers that perform standard tasks needed when implementing new functions. The following table lists several functions for these purposes.

```
getRatingLayer Retrieve grid scores from grid object.
getNoOfConstructs Get the number of constructs in a grid object.
getNoOfElements Get the number of elements in a grid object.
dim Get grid dimensions, i.e. constructs x elements.
setScale Get minimum and maximum scale value used in grid.
scaleMidpoint Get midpoint of the grid rating scale.
getConstructNames Get construct names.
getConstructNames2 Get construct names (another newer version).
getElementNames Retrieve element names of repgrid object.
bindConstructs Concatenate the constructs of two grids.
doubleEntry Join the constructs of a grid with the same reversed constructs.
```

Other internal functions

```
importTxtInternal
```

Author(s)

Current members of the **OpenRepGrid** development team: Mark Heckmann. Everyone who is interested in developing the package is invited to join.
The OpenRepGrid package development is hosted on github (https://github.com/markheckmann/OpenRepGrid). The github site provides information and allows to file bug reports or feature requests. Bug reports can also be emailed to the package maintainer or issued on https://openrepgrid.org under section Suggestions/Issues. The package maintainer is Mark Heckmann <heckmann(dot)mark(at)gmail(dot)com>.

permuteConstructs

Generate a list with all possible construct reflections of a grid.

Description

Generate a list with all possible construct reflections of a grid.

Usage

permuteConstructs(x, progress = TRUE)

Arguments

x repgrid object.

progress Whether to show a progress bar (default is TRUE). This may be sensible for a larger number of elements.

Value

A list of repgrid objects with all possible permutations of the grid.

Examples

## Not run:

l <- permuteConstructs(mackay1992)
l

## End(Not run)
perturbate

Perturbate grid ratings

Description
Randomly subtract or add an amount to a proportion of the grid ratings. This emulates randomness during the rating process, producing a grid which might also have resulted.

Usage
perturbate(x, prop = 0.1, amount = c(-1, 1), prob = c(0.5, 0.5))

grids_perturbate(x, n = 10, prop = 0.1, amount = c(-1, 1), prob = c(0.5, 0.5))

Arguments

x A repgrid object.
prop The proportion of ratings to be perturbated.
amount The amount set of possible perturbations. Will depend on scale range. Usually -1, 1 are reasonable settings
prob Probability for each amount to occur.
n Number of perturbated grid to generate.

Examples
## All results for PVAFF index when ratings are slightly perturbated
p <- indexPvaff(boeker)
l <- grids_perturbate(boeker, n = 100, prop = .1)
pp <- sapply(l, indexPvaff) # apply indexPvaff function to all perturbated grids
range(pp) # min and max PVAFF
hist(pp, xlab = "PVAFF values") # visualize
abline(v = p, col = "blue", lty = 2)

randomGrid

Generate a random grid (quasis) of prompted size.

Description
This feature is useful for research purposes like exploring distributions of indexes etc.
Usage

randomGrid(
  nc = 10,
  ne = 15,
  nwc = 8,
  nwe = 5,
  range = c(1, 5),
  prob = NULL,
  options = 1
)

Arguments

nc     Number of constructs (default 10).
ne     Number of elements (default 15).
nwc    Number of random words per construct.
nwe    Number of random words per element.
range  Minimal and maximal scale value (default c(1, 5)).
prob   The probability of each rating value to occur. If NULL (default) the distribution is uniform.
options Use random sentences as constructs and elements (1) or not (0). If not, the elements and constructs are given default names and are numbered.

Value

repgrid object.

Examples

## Not run:

x <- randomGrid()
x
x <- randomGrid(10, 25)
x
x <- randomGrid(10, 25, options=0)
x

## End(Not run)
randomGrids

Generate a list of random grids (quasis) of prompted size.

Description

This feature is useful for research purposes like exploring distributions of indexes etc. The function is a simple wrapper around `randomGrid`.

Usage

```r
randomGrids(
  rep = 3,
  nc = 10,
  ne = 15,
  nwc = 8,
  nwe = 5,
  range = c(1, 5),
  prob = NULL,
  options = 1
)
```

Arguments

- `rep`: Number of grids to be produced (default is 3).
- `nc`: Number of constructs (default 10).
- `ne`: Number of elements (default 15).
- `nwc`: Number of random words per construct.
- `nwe`: Number of random words per element.
- `range`: Minimal and maximal scale value (default `c(1, 5)`).
- `prob`: The probability of each rating value to occur. If `NULL` (default) the distribution is uniform.
- `options`: Use random sentences as constructs and elements (1) or not (0). If not, the elements and constructs are given default names and are numbered.

Value

A list of `repgrid` objects.

Examples

```r
## Not run:
x <- randomGrids()
x
x <- randomGrids(5, 3, 3)
x
```
ratings <- randomGrids(5, 3, 3, options=0)

## End(Not run)

ratings

Extract ratings (wide or long format)

Description

Extract ratings (wide or long format)

Usage

ratings(x, names = TRUE, trim = 10)

ratings_df(x, long = FALSE, names = TRUE, trim = NA)

ratings(x, i, j) <- value

Arguments

x A repgrid object.

names Extract row and columns names (constructs and elements).

trim The number of characters a row or column name is trimmed to (default is 10). If NA no trimming is done. Trimming simply saves space when displaying the output.

long Return as long format? (default FALSE)

i, j Row and column indices.

value Numeric replacement value(s).

Value

A matrix.

See Also

'<<-method'
Examples

```r
## store Bell's dataset in x
x <- bell2010

## get ratings
ratings(x)

## replace ratings
ratings(x)[1,1] <- 1
# noet that this is even simpler using the repgrid object directly
x[1,1] <- 2

# replace several values
ratings(x)[1,1:5] <- 1
x[1,1:5] <- 2  # the same

ratings(x)[1:3,5:6] <- matrix(5, 3, 2)
x[1:3,5:6] <- matrix(5, 3, 2)  # the same

## ratings as dataframe in wide or long format
ratings_df(x)
ratings_df(x, long = TRUE)
```

---

reorder.repgrid  
Invert construct and element order

Description

Invert construct and element order

Usage

```r
## S3 method for class 'repgrid'
reorder(x, what = "CE", ...)
```

Arguments

- **x**: A repgrid object.
- **what**: A string or numeric to indicate if constructs ("C", 1) or elements ("C", 1), or both ("CE", 12) should be reversed.
- **...**: Ignored.
Examples

# invert order of constructs
reorder(boeker, "C")
reorder(boeker, 1)

# invert order of elements
reorder(boeker, "E")
reorder(boeker, 2)

# invert both (default)
reorder(boeker)
reorder(boeker, "CE")
reorder(boeker, 12)

# not reordering
reorder(boeker, NA)

---

reorder2d  
*Order grid by angles between construct and/or elements in 2D.*

Description

The approach is to reorder the grid matrix by their polar angles on the first two principal components from a data reduction technique (here the biplot, i.e. SVD). The function `reorder2d` reorders the grid according to the angles between the x-axis and the element (construct) vectors derived from a 2D biplot solution. This approach is apt to identify circumplex structures in data indicated by the diagonal stripe in the display (see examples).

Usage

```r
reorder2d(
  x,
  dim = c(1, 2),
  center = 1,
  normalize = 0,
  g = 0,
  h = 1 - g,
  rc = TRUE,
  re = TRUE,
  ...
)
```

Arguments

- `x`: repgrid object.
- `dim`: Dimension of 2D solution used to calculate angles (default c(1, 2)).
saveAsExcel

center Numeric. The type of centering to be performed. 0= no centering, 1= row mean centering (construct), 2= column mean centering (elements), 3= double-centering (construct and element means), 4= midpoint centering of rows (constructs). The default is 1 (row centering).

normalize A numeric value indicating along what direction (rows, columns) to normalize by standard deviations. 0 = none, 1= rows, 2 = columns (default is 0).

g Power of the singular value matrix assigned to the left singular vectors, i.e. the constructs.

h Power of the singular value matrix assigned to the right singular vectors, i.e. the elements.

rc Logical. Reorder constructs by similarity (default TRUE).

re Logical. Reorder elements by similarity (default TRUE).

Value
Reordered repgrid object.

Examples
## Not run:
##
x <- feixas2004
greorder2d(x) # reorder grid by angles in first two dimensions
greorder2d(x, rc=F) # reorder elements only
greorder2d(x, re=F) # reorder constructs only

saveAsExcel

Save grid in a Microsoft Excel file (.xlsx)

Description
saveAsExcel will save the grid as a Microsoft Excel file (.xlsx).

Usage
saveAsExcel(x, file, sheet = 1)

Arguments
x A repgrid object.

file Filename to save the grid to. The name should have the suffix .xlsx.

sheet Index of the sheet to write to.
saveAsTxt

Value
Invisibly returns the name of the file.

See Also
importExcel

Examples
## Not run:

```r
x <- randomGrid(options=0)
saveAsExcel(x, "grid.xlsx")
```

## End(Not run)

saveAsTxt

Save grid in a text file (txt).

Description
saveAsTxt will save the grid as a .txt file in format used by OpenRepGrid. This file format can also easily be edited by hand (see importTxt for a description).

Usage
```r
saveAsTxt(x, file = NA)
```

Arguments
- `x`: repgrid object.
- `file`: Filename to save the grid to. The name should have the suffix .txt.

Value
Invisibly returns the name of the file.

Note
Structure of a txt file that can be read by importTxt.

```
--------------- .txt file ---------------
anything not contained within the tags will be discarded
 ELEMENTS
element 1
```
element 2
element 3
END ELEMENTS

CONSTRUCTS
left pole 1 : right pole 1
left pole 2 : right pole 2
left pole 3 : right pole 3
left pole 4 : right pole 4
END CONSTRUCTS

RATINGS
1 3 2
4 1 1
1 4 4
3 1 1
END RATINGS

RANGE
1 4
END RANGE

--------- end of file ---------

See Also
importTxt

Examples

## Not run:
x <- randomGrid()
saveAsTxt(x, "random.txt")

## End(Not run)

setConstructAttr Set the attributes of a construct

Description

Set the attributes of a construct i.e. name, abbreviation, status etc.
setConstructAttr

Usage

setConstructAttr(
  x,
  pos,
  l.name,
  r.name,
  l.preferred,
  r.preferred,
  l.emerged,
  r.emerged
)

Arguments

x repgrid object.
pos Row number of construct in the grid to be changed
l.name Name of the left pole (string) (optional).
r.name Name of the right pole (string) (optional).
l.preferred Logical. Is the left one the preferred pole? (optional).
r.preferred Logical. Is the right one the preferred pole? (optional).
l.emerged Logical. Is the left one the emergent pole? (optional).
r.emerged Logical. Is the right one the emergent pole? (optional).

Value

repgrid object

See Also

setElementAttr

Examples

## Not run:

x <- setConstructAttr(bell2010, 1,
            "new left pole", "new right pole")
x

## End(Not run)
setElementAttr

Set the attributes of an element

Description

Set the attributes of an element i.e. name, abbreviation, status etc.

Usage

setElementAttr(x, pos, name, abb, status)

Arguments

x repgrid object.
pos Column number of element in the grid whose attributes are changed.
name New element name (optional).
abb Abbreviation of element name (optional).
status Status of element (e.g. ideal etc.) (optional).

Value

repgrid object

Note

Currently the main purpose is to change element names. Future implementations will allow to set further attributes.

See Also

setConstructAttr

Examples

## Not run:

x <- setElementAttr(boeker, 1, "new name") # change name of first element
x

## End(Not run)
setScale  

_setScale_  
_SET the scale range of a grid._

Description

The scale must be known for certain operations, e.g. to swap the construct poles. If the user construes a grid he should make sure that the scale range is set correctly.

Usage

```
setScale(x, min, max, step, ...)
```

Arguments

- `x` repgrid object.
- `min` Minimal possible scale value for ratings.
- `max` Maximal possible scale value for ratings.
- `step` Steps the scales uses (not yet in use).
- `...` Not evaluated.

Value

repgrid object

Examples

```r
## Not run:

x <- bell2010
x <- setScale(x, 0, 8) # not set correctly
x
x <- setScale(x, 1, 7) # set correctly
x
```

## End(Not run)
settings  

**global settings for OpenRepGrid**

**Description**

global settings for OpenRepGrid

**Usage**

```r
settings(...)```

**Arguments**

...  

Use parameter value pairs (par1=val1, par2=val2) to change a parameter. Use parameter names to request parameter's value ("par1", "par2").

**Note**

Currently the following parameters can be changed, ordered by topic. The default value is shown in the brackets at the end of a line.

*Printing grid to the console*

- `show.scale` Show grid scale info? (TRUE)
- `show.meta` Show grid meta data? (TRUE)
- `show.trim` Number of chars to trim strings to (30)
- `show.cut` Maximum number of characters printed on the sides of a grid (20)
- `c.no` Print construct ID number? (TRUE)
- `e.no` Print element ID number? (TRUE)

**Examples**

```r
## Not run:
# get current settings
settings()

# get some parameters
settings("show.scale", "show.meta")

# change parameters
bell2010

settings(show.meta=F)
bell2010

settings(show.scale=F, show.cut=30)
bell2010

## End(Not run)```
settingsLoad  
*Load OpenRepGrid settings*

**Description**

OpenRepGrid settings saved in an a settings file with the extension `.orgset` can be loaded to restore the settings.

**Usage**

```
settingsLoad(file)
```

**Arguments**

- `file`  
  Path of the file to be loaded.

settingsSave  
*Save OpenRepGrid settings*

**Description**

The current settings of OpenRepGrid can be saved into a file with the extension `.orgset`.

**Usage**

```
settingsSave(file)
```

**Arguments**

- `file`  
  Path of the file to be saved to.

shift  
*Shift construct or element to first position.*

**Description**

Shifts the whole grid vertically or horizontally so that the order remains the same but the prompted element or construct appears in first position.

**Usage**

```
shift(x, c = 1, e = 1)
```
Arguments

x     repgrid object.
c     Index of construct to be shifted to first position.
e     Index of element to be shifted to first position.

Value

repgrid object.

Examples

## Not run:

# shift element 13: 'Ideal self' to first position
shift(feixas2004, 13)

x <- randomGrid(5, 10)
shift(x, 3, 5)

## End(Not run)
statsElements

Descriptive statistics for constructs and elements of a grid.

Description
Descriptive statistics for constructs and elements of a grid.

Usage
statsElements(x, index = TRUE, trim = 20)
statsConstructs(x, index = T, trim = 20)

Arguments

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>x</td>
<td>repgrid object.</td>
</tr>
<tr>
<td>index</td>
<td>Whether to print the number of the element.</td>
</tr>
<tr>
<td>trim</td>
<td>The number of characters an element or a construct is trimmed to (default is 20). If NA no trimming occurs. Trimming simply saves space when displaying correlation of constructs or elements with long names.</td>
</tr>
</tbody>
</table>

Value
A dataframe containing the following measures is returned invisibly (see describe):

- item name
- item number
- number of valid cases
- mean standard deviation
- trimmed mean (with trim defaulting to .1)
- median (standard or interpolated)
- mad: median absolute deviation (from the median)
- minimum
- maximum
- skew
- kurtosis
- standard error

Note
Note that standard deviation and variance are estimations, i.e. including Bessel’s correction. For more info type ?describe.

Note that standard deviation and variance are estimated ones, i.e. including Bessel’s correction. For more info type ?describe.
Examples

## Not run:

```r
statsConstructs(fbb2003)
statsConstructs(fbb2003, trim=10)
statsConstructs(fbb2003, trim=10, index=F)

statsElements(fbb2003)
statsElements(fbb2003, trim=10)
statsElements(fbb2003, trim=10, index=F)

# save the access the results
d <- statsElements(fbb2003)
d

d["mean"]
d[2, "mean"] # mean rating of 2nd element

d <- statsConstructs(fbb2003)
d
d["sd"]
d[1, "sd"] # sd of ratings on first construct

## End(Not run)
```

---

**swapConstructs**

*Swap the position of two constructs in a grid.*

**Description**

Swap the position of two constructs in a grid.

**Usage**

```r
swapConstructs(x, pos1 = 1, pos2 = 1)
```

**Arguments**

- `x`: repgrid object.
- `pos1`: Row number of first construct to be swapped (default=1).
- `pos2`: Row number of second construct to be swapped (default=1).

**Value**

repgrid object
swapElements

Swap the position of two elements in a grid.

Description

Swap the position of two elements in a grid.

Usage

swapElements(x, pos1 = 1, pos2 = 1)

Arguments

x repgrid object.
pos1 Column number of first element to be swapped (default=1).
pos2 Column number of second element to be swapped (default=1).

Value

repgrid object.

Examples

## Not run:
x <- randomGrid()
swapConstructs(x, 1, 3)  # swap constructs 1 and 3
swapConstructs(x, 1:2, 3:4)  # swap construct 1 with 3 and 2 with 4

## End(Not run)
**swapPoles**  
*Reverse constructs / swaps construct poles*

---

**Description**

Constructs are bipolar. They can be reversed without a change in meaning. The function swaps the constructs poles and re-adjusts ratings accordingly, i.e. it reversed selected constructs.

**Usage**

```r
swapPoles(x, pos)
reverse(x, pos = 1L:nrow(x))
```

**Arguments**

- `x`: A `repgrid` object.
- `pos`: Row indexes of constructs to reverse.

**Value**

A `repgrid` object with reversed constructs.

**Note**

Please note that the scale of the rating grid has to be set in order to reverse constructs. If the scale is unknown no reversal occurs and an error is raised.

**Examples**

```r
x <- boeker
reverse(x) # reverse all constructs
reverse(x, 1) # reverse construct 1
reverse(x, 1:2) # reverse constructs 1 and 2

# swapPoles will become deprecated, use reverse instead
swapPoles(x, 1) # swap construct poles of construct
```
[<-,repgrid-method

Extract parts of the repgrid object.

Description

Methods for "[", i.e., subsetting of repgrid objects.

Usage

## S4 method for signature 'repgrid'
x[i, j, ..., drop = TRUE]

Arguments

  x  A repgrid object.
  i, j Row and column indices.
  ... Not evaluated.
  drop Not used.

Examples

    x <- randomGrid()
    x[1:4, 1:3]

[<-,repgrid-method

Method for "<-" assignment of the repgrid ratings.

Description

It should be possible to use it for ratings on all layers.

Usage

## S4 replacement method for signature 'repgrid'
x[i, j, ...] <- value

Arguments

  x  A repgrid object.
  i, j Row and column indices.
  ... Not evaluated.
  value Numeric replacement value(s).
Examples

## Not run:
x <- randomGrid()
x[1,1] <- 2
x[1,] <- 4
x[,2] <- 3

# settings values outside defined rating scale
# range throws an error
x[1,1] <- 999

# removing scale range allows arbitrary values to be set
x <- setScale(x, min = NA, max=NA)
x[1,1] <- 999

## End(Not run)
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