

# Package ‘OpenRepGrid’

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**License** GPL (>= 2)

**Title** Tools to Analyze Repertory Grid Data

**LazyData** yes

**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 (e.g. 'Fransella', 'Bell', & 'Bannister', 2004, ISBN: 978-0-470-09080-0). The package is part of the <https://openrepgrid.org/> project.

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**Imports** methods, graphics, grid, utils, stats, grDevices, crayon, plyr, stringr, abind, colorspace, psych, XML, pvclust, openxlsx, tidyr, dplyr, scales, igraph

**Collate** 'bertin.r' 'calc.r' 'data-openrepgrid.r' 'dev-functions.r' 'distance.R' 'double-entry.R' 'export.r' 'globals.R' 'gmMain.r' 'gridlist.R' 'import.r' 'measures.r' 'onair.r' 'openrepgrid.r' 'perturbate.R' 'preferred\_poles.R' 'repgrid.r' 'repgrid-basicops.r' 'repgrid-constructs.r' 'repgrid-elements.r' 'repgrid-output.r' 'repgrid-plots.r' 'repgrid-ratings.r' 'resampling.R' 'rgl-3d.r' 'settings.r' 'utils-import.r' 'utils.r' 'zzz.r'

**RoxygenNote** 7.3.2

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**Author** Mark Heckmann [aut, cre, cph] (ORCID:  
<https://orcid.org/0000-0002-0736-7417>),  
 Alejandro García Gutiérrez [ctb],  
 Diego Vitali [ctb]  
**Maintainer** Mark Heckmann <heckmann.mark@gmail.com>  
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|                                     |
|-------------------------------------|
| +,repgrid,repgrid-method            |
| <i>Concatenate repgrid objects.</i> |

---

**Description**

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

**Usage**

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

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

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

## S4 method for signature 'repgrid,repgrid'
e1 / e2
```

**Arguments**

e1, e2            A repgrid object.

**Examples**

```
# join constructs
x <- bell2010
x + x
x + list(x, x)
list(x, x) + x
```

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**

Bell, R. C. (2010). A note on aligning constructs. *Personal Construct Theory & Practice*, 7, 42-48.

Mackay, N. (1992). Identification, Reflection, and Correlation: Problems in the bases of repertory grid measures. *International Journal of Personal Construct Psychology*, 5(1), 57-75.

Winter, D. A., Bell, R. C., & Watson, S. (2010). Midpoint ratings on personal constructs: Constriction or the middle way? *Journal of Constructivist Psychology*, 23(4), 337-356.

**See Also**

Aligning constructs [alignByLoadings\(\)](#), [alignByPreferredPole\(\)](#)

## Examples

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

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

---

|                 |                                                                   |
|-----------------|-------------------------------------------------------------------|
| alignByLoadings | <i>Align constructs by loadings on first principal component.</i> |
|-----------------|-------------------------------------------------------------------|

---

## 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 detail section for more).

## Usage

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

## Arguments

|                    |                                                                                                                                                        |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|
| <code>x</code>     | regrid object.                                                                                                                                         |
| <code>trim</code>  | 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. |
| <code>index</code> | 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**

Bell, R. C. (2010). A note on aligning constructs. *Personal Construct Theory & Practice*, 7, 42-48.

Mackay, N. (1992). Identification, Reflection, and Correlation: Problems in the bases of repertory grid measures. *International Journal of Personal Construct Psychology*, 5(1), 57-75.

**See Also**

Aligning constructs [alignByIdeal\(\)](#), [alignByPreferredPole\(\)](#)

**Examples**

```
# 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
```

---

alignByPreferredPole    *Align constructs by preferred pole*

---

**Description**

The direction of the constructs in a grid is arbitrary. While their reversal (see [reverse\(\)](#)) does not affect the information contained in the grid, it is often useful to align constructs for easier interpretation. One way of alignment is placing all positive poles on the same side. Note that this is only possible if the preferred poles are defined (see [preferredPoles\(\)](#)).

**Usage**

```
alignByPreferredPole(x, side_positive = "right")
```

**Arguments**

`x`                      A repgrid object.  
`side_positive`      Align all positive poles on '

**Value**

A repgrid object with aligned constructs.

**See Also**

Aligning constructs [alignByIdeal\(\)](#), [alignByLoadings\(\)](#)

**Examples**

```
x <- preferredPolesByIdeal(boeker, "ideal self")
x <- alignByPreferredPole(x)
x
```

---

 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-balling 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(TRUE, TRUE),
    col.e = "black",
    col.c.left = "black",
    col.c.right = "black",
    col.e.lines = "black",
    cc = 0,
    cr = 0,
    cc.old = 0,
    cr.old = 0,
    col.mark.fill = "#FCF5A4",
    print = TRUE,
    ...
)

```

### Arguments

|                         |                                                                                                                                                                                                                                                                |
|-------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| x                       | regrid 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 is 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)).                                                                                                                                                                 |
| col.e                   | Color of elements.                                                                                                                                                                                                                                             |
| col.c.left, col.c.right | Color of left and right constructs poles.                                                                                                                                                                                                                      |
| col.e.lines             | Color of vertical elements lines.                                                                                                                                                                                                                              |
| cc                      | Numeric. Current column to mark.                                                                                                                                                                                                                               |

|                            |                                                                               |
|----------------------------|-------------------------------------------------------------------------------|
| <code>cr</code>            | Numeric. Current row to mark.                                                 |
| <code>cc.old</code>        | Numeric. Column to unmark.                                                    |
| <code>cr.old</code>        | Numeric. Row to unmark.                                                       |
| <code>col.mark.fill</code> | Color of marked row or column (default "#FCF5A4").                            |
| <code>print</code>         | Print whole bertin. If FALSE only current and old row and column are printed. |
| <code>...</code>           | Optional arguments to be passed on to bertinBase.                             |

### Value

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

### References

Bertin, J. (1974). *Graphische Semiologie: Diagramme, Netze, Karten*. Berlin, New York: de Gruyter.

Dick, M. (2000). The Use of Narrative Grid Interviews in Psychological Mobility Research. *Forum Qualitative Sozialforschung / Forum: Qualitative Social Research*, 1(2).

Raeithel, A. (1998). Kooperative Modellproduktion von Professionellen und Klienten - erlaeuert am Beispiel des Repertory Grid. *Selbstorganisation, Kooperation, Zeichenprozess: Arbeiten zu einer kulturwissenschaftlichen, anwendungsbezogenen Psychologie* (pp. 209-254). Opladen: West-deutscher Verlag.

### Examples

```
bertin(feixas2004)
bertin(feixas2004, c("white", "darkblue"))
bertin(feixas2004, showvalues = FALSE)
bertin(feixas2004, border = "grey")
bertin(feixas2004, cex.text = .9)
bertin(feixas2004, id = c(FALSE, FALSE))

bertin(feixas2004, cc = 3, cr = 4)
bertin(feixas2004, cc = 3, cr = 4, col.mark.fill = "#e6e6e6")
```

---

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.D", "ward.D"),
  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**

|                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <code>x</code>       | repgrid object.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <code>dmethod</code> | 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.                                                                  |
| <code>cmethod</code> | The agglomeration method to be used. This should be (an unambiguous abbreviation of) one of "ward.D", "ward.D2", "single", "complete", "average", "mcquitty", "median" or "centroid". Default is "ward.D". A vector of length two can be passed if a different cluster method for constructs and elements is wanted (e.g. c("ward.D", "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.D"). |
| <code>p</code>       | 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)).                                                                                                                                                                                                                                                                                                                                                                                      |
| <code>align</code>   | 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 <a href="#">cluster()</a> for more information.                                                                                                                                                                                                                                                                                                                                                                                              |
| <code>trim</code>    | 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.                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <code>type</code>    | Type of dendrogram. Either "triangle" (default) or "rectangle" form.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |

|           |                                                                                                                                                                                                                              |
|-----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| xsegs     | 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). |
| ysegs     | 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.                    |
| x.off     | Horizontal offset between construct labels and construct dendrogram and (default is 0.01 in normal device coordinates).                                                                                                      |
| y.off     | Vertical offset between bertin display and element dendrogram and (default is 0.01 in normal device coordinates).                                                                                                            |
| cex.axis  | cex for axis labels, default is .6.                                                                                                                                                                                          |
| col.axis  | Color for axis and axis labels, default is grey(.4).                                                                                                                                                                         |
| draw.axis | Whether to draw axis showing the distance metric for the dendrograms (default is TRUE).                                                                                                                                      |
| ...       | additional parameters to be passed to function <code>bertin()</code> .                                                                                                                                                       |

**Value**

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

**See Also**

`cluster()`

**Examples**

```
# default is euclidean distance and ward clustering
bertinCluster(bell2010)

### applying different distance measures and cluster methods

# euclidean distance and single linkage clustering
bertinCluster(bell2010, cmethod = "single")
# manhattan distance and single linkage clustering
bertinCluster(bell2010, dmethod = "manhattan", cm = "single")
# minkowski 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, cmethod = c("ward.D", "single"))
# euclidean distance measure for constructs, manhattan
# distance for elements
bertinCluster(bell2010, dmethod = c("euclidean", "man"))
# minkowski metric with different powers for constructs and elements
bertinCluster(bell2010, dmethod = "mink", p = c(2, 1))

### clustering either constructs or elements only
```

```

# euclidean distance and ward clustering for constructs no
# clustering for elements
bertinCluster(bell2010, cmethod = c("ward.D", NA))
# euclidean distance and single linkage clustering for elements
# no clustering for constructs
bertinCluster(bell2010, cm = c(NA, "single"), align = FALSE)

### changing the appearance
# different dendrogram type
bertinCluster(bell2010, type = "rectangle")
# no axis drawn for dendrogram
bertinCluster(bell2010, draw.axis = FALSE)

### 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))

```

---

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.col.left = NULL,
c.label.col.right = NULL,
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.

|                          |                                                                                                                                                                                                                                                                                                                                                                  |
|--------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <code>dim</code>         | Dimensions (i.e. principal components) to be used for biplot (default is <code>c(1, 2)</code> ).                                                                                                                                                                                                                                                                 |
| <code>map.dim</code>     | Third dimension (depth) used to map aesthetic attributes to (default is 3).                                                                                                                                                                                                                                                                                      |
| <code>center</code>      | 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).                                                                                        |
| <code>normalize</code>   | A numeric value indicating along what direction (rows, columns) to normalize by standard deviations. 0 = none, 1= rows, 2 = columns (default is 0).                                                                                                                                                                                                              |
| <code>g</code>           | Power of the singular value matrix assigned to the left singular vectors, i.e. the constructs.                                                                                                                                                                                                                                                                   |
| <code>h</code>           | Power of the singular value matrix assigned to the right singular vectors, i.e. the elements.                                                                                                                                                                                                                                                                    |
| <code>col.active</code>  | 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.                                                                                                                                                                                                                 |
| <code>col.passive</code> | 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.                                                                                                                                |
| <code>e.point.col</code> | Color of the element symbols. The default is "black". Two values can be entered that will create a color ramp. The values of <code>map.dim</code> are mapped onto the ramp. If only one color value is supplied (e.g. "black") no mapping occurs and all elements will have the same color irrespective of their value on the <code>map.dim</code> dimension.    |
| <code>e.point.cex</code> | Size of the element symbols. The default is .9. Two values can be entered that will create a size ramp. The values of <code>map.dim</code> 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 <code>map.dim</code> dimension.            |
| <code>e.label.col</code> | Color of the element label. The default is "black". Two values can be entered that will create a color ramp. The values of <code>map.dim</code> are mapped onto the ramp. If only one color value is supplied (e.g. "black") no mapping occurs and all labels will have the same color irrespective of their value on the <code>map.dim</code> dimension.        |
| <code>e.label.cex</code> | Size of the element labels. The default is .7. Two values can be entered that will create a size ramp. The values of <code>map.dim</code> 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 <code>map.dim</code> dimension.               |
| <code>e.color.map</code> | Value range to determine what range of the color ramp defined in <code>e.color</code> will be used for mapping the colors. Default is <code>c(.4, , 1)</code> . Usually not important for the user.                                                                                                                                                              |
| <code>c.point.col</code> | Color of the construct symbols. The default is "black". Two values can be entered that will create a color ramp. The values of <code>map.dim</code> are mapped onto the ramp. If only one color value is supplied (e.g. "black") no mapping occurs and all construct will have the same color irrespective of their value on the <code>map.dim</code> dimension. |

|                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                 |
|--------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <code>c.point.cex</code>                         | Size of the construct symbols. The default is .8. Two values can be entered that will create a size ramp. The values of <code>map.dim</code> are mapped onto the ramp. If only one color size value is supplied (e.g. .8) no mapping occurs and all construct will have the same size irrespective of their value on the <code>map.dim</code> dimension.                                                        |
| <code>c.label.col</code>                         | Color of the construct label. The default is "black". Two values can be entered that will create a color ramp. The values of <code>map.dim</code> 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 <code>map.dim</code> dimension.                                               |
| <code>c.label.col.left, c.label.col.right</code> | Explicit color values for left and right construct poles. NULL by default. Will overwrite <code>c.label.col</code> .                                                                                                                                                                                                                                                                                            |
| <code>c.label.cex</code>                         | Size of the construct labels. The default is .7. Two values can be entered that will create a size ramp. The values of <code>map.dim</code> 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 <code>map.dim</code> dimension.                                                            |
| <code>c.color.map</code>                         | Value range to determine what range of the color ramp defined in <code>c.color</code> will be used for mapping. Default is <code>c(.4, ,1)</code> . Usually not important for the user.                                                                                                                                                                                                                         |
| <code>c.points.devangle</code>                   | The deviation angle from the x-y plane in degrees. These can only be calculated if a third dimension <code>map.dim</code> 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. |
| <code>c.labels.devangle</code>                   | The deviation angle from the x-y plane in degrees. These can only be calculated if a third dimension <code>map.dim</code> 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.                                                                                        |
| <code>c.points.show</code>                       | 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. <code>c(1:10)</code> ).                                                                                                                                                                                                       |
| <code>c.labels.show</code>                       | 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. <code>c(1:10)</code> ).                                                                                                                                                                                               |
| <code>e.points.show</code>                       | 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. <code>c(1:10)</code> ).                                                                                                                                                                                                             |
| <code>e.labels.show</code>                       | 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. <code>c(1:10)</code> ).                                                                                                                                                                                                   |
| <code>inner.positioning</code>                   | 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.                                                                                                                                                                                                                                      |

|                                |                                                                                                                                                                                                            |
|--------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <code>outer.positioning</code> | Logical. Whether to calculate positions to minimize overplotting of of construct labels on the outer borders (default is TRUE). Note that the positioning may slow down the plotting.                      |
| <code>c.labels.inside</code>   | Logical. Whether to print construct labels next to the points. Can be useful during inspection of the plot (default FALSE).                                                                                |
| <code>c.lines</code>           | Logical. Whether construct lines from the center of the biplot to the surrounding box are drawn (default is FALSE).                                                                                        |
| <code>col.c.lines</code>       | The color of the construct lines from the center to the borders of the plot (default is <code>gray(.9)</code> ).                                                                                           |
| <code>flipaxes</code>          | Logical vector of length two. Whether x and y axes are reversed (default is <code>c(F,F)</code> ).                                                                                                         |
| <code>strokes.x</code>         | Length of outer strokes in x direction in NDC.                                                                                                                                                             |
| <code>strokes.y</code>         | Length of outer strokes in y direction in NDC.                                                                                                                                                             |
| <code>offsetting</code>        | Do offsetting? (TODO)                                                                                                                                                                                      |
| <code>offset.labels</code>     | Offsetting parameter for labels (TODO).                                                                                                                                                                    |
| <code>offset.e</code>          | offsetting parameter for elements (TODO).                                                                                                                                                                  |
| <code>axis.ext</code>          | Axis extension factor (default is <code>.1</code> ). A bigger value will zoom out the plot.                                                                                                                |
| <code>mai</code>               | Margins available for plotting the labels in inch (default is <code>c(.2, 1.5, .2, 1.5)</code> ).                                                                                                          |
| <code>rect.margins</code>      | Vector of length two (default is <code>c(.07, .07)</code> ). Two values specifying the additional horizontal and vertical margin around each label.                                                        |
| <code>srt</code>               | Angle to rotate construct label text. Only used in case <code>offsetting=FALSE</code> .                                                                                                                    |
| <code>cex.pos</code>           | Cex parameter used during positioning of labels if prompted. Does usually not have to be changed by user.                                                                                                  |
| <code>xpd</code>               | Logical (default is TRUE). Whether to extend text labels over figure region. Usually not needed by the user.                                                                                               |
| <code>unity</code>             | Scale elements and constructs coordinates to unit scale in 2D (maximum of 1) so they are printed more neatly (default TRUE).                                                                               |
| <code>unity3d</code>           | Scale elements and constructs coordinates to unit scale in 3D (maximum of 1) so they are printed more neatly (default TRUE).                                                                               |
| <code>scale.e</code>           | Scaling factor for element vectors. Will cause element points to move a bit more to the center. (but only if <code>unity</code> or <code>unity3d</code> is TRUE). This argument is for visual appeal only. |
| <code>zoom</code>              | Scaling factor for all vectors. Can be used to zoom the plot in and out (default 1).                                                                                                                       |
| <code>var.show</code>          | Show explained sum-of-squares in biplot? (default TRUE).                                                                                                                                                   |
| <code>var.cex</code>           | The cex value for the percentages shown in the plot.                                                                                                                                                       |
| <code>var.col</code>           | The color value of the percentages shown in the plot.                                                                                                                                                      |
| <code>...</code>               | 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.

$$\hat{X} = UD^g D^h V^T$$

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

```
biplot2d(boeker) # biplot of boeker data
## Not run:
biplot2d(boeker, c.lines = T) # add construct lines
biplot2d(boeker, center = 2) # with column centering
biplot2d(boeker, center = 4) # midpoint centering
biplot2d(boeker, normalize = 1) # normalization of constructs

biplot2d(boeker, dim = 2:3) # plot 2nd and 3rd dimension
biplot2d(boeker, dim = c(1, 4)) # plot 1st and 4th dimension

biplot2d(boeker, g = 1, h = 1) # assign singular values to con. & elem.
biplot2d(boeker, g = 1, h = 1, center = 1) # row centering (Slater)
biplot2d(boeker, g = 1, h = 1, center = 4) # midpoint centering (ESA)

biplot2d(boeker, e.color = "red", c.color = "blue") # change colors
biplot2d(boeker, c.color = c("white", "darkred")) # mapped onto color range

biplot2d(boeker, unity = T) # scale con. & elem. to equal length
biplot2d(boeker, unity = T, scale.e = .5) # scaling factor for element vectors

biplot2d(boeker, e.labels.show = F) # do not show element labels
biplot2d(boeker, e.labels.show = c(1, 2, 4)) # show labels for elements 1, 2 and 4
biplot2d(boeker, e.points.show = c(1, 2, 4)) # only show elements 1, 2 and 4
```

```

biplot2d(boeker, c.labels.show = c(1:4)) # show constructs labels 1 to 4
biplot2d(boeker, c.labels.show = c(1:4)) # show constructs labels except 1 to 4

biplot2d(boeker, e.cex.map = 1) # change size of texts for elements
biplot2d(boeker, c.cex.map = 1) # change size of texts for constructs

biplot2d(boeker, g = 1, h = 1, c.labels.inside = T) # constructs inside the plot
biplot2d(boeker,
  g = 1, h = 1, c.labels.inside = T, # different margins and elem. color
  mai = c(0, 0, 0, 0), e.color = "red"
)

biplot2d(boeker, strokes.x = .3, strokes.y = .05) # change length of strokes

biplot2d(boeker, flipaxes = c(T, F)) # flip x axis
biplot2d(boeker, flipaxes = c(T, T)) # flip x and y axis

biplot2d(boeker, outer.positioning = F) # no positioning of con.-labels

biplot2d(boeker, c.labels.devangle = 20) # only con. within 20 degree angle

## End(Not run)

```

---

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).

## Usage

```

biplot3d(
  x,
  dim = 1:3,
  labels.e = TRUE,
  labels.c = TRUE,
  lines.c = 2,
  lef = 1.3,
  center = 1,
  normalize = 0,
  g = 0,
  h = 1,
  col.active = NA,

```

```

col.passive = NA,
c.axis.show = TRUE,
c.sphere.show = FALSE,
c.sphere.col = grey(0.4),
c.cex = 0.6,
c.text.col = grey(0.4),
e.sphere.show = TRUE,
e.labels.show = TRUE,
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.                                                                                                                                                                        |
| 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.                                     |

|                            |                                                                                                                                                                                                                |
|----------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <code>c.axis.show</code>   | Whether the construct axes are shown (default is TRUE). FALSE will suppress the printing all axes. To only print certain axes, a numeric vector can be provided (e.g. <code>c(1:10)</code> ).                  |
| <code>c.sphere.show</code> | Whether the construct speheres are shown (default is FALSE). To only print certain speheres, a numeric vector can be provided (e.g. <code>c(1:10)</code> ).                                                    |
| <code>c.sphere.col</code>  | Color of construct spheres.                                                                                                                                                                                    |
| <code>c.cex</code>         | Size of construct text.                                                                                                                                                                                        |
| <code>c.text.col</code>    | Color for construct text.                                                                                                                                                                                      |
| <code>e.sphere.show</code> | 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. <code>c(1:10)</code> ).           |
| <code>e.labels.show</code> | 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. <code>c(1:10)</code> ). |
| <code>e.sphere.col</code>  | Color of elements.                                                                                                                                                                                             |
| <code>e.cex</code>         | Size of element labels.                                                                                                                                                                                        |
| <code>e.text.col</code>    | Color of element labels.                                                                                                                                                                                       |
| <code>alpha.sphere</code>  | Numeric. alpha blending of the surrounding sphere (default <code>"0.05"</code> ).                                                                                                                              |
| <code>col.sphere</code>    | Color of surrounding sphere (default <code>"black"</code> ).                                                                                                                                                   |
| <code>unity</code>         | Scale elements and constructs coordinates to unit scale (maximum of 1) so they are printed more neatly (default TRUE).                                                                                         |
| <code>unity3d</code>       | To come.                                                                                                                                                                                                       |
| <code>scale.e</code>       | Scaling factor for element vectors. Will cause element points to move a bit more to the center (but only if <code>unity</code> or <code>unity3d</code> is TRUE). This argument is for visual appeal only.      |
| <code>zoom</code>          | Not yet used. Scaling factor for all vectors. Can be used to zoom the plot in and out (default 1).                                                                                                             |
| <code>...</code>           | Parameters to be passed on.                                                                                                                                                                                    |

## References

Raeithel, A. (1998). Kooperative Modellproduktion von Professionellen und Klienten - erlaeuert am Beispiel des Repertory Grid. *Selbstorganisation, Kooperation, Zeichenprozess: Arbeiten zu einer kulturwissenschaftlichen, anwendungsbezogenen Psychologie* (pp. 209-254). Opladen: West-deutscher Verlag.

## 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:
biplot3d(boeker)

biplot3d(boeker, e.sphere.show = 1:4)
biplot3d(boeker, e.sphere.show = 1:4, e.labels.show = 1:2)
biplot3d(boeker, c.axis.show = 1:2)

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

```
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 <code>g=1</code> .                                                                                                                                               |
| h      | Power of the singular value matrix assigned to the right singular vectors, i.e. the elements. Eigenstructure analysis uses <code>h=1</code> .                                                                                                                                                |
| ...    | Additional parameters for be passed to <a href="#">biplot2d()</a> .                                                                                                                                                                                                                          |

## References

Raeithel, A. (1998). Kooperative Modellproduktion von Professionellen und Klienten. Erläutert am Beispiel des Repertory Grid. In A. Raeithel (1998). Selbstorganisation, Kooperation, Zeichenprozess. Arbeiten zu einer kulturwissenschaftlichen, anwendungsbezogenen Psychologie (p. 209-254). Opladen: Westdeutscher Verlag.

## 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 [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

|                     |                                                                                                                                                                                                                                                                                  |
|---------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <code>x</code>      | repgrid object.                                                                                                                                                                                                                                                                  |
| <code>center</code> | 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). |

|     |                                                                                                |
|-----|------------------------------------------------------------------------------------------------|
| 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 <code>biplot3d()</code> .                                 |

### 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:

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)
```

---

|                                |                                                                                         |
|--------------------------------|-----------------------------------------------------------------------------------------|
| <code>biplotEsaPseudo3d</code> | <i>Plot an eigenstructure analysis (ESA) in 2D grid with 3D impression (pseudo 3D).</i> |
|--------------------------------|-----------------------------------------------------------------------------------------|

---

### 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

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

**Arguments**

|        |                                                                                                                                                                                                                                                                                              |
|--------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| x      | regrid 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 <a href="#">biplotPseudo3d()</a> .                                                                                                                                                                                                                    |

**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 [biplotPseudo3d()] as the same arguments
# can used for this function.

## End(Not run)
```

---

|                |                                                                            |
|----------------|----------------------------------------------------------------------------|
| biplotPseudo3d | <i>Draws a biplot of the grid in 2D with depth impression (pseudo 3D).</i> |
|----------------|----------------------------------------------------------------------------|

---

**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**

```
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**

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

|                          |                                                                                                                                                                                                                                                                                                                                                                                                                                |
|--------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <code>c.point.col</code> | Color(s) of the construct symbols. Two values can be entered that will create a color ramp. The values of <code>map.dim</code> are mapped onto the ramp. The default is <code>c("white", "darkred")</code> . If only one color value is supplied (e.g. "black") no mapping occurs and all elements will have the same color irrespective of their value on the <code>map.dim</code> dimension.                                 |
| <code>c.point.cex</code> | Size of the construct symbols. Two values can be entered that will represent the lower and upper size of a range of <code>cex</code> the values of <code>map.dim</code> are mapped onto. The default is <code>c(.6, 1.2)</code> . If only one <code>cex</code> value is supplied (e.g. .7) no mapping occurs and all elements will have the same size irrespective of their value on the <code>map.dim</code> dimension.       |
| <code>c.label.col</code> | Color(s) of the construct labels. Two values can be entered that will create a color ramp. The values of <code>map.dim</code> are mapped onto the ramp. The default is <code>c("white", "black")</code> . 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 <code>map.dim</code> dimension.                            |
| <code>c.label.cex</code> | Size of the construct labels. Two values can be entered that will represent the lower and upper size of a range of <code>cex</code> the values of <code>map.dim</code> are mapped onto. The default is <code>c(.6, .9)</code> . If only one <code>cex</code> value is supplied (e.g. .7) no mapping occurs and all construct labels will have the same size irrespective of their value on the <code>map.dim</code> dimension. |
| <code>c.color.map</code> | Value range to determine what range of the color ramp defined in <code>c.color</code> will be used for mapping. Default is <code>c(.4, 1)</code> . Usually not important for the user.                                                                                                                                                                                                                                         |
| <code>...</code>         | Additional parameters passed to <code>biplot2d()</code> .                                                                                                                                                                                                                                                                                                                                                                      |

### 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:
# 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))

## End(Not run)
```

---

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

```
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

|                  |                                                                                                  |
|------------------|--------------------------------------------------------------------------------------------------|
| <code>x</code>   | regrid object.                                                                                   |
| <code>dim</code> | Dimensions (i.e. principal components) to be used for biplot (default is <code>c(1, 2)</code> ). |

|             |                                                                                                                                                                                                                                                                           |
|-------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 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

```
## 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

biplotSimple(boeker, zoom = .9) # zooming out
biplotSimple(boeker, scale.e = .6) # scale element vectors

biplotSimple(boeker, e.point.col = "brown") # change colors
biplotSimple(boeker,
  e.point.col = "brown",
  c.label.col = "darkblue"
)

## End(Not run)
```

---

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

|                     |                                                                                                                                                                                                                                                                                 |
|---------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <code>x</code>      | regrid object.                                                                                                                                                                                                                                                                  |
| <code>center</code> | 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). |
| <code>g</code>      | Power of the singular value matrix assigned to the left singular vectors, i.e. the constructs.                                                                                                                                                                                  |
| <code>h</code>      | Power of the singular value matrix assigned to the right singular vectors, i.e. the elements.                                                                                                                                                                                   |
| <code>...</code>    | Additional parameters for be passed to <a href="#">biplot2d()</a> .                                                                                                                                                                                                             |

**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 [biplot2d()] as the same arguments
# can used for this function.

## End(Not run)
```

---

|                             |                                                            |
|-----------------------------|------------------------------------------------------------|
| <code>biplotSlater3d</code> | <i>Draw the Slater's INGRID biplot in rgl (3D device).</i> |
|-----------------------------|------------------------------------------------------------|

---

**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**

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

**Arguments**

|                     |                                                                                                                                                                                                                                                                                      |
|---------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <code>x</code>      | regrid object.                                                                                                                                                                                                                                                                       |
| <code>center</code> | 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). |
| <code>g</code>      | Power of the singular value matrix assigned to the left singular vectors, i.e. the constructs.                                                                                                                                                                                       |
| <code>h</code>      | Power of the singular value matrix assigned to the right singular vectors, i.e. the elements.                                                                                                                                                                                        |
| <code>...</code>    | Additional arguments to be passed to <code>biplot3d</code> .                                                                                                                                                                                                                         |

**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:

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**

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

**Arguments**

|                     |                                                                                                                                                                                                                                                                                 |
|---------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <code>x</code>      | repgrid object.                                                                                                                                                                                                                                                                 |
| <code>center</code> | 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). |
| <code>g</code>      | 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 <a href="#">biplotPseudo3d()</a> .                     |

### 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 [biplotPseudo3d()] as the same arguments
# can used for this function.

## End(Not run)
```

---

|               |                                              |
|---------------|----------------------------------------------|
| cbind.repgrid | <i>Concatenate the elements of two grids</i> |
|---------------|----------------------------------------------|

---

### Description

Concatenate the elements of two grids

### Usage

```
## S3 method for class 'repgrid'
cbind(..., .reorder = TRUE, .unique = FALSE)
```

### Arguments

|          |                                                                                                  |
|----------|--------------------------------------------------------------------------------------------------|
| ...      | repgrid objects or list of objects.                                                              |
| .reorder | If TRUE (default), matches construct order of y to x.                                            |
| .unique  | If FALSE (default), x and y may have common elements. If FALSE, they must be mutually exclusive. |

### Value

repgrid with combined elements.

**Examples**

```
x <- boeker[, 1:2]
y <- boeker[, 5:7]
cbind(x, y)
x / y
y_reordered <- y[sample(nrow(y)), ]
cbind(x, y, y_reordered)
```

center

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

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

**Usage**

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

**Arguments**

|        |                                                                                                                                                                                                                                                                                                    |
|--------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| x      | regrid 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**

```
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
```

cluster

*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.

**Usage**

```
cluster(
  x,
  along = 0,
  dmethod = "euclidean",
  cmethod = "ward.D",
  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. |
| cmethod | The agglomeration method to be used. This should be (an unambiguous abbreviation of) one of "ward.D", "ward.D2", "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. If NA (default), no trimming is done. Trimming simply saves space when displaying the output.                                                                                    |

|                       |                                                                                                                                                                                                                              |
|-----------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <code>main</code>     | Title of plot. The default is a name indicating the distance function and cluster method.                                                                                                                                    |
| <code>mar</code>      | Define the plot region (bottom, left, upper, right).                                                                                                                                                                         |
| <code>cex</code>      | Size parameter for the nodes. Usually not needed.                                                                                                                                                                            |
| <code>lab.cex</code>  | Size parameter for the constructs on the right side.                                                                                                                                                                         |
| <code>cex.main</code> | Size parameter for the plot title (default is .9).                                                                                                                                                                           |
| <code>print</code>    | Logical. Whether to print the dendrogram (default is TRUE).                                                                                                                                                                  |
| <code>...</code>      | Additional parameters to be passed to plotting function from <code>as.dendrogram</code> . Type <code>?as.dendrogram</code> for further information. This option is usually not needed, except if special designs are needed. |

### Details

**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

Reordered repgrid object.

### References

Jankowicz, D., & Thomas, L. (1982). An Algorithm for the Cluster Analysis of Repertory Grids in Human Resource Development. *Personnel Review*, 11(4), 15-22. doi:10.1108/eb055464.

### See Also

[bertinCluster\(\)](#)

### Examples

```
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, edgePar = list(lty = 1:2, col = 2:1)) # advanced appearance changes
```

clusterBoot

*Multiscale bootstrap cluster analysis.*

## 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.D",
  p = 2,
  nboot = 1000,
  r = seq(0.8, 1.4, by = 0.1),
  seed = NULL,
  trim = NA,
  ...
)
```

## Arguments

|                      |                                                                                                                                                                                                                                                    |
|----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <code>x</code>       | grid object                                                                                                                                                                                                                                        |
| <code>along</code>   | Along which dimension to cluster. 1 = constructs, 2= elements.                                                                                                                                                                                     |
| <code>align</code>   | 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.                                                                                |
| <code>dmethod</code> | 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 <code>?dist</code> . |
| <code>cmethod</code> | The agglomeration method to be used. This should be (an unambiguous abbreviation of) one of "ward.D", "ward.D2", "single", "complete", "average", "mcquitty", "median" or "centroid".                                                              |
| <code>p</code>       | Power of the Minkowski metric. Not yet passed on to <code>pvclust</code> !                                                                                                                                                                         |
| <code>nboot</code>   | the number of bootstrap replications. The default is 1000.                                                                                                                                                                                         |
| <code>r</code>       | 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 <code>set.seed()</code> ). Usually not needed.                                 |
| trim | the number of characters a construct is trimmed to. If NA (default), no trimming is done. Trimming simply saves space when displaying the output. |
| ...  | Arguments to pass on to <code>pvcust::pvcust()</code> .                                                                                           |

## 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 `pvcust` object as returned by the function `pvcust::pvcust()`

## References

- Felsenstein, J. (1985). Confidence Limits on Phylogenies: An Approach Using the Bootstrap. *Evolution*, 39(4), 783. doi:10.2307/2408678
- Hillis, D. M., & Bull, J. J. (1993). An Empirical Test of Bootstrapping as a Method for Assessing Confidence in Phylogenetic Analysis. *Systematic Biology*, 42(2), 182-192.
- Jankowicz, D., & Thomas, L. (1982). An Algorithm for the Cluster Analysis of Repertory Grids in Human Resource Development. *Personnel Review*, 11(4), 15-22. doi:10.1108/eb055464.
- Shimodaira, H. (2002) An approximately unbiased test of phylogenetic tree selection. *Syst. Biol.*, 51, 492-508.
- Shimodaira, H. (2004) Approximately unbiased tests of regions using multistep- multiscale bootstrap resampling. *Ann. Stat.*, 32, 2616-2614.
- Suzuki, R., & Shimodaira, H. (2006). Pvcust: an R package for assessing the uncertainty in hierarchical clustering. *Bioinformatics*, 22(12), 1540-1542. doi:10.1093/bioinformatics/btl117
- Zharkikh, A., & Li, W.-H. (1995). Estimation of confidence in phylogeny: the complete-and-partial bootstrap technique. *Molecular Phylogenetic Evolution*, 4(1), 44-63.

## Examples

```
## 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

```
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

```
# 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 | <i>Calculate Somers' d for the constructs.</i> |
|------------|------------------------------------------------|

---

Description

Somer'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         | regrid 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 "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**

Somers, R. H. (1962). A New Asymmetric Measure of Association for Ordinal Variables. *American Sociological Review*, 27(6), 799-811.

**Examples**

```
## 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**

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

**Arguments**

|          |                                                                                                                                                                                     |
|----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| x        | repgrid object.                                                                                                                                                                     |
| nfactors | Number of components to extract (default is 3).                                                                                                                                     |
| rotate   | "none", "varimax", "promax" and "cluster" are possible rotations (default is none).                                                                                                 |
| 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 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**

Fransella, F., Bell, R. & Bannister, D. (2003). *A Manual for Repertory Grid Technique* (2. Ed.). Chichester: John Wiley & Sons.

**See Also**

To extract the PCA loadings for further processing see [constructPcaLoadings\(\)](#).

**Examples**

```
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    *Extract loadings from PCA of constructs.*

---

### Description

Extract loadings from PCA of constructs.

### Usage

```
constructPcaLoadings(x)
```

### Arguments

x                      repgrid object. This object is returned by the function [constructPca\(\)](#).

### Value

A matrix containing the factor loadings.

### Examples

```
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**

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

**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**

Fransella, F., Bell, R. C., & Bannister, D. (2003). A Manual for Repertory Grid Technique (2. Ed.). Chichester: John Wiley & Sons.

**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**

```
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**

```
# 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

Bell, R. C. (2010). A note on aligning constructs. *Personal Construct Theory and Practice*, 7, 43-48.

Haritos, A., Gindidis, A., Doan, C., & Bell, R. C. (2004). The effect of element role titles on construct structure and content. *Journal of constructivist psychology*, 17(3), 221-236.

### Examples

bell2010

---

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

Bell, R. C. (1977). *Using SPSS to Analyse Repertory Grid Data*. Technical Report, University of Melbourne.

Bell, R. C., & McGorry, P. (1992). The analysis of repertory grids used to monitor the perceptions of recovering psychotic patients. In A. Thomson & P. Cummins (Eds.), *European Perspectives in Personal Construct Psychology* (p. 137-150). Lincoln, UK: European Personal Construct Association.

### Examples

bellmcgorry1992

---

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**

Boeker, H. (1996). The reconstruction of the self in the psychotherapy of chronic schizophrenia: a case study with the Repertory Grid Technique. In: Scheer, J. W., Catina, A. (Eds.): *Empirical Constructivism in Europe - The Personal Construct Approach* (p. 160-167). Giessen: Psychosozial-Verlag.

**Examples**

boeker

```
# data is also available as Excel file
path <- system.file("extdata", "boeker.xlsx", package = "OpenRepGrid")
x <- importExcel(path)
```

---

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**

Fransella, F., Bell, R. & Bannister, D. (2003). *A Manual for Repertory Grid Technique* (2. Ed.). Chichester: John Wiley & Sons.

**Examples**

fbb2003

---

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

Feixas, G., & Saul, L. A. (2004). The Multi-Center Dilemma Project: an investigation on the role of cognitive conflicts in health. *The Spanish Journal of Psychology*, 7(1), 69-78.

### Examples

feixas2004

---

data-leach2001

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

Leach, C., Freshwater, K., Aldridge, J., & Sunderland, J. (2001). Analysis of repertory grids in clinical practice. *The British Journal of Clinical Psychology*, 40, 225-248.

**Examples**

leach2001a  
leach2001b

---

|                 |                                      |
|-----------------|--------------------------------------|
| data-mackay1992 | <i>Grid data from Mackay (1992).</i> |
|-----------------|--------------------------------------|

---

**Description**

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

**References**

Mackay, N. (1992). Identification, reflection, and correlation: Problems in the bases of repertory grid measures. *International Journal of Personal Construct Psychology*, 5(1), 57-75.

**Examples**

mackay1992

---

|               |                                        |
|---------------|----------------------------------------|
| data-raeithel | <i>Grid data from Raeithel (1998).</i> |
|---------------|----------------------------------------|

---

**Description**

Grid data to demonstrate the use of Bertin diagrams (Raeithel, 1998, p. 223). The context of its administration is unknown.

**References**

Raeithel, A. (1998). Kooperative Modellproduktion von Professionellen und Klienten. Erläutert am Beispiel des Repertory Grid. In A. Raeithel (1998). *Selbstorganisation, Kooperation, Zeichenprozess. Arbeiten zu einer kulturwissenschaftlichen, anwendungsbezogenen Psychologie* (p. 209-254). Opladen: Westdeutscher Verlag.

**Examples**

raeithel

---

|                  |                                                               |
|------------------|---------------------------------------------------------------|
| data-slater1977a | <i>Drug addict's grid data set from Slater (1977, p. 32).</i> |
|------------------|---------------------------------------------------------------|

---

**Description**

Drug addict's grid data set from Slater (1977, p. 32).

**References**

Slater, P. (1977). *The measurement of intrapersonal space by grid technique*. London: Wiley.

**Examples**

slater1977a

---

|                  |                                      |
|------------------|--------------------------------------|
| data-slater1977b | <i>Grid data from Slater (1977).</i> |
|------------------|--------------------------------------|

---

**Description**

Grid data (ranked) from a seventeen year old female psychiatric patient (Slater, 1977, p. 110). She was depressed, anxious and took to cutting herself. The data was originally reported by Watson (1970).

**References**

Slater, P. (1977). *The measurement of intrapersonal space by grid technique*. London: Wiley.

Watson, J. P. (1970). The relationship between a self-mutilating patient and her doctor. *Psychotherapy and Psychosomatics*, 18(1), 67-73.

**Examples**

slater1977b

---

df\_construct\_columns     *Sample dataframe with grid data (constructs are columns)*

---

## Description

This dataframe can be converted into a repgrid object via `importDataframe()`. The columns names are elements followed by the constructs (left\_pole\_1:right\_pole\_1 to left\_pole\_3:right\_pole\_3). The poles are separated by a colon by default (change via arg `pole_sep`). The rows contain the elements' entries (element name and ratings). The min and max of the rating scale should be passed explicitly via the args `rmin` and `rmax`. See sample data [df\\_construct\\_columns](#).

## Details

| elements  | left_pole_1:right_pole_1 | left_pole_2:right_pole_2 | left_pole_3:right_pole_3 |
|-----------|--------------------------|--------------------------|--------------------------|
| element_1 | 5                        | 3                        | 2                        |
| element_2 | 3                        | 3                        | 4                        |
| element_3 | 1                        | 5                        | 2                        |
| element_4 | 4                        | 3                        | 3                        |

## See Also

[importDataframe\(\)](#)

Other grid dataframes: [df\\_element\\_columns](#), [df\\_long](#)

## Examples

```
df_construct_columns
importDataframe(df_construct_columns, format = "construct_columns", rmin = 1, rmax = 5)
```

---

df\_element\_columns     *Sample dataframe with grid data (elements are columns)*

---

## Description

This dataframe can be converted into a repgrid object via `importDataframe()`. The dataframe column names are the minimum of the rating scale (1), the element names (element\_1 to element\_4), the maximum of the rating scale (5), and optionally a column indicating the preferred pole. Each row contains the constructs' entries (left pole, ratings, right pole, preferred pole). The preferred pole must be one of left, right, none, NA (see [preferredPoles\(\)](#)). See sample data [df\\_element\\_columns](#).

Details

|             |           |           |           |           |              |           |
|-------------|-----------|-----------|-----------|-----------|--------------|-----------|
| 1           | element_1 | element_2 | element_3 | element_4 | 5            | preferred |
| left_pole_1 | 1         | 5         | 3         | 4         | right_pole_1 | left      |
| left_pole_2 | 3         | 1         | 1         | 3         | right_pole_2 | right     |
| left_pole_3 | 4         | 2         | 5         | 1         | right_pole_3 | none      |

See Also

[importDataframe\(\)](#)  
Other grid dataframes: [df\\_construct\\_columns](#), [df\\_long](#)

Examples

```
df_element_columns
importDataframe(df_element_columns)
```

---

|         |                                               |
|---------|-----------------------------------------------|
| df_long | <i>Sample dataframe with grid data (long)</i> |
|---------|-----------------------------------------------|

---

Description

This dataframe can be converted into a repgrid object via [importDataframe\(\)](#). The long format has this name because it has few columns and many rows. It is a common format in data analytics. Here, each row contains a different element-construct combination and the corresponding rating value. The format looks like this:

Details

|           |             |              |        |                |      |      |
|-----------|-------------|--------------|--------|----------------|------|------|
| element   | left_pole   | right_pole   | rating | preferred_pole | rmin | rmax |
| element 1 | left pole 1 | right pole 1 | 5      | left           | 1    | 5    |
| element_2 | left pole 1 | right pole 1 | 3      | left           | 1    | 5    |
| element_3 | left pole 1 | right pole 1 | 1      | left           | 1    | 5    |

The columns element, left\_pole, right\_pole, and rating are mandatory, the columns preferred\_pole, rmin, and rmax are optional. rmin and rmax contain the min and max of the rating scale. Alternatively, you may pass rmin and rmax as arguments in the function call.

See Also

[importDataframe\(\)](#)  
Other grid dataframes: [df\\_construct\\_columns](#), [df\\_element\\_columns](#)

**Examples**

```
df_long
importDataframe(df_long, format = "long")
```

---

|          |                                                            |
|----------|------------------------------------------------------------|
| distance | <i>Distance measures (between constructs or elements).</i> |
|----------|------------------------------------------------------------|

---

**Description**

Various distance measures between elements or constructs are calculated.

**Usage**

```
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 fo 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**

```
# 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]
```

---

|                  |                                                             |
|------------------|-------------------------------------------------------------|
| distanceHartmann | <i>'Hartmann distance' (standardized Slater distances).</i> |
|------------------|-------------------------------------------------------------|

---

**Description**

Calculate Hartmann distance

**Usage**

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

## Arguments

|               |                                                                                                                                                                                                                                                                                                                                                                                    |
|---------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| x             | regrid 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 may 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 quasias.                                                                                                                                                                                                         |
| 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) showed in a simulation study that Slater distances (see [distanceSlater\(\)](#)) based on random grids, for which Slater coined the expression quasias, 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 quasias 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

Hartmann, A. (1992). Element comparisons in repertory grid technique: Results and consequences of a Monte Carlo study. *International Journal of Personal Construct Psychology*, 5(1), 41-56.

## See Also

[distanceSlater\(\)](#)

## Examples

```
## 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      *Calculate power-transformed Hartmann distances.*

---

## Description

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.

## Usage

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

## Arguments

|               |                                                                                                                                                                            |
|---------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| x             | regrid 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 quasies. |
| 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

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**

- Box, G. E. P., & Cox, D. R. (1964). An Analysis of Transformations. *Journal of the Royal Statistical Society. Series B (Methodological)*, 26(2), 211-252.
- Hartmann, A. (1992). Element comparisons in repertory grid technique: Results and consequences of a Monte Carlo study. *International Journal of Personal Construct Psychology*, 5(1), 41-56.
- Heckmann, M. (2012). *Standardizing inter-element distances in grids - A revision of Hartmann's distances*, 11th Biennial Conference of the European Personal Construct Association (EPCA), Dublin, Ireland, Paper presentation, July 2012.
- Slater, P. (1977). *The measurement of intrapersonal space by Grid technique*. London: Wiley.

**See Also**

[distanceHartmann\(\)](#) and [distanceSlater\(\)](#).

**Examples**

```
## Not run:

### basics ###

distanceNormalized(bell2010)
n <- distanceNormalized(bell2010)
n

# printing options
print(n)
```

```

print(n, digits = 4)
# 'significant' distances only
print(n, p = c(.05, .95))

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

### advanced ###

# histogram of Slater distances and indifference region
n <- distanceNormalized(bell2010, distributions = TRUE)
l <- attr(n, "distributions")
hist(l$bc, breaks = 100)

## End(Not run)

```

---

|                |                                                             |
|----------------|-------------------------------------------------------------|
| distanceSlater | <i>Slater distances (standardized Euclidean distances).</i> |
|----------------|-------------------------------------------------------------|

---

## Description

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 [distanceHartmann\(\)](#)

## Usage

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

## Arguments

|       |                                                                                                                                                                                                 |
|-------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| x     | regrid 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.                          |

**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**

Hartmann, A. (1992). Element comparisons in repertory grid technique: Results and consequences of a Monte Carlo study. *International Journal of Personal Construct Psychology*, 5(1), 41-56.

Schoeneich, F., & Klapp, B. F. (1998). Standardization of interelement distances in repertory grid technique and its consequences for psychological interpretation of self-identity plots: An empirical study. *Journal of Constructivist Psychology*, 11(1), 49-58.

Slater, P. (1977). *The measurement of intrapersonal space by Grid technique*. Vol. II. London: Wiley.

**See Also**

[distanceHartmann\(\)](#)

**Examples**

```
distanceSlater(bell2010)
distanceSlater(bell2010, trim = 40)

d <- distanceSlater(bell2010)
print(d)
print(d, digits = 4)

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

---

|            |                                                     |
|------------|-----------------------------------------------------|
| elementCor | <i>Calculate the correlations between elements.</i> |
|------------|-----------------------------------------------------|

---

### 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

- Bell, R. C. (2010). A note on aligning constructs. *Personal Construct Theory & Practice*, (7), 42-48.
- Cohen, J. (1969). rc: A profile similarity coefficient invariant over variable reflection. *Psychological Bulletin*, 71(4), 281-284.
- Mackay, N. (1992). Identification, Reflection, and Correlation: Problems In The Bases Of Repertory Grid Measures. *International Journal of Personal Construct Psychology*, 5(1), 57-75.

### See Also

[constructCor\(\)](#)

## Examples

```

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)
elementCor(mackay1992, index = FALSE, 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

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

## Arguments

|        |                                                                                                                                                                                     |
|--------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| x      | regrid 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   | The number of characters an element is trimmed to (default is NA). If NA no trimming occurs. Trimming simply saves space when displaying correlation of constructs with long names. |

### Details

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 in this function.

### Value

dataframe of the RMS of inter-element correlations.

### References

Fransella, F., Bell, R. C., & Bannister, D. (2003). *A Manual for Repertory Grid Technique* (2. Ed.). Chichester: John Wiley & Sons.

### See Also

[constructRmsCor\(\)](#), [elementCor\(\)](#)

### Examples

```
# data from grid manual by Fransella, Bell and Bannister
elementRmsCor(fbb2003)
elementRmsCor(fbb2003, trim = 10)

# modify output
r <- elementRmsCor(fbb2003)
print(r, digits = 5)

# access second row of calculation results
r[2, "RMS"]
```

---

elements

*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**

|                       |                                    |
|-----------------------|------------------------------------|
| <code>x</code>        | A repgrid object.                  |
| <code>position</code> | Index where to insert element.     |
| <code>value</code>    | 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)
```

**Arguments**

|                  |                                       |
|------------------|---------------------------------------|
| <code>...</code> | Objects to be converted into gridlist |
| <code>x</code>   | Any object.                           |

---

|                   |                            |
|-------------------|----------------------------|
| grids_leave_n_out | <i>Resample constructs</i> |
|-------------------|----------------------------|

---

## 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

|                      |                                                                   |
|----------------------|-------------------------------------------------------------------|
| <code>x</code>       | A repgrid object.                                                 |
| <code>n</code>       | Number of constructs to drop or to sample in each generated grid. |
| <code>reps</code>    | Number of grids to generate.                                      |
| <code>replace</code> | 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 | <i>Rotate the interactive 3D device to default views.</i> |
|------|-----------------------------------------------------------|

---

## 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**

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

**Arguments**

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

return NULL.

**See Also**

Interactive 3D biplots: [biplot3d\(\)](#), [biplotSlater3d\(\)](#), [biplotEsa3d\(\)](#).

**Examples**

```
## Not run:

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

## End(Not run)
```

---

|                 |                                                   |
|-----------------|---------------------------------------------------|
| importDataframe | <i>Convert a dataframe into a repgrid object.</i> |
|-----------------|---------------------------------------------------|

---

**Description**

There are three different dataframe formats from which a repgrid object can be created: Columns are a) element\_columns, b) construct\_columns, c) long. Three corresponding sample dataframes, ([df\\_element\\_columns](#), [df\\_construct\\_columns](#), and [df\\_long](#)) are included in the package (see examples). See Detail section below for more info.

**Usage**

```
importDataframe(
  x,
  format = "element_columns",
  rmin = NULL,
  rmax = NULL,
  pole_sep = ":"
)
```

Arguments

|            |                                                                                                                                                                                       |
|------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| x          | A dataframe. See Detail section and examples for required format.                                                                                                                     |
| format     | One of element_columns (default), construct_columns, or long. See corresponding sections below.                                                                                       |
| rmin, rmax | Min and max of rating scale.                                                                                                                                                          |
| pole_sep   | Character(s) to separate the constructs poles (defaults to a colon) for format construct_columns. Without a separator, constructs are used as right poles, all left poles will be NA. |

Value

A ‘repgrid’ object.

Format element\_columns

In this format, each element has a separate column, and each row contains the ratings for one construct. It is a common way to represent grid data and looks like this.

| 1           | element_1 | element_2 | element_3 | element_4 | 5            | preferred |
|-------------|-----------|-----------|-----------|-----------|--------------|-----------|
| left_pole_1 | 1         | 5         | 3         | 4         | right_pole_1 | left      |
| left_pole_2 | 3         | 1         | 1         | 3         | right_pole_2 | right     |
| left_pole_3 | 4         | 2         | 5         | 1         | right_pole_3 | NA        |

The columns names contains the minimum of the rating scale (1), the names of the elements (element\_1 to element\_4), the maximum of the rating scale (5), and optionally the column preferred, indicating the preferred pole. Each row contains the constructs entries (left pole, ratings, right pole, preferred pole). The preferred pole must be one of left, right, none, NA (see [preferredPoles\(\)](#)). See sample dataframe [df\\_element\\_columns](#).

Format construct\_columns

In this format, each construct has a separate column, and each row contains represents element. This format often results when summarising data (see examples). It looks like this:

The first column is named elements followed by the constructs. The construct poles are separated by a colon by default (see arg pole\_sep). The rows below contain the elements’ entries (element name, ratings). The min and max of the rating scale should be passed explicitly via the args rmin and rmax. See sample dataframe [df\\_construct\\_columns](#).

| elements  | left_pole_1:right_pole_1 | left_pole_2:right_pole_2 | left_pole_3:right_pole_3 |
|-----------|--------------------------|--------------------------|--------------------------|
| element_1 | 1                        | 5                        | 3                        |
| element_2 | 3                        | 1                        | 1                        |
| element_3 | 4                        | 2                        | 5                        |

**Format long**

The long format gets its name from the fact, that it has less columns, but many more rows. It is a common format in data analytics. Here, each row contains a different element-construct combination and the corresponding rating value. The format looks like this:

| element   | left_pole   | right_pole   | rating | preferred_pole | rmin | rmax |
|-----------|-------------|--------------|--------|----------------|------|------|
| element 1 | left pole 1 | right pole 1 | 1      | left           | 1    | 5    |
| element_2 | left pole 1 | right pole 1 | 5      | left           | 1    | 5    |
| element_3 | left pole 1 | right pole 1 | 4      | left           | 1    | 5    |

The columns element, left\_pole, right\_pole, and rating are mandatory, the columns preferred\_pole, rmin, and rmax are optional. rmin and rmax contain the min and max of the rating scale. Alternatively, you may pass rmin and rmax as arguments in the function call. See sample dataframe [df\\_long](#).

**See Also**

Import data [importExcel\(\)](#), [importGridcor\(\)](#), [importGridstat\(\)](#), [importGridsuite\(\)](#), [importScivesco\(\)](#), [importTxt\(\)](#)

**Examples**

```
# dataframe with elements as columns (preferred way)
importDataframe(df_element_columns)

# dataframe with constructs as columns
importDataframe(df_construct_columns, format = "construct_columns", rmin = 1, rmax = 5)

# dataframe with long format
importDataframe(df_long, format = "long", rmin = 1, rmax = 5)
```

---

|             |                                             |
|-------------|---------------------------------------------|
| importExcel | <i>Import grid data from an Excel file.</i> |
|-------------|---------------------------------------------|

---

**Description**

You can define a grid in a Microsoft Excel file (suffix .xlsx). The file must have one of two formats (wide or long, see format sections below).

**Usage**

```
importExcel(file, sheet = 1, format = "wide", rmin = NULL, rmax = NULL)
```

**Arguments**

|            |                                                                                                                                                                                                                                  |
|------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| file       | Path(s) to Excel file(s) (suffix .xlsx).                                                                                                                                                                                         |
| sheet      | Names or indexes of sheet with grid data to import.                                                                                                                                                                              |
| format     | Two formats are supported. wide (default): each column represents one element, each row represent one constructs. long: each row contains one rating value for a element-construct combination. See sections below and examples. |
| rmin, rmax | Min and max of the rating scale (numeric, default NULL).                                                                                                                                                                         |

**Value**

A repgrid object (one input file) or a named list with repgrid objects (several input files). List names are filename + sheet.

**Format wide**

In the wide format, each element has a separate column, and each row contains the ratings for one construct. It is a common way to represent grid data and looks like this:

| 1           | element_1 | element_2 | element_3 | element_4 | 5            | preferred |
|-------------|-----------|-----------|-----------|-----------|--------------|-----------|
| left_pole_1 | 1         | 5         | 3         | 4         | right_pole_1 | left      |
| left_pole_2 | 3         | 1         | 1         | 3         | right_pole_2 | right     |
| left_pole_3 | 4         | 2         | 5         | 1         | right_pole_3 | NA        |

The header row contains the minimum of the rating scale (1), the names of the elements (element\_1 to element\_4), the maximum of the rating scale (5), and optionally the column preferred, indicating the preferred pole. Each row contains the constructs entries (left pole, ratings, right pole, preferred pole). The preferred pole must be one of left, right, none, NA (see [preferredPoles\(\)](#)).

**Format long**

The long format has this name because it has few columns and many rows. It is a common format in data analytics. Here, each row contains a different element-construct combination and the corresponding rating value. The format looks like this:

| element   | left_pole   | right_pole   | rating | preferred_pole | rmin | rmax |
|-----------|-------------|--------------|--------|----------------|------|------|
| element_1 | left pole 1 | right pole 1 | 1      | left           | 1    | 5    |
| element_2 | left pole 1 | right pole 1 | 5      | left           | 1    | 5    |
| element_3 | left pole 1 | right pole 1 | 4      | left           | 1    | 5    |

The columns element, left\_pole, right\_pole, and rating are mandatory, the columns preferred\_pole, rmin, and rmax are optional. rmin and rmax contain the min and max of the rating scale. Alternatively, you may pass rmin and rmax as arguments in the function call.

**See Also**

Import data [importDataframe\(\)](#), [importGridcor\(\)](#), [importGridstat\(\)](#), [importGridsuite\(\)](#), [importScivesco\(\)](#), [importTxt\(\)](#)

## Examples

```

file <- system.file("extdata", "grid_01.xlsx", package = "OpenRepGrid")
rg_1 <- importExcel(file, sheet = "wide")
rg_2 <- importExcel(file, sheet = "long", format = "long")

# Open sample file to inspect it (requires Excel to be installed).
## Not run:
browseURL(file) # may not work on all systems
## End(Not run)

# Import more than one Excel file
files <- system.file("extdata", c("grid_01.xlsx", "grid_02.xlsx"), package = "OpenRepGrid")
rgs <- importExcel(files) # returns a list of grids

# Import from several sheets at once (all must have same format)
file <- system.file("extdata", "grid_03.xlsx", package = "OpenRepGrid")
rgs <- importExcel(file, sheet = 1:3) # by index
rgs <- importExcel(file, sheet = c("grid 1", "grid 2", "grid 3")) # or by name

```

---

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.

## 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

Feixas, G., & Cornejo, J. M. (2002). GRIDCOR: Correspondence Analysis for Grid Data (version 4.0). Barcelona: Centro de Terapia Cognitiva. Retrieved from <https://repertorygrid.net/en/>.

## See Also

Import data `importDataframe()`, `importExcel()`, `importGridstat()`, `importGridsuite()`, `importScivesco()`, `importTxt()`

## 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 | <i>Import Gridstat data files.</i> |
|----------------|------------------------------------|

---

## Description

Reads the file format that is used by the latest version of the grid program gridstat (Bell, 1998).

## Usage

```
importGridstat(file, dir = NULL, min = NULL, max = 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).                                             |
| 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**

Bell, R. C. (1998) GRIDSTAT: A program for analyzing the data of a repertory grid. Melbourne: Author.

**See Also**

Import data `importDataframe()`, `importExcel()`, `importGridcor()`, `importGridsuite()`, `importScivesco()`, `importTxt()`

**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"
rg <- importGridstat(file, dir)

# using a full path (example)
rg <- importGridstat("/Users/markheckmann/data/gridstat.dat")

# setting rating scale range
rg <- importGridstat(file, dir, min = 1, max = 6)

## End(Not run)
```

---

|                 |                                     |
|-----------------|-------------------------------------|
| importGridsuite | <i>Import Gridsuite data files.</i> |
|-----------------|-------------------------------------|

---

**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).

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/>

Walter, O. B., Bacher, A., & Fromm, M. (2004). A proposal for a common data exchange format for repertory grid data. *Journal of Constructivist Psychology*, 17(3), 247. doi:10.1080/10720530490447167

**See Also**

Import data [importDataframe\(\)](#), [importExcel\(\)](#), [importGridcor\(\)](#), [importGridstat\(\)](#), [importScivesco\(\)](#), [importTxt\(\)](#)

### Examples

```
## 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 | <i>Import sci:vesco data files.</i> |
|----------------|-------------------------------------|

---

### Description

Import sci:vesco data files.

### Usage

```
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 one 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

Menzel, F., Rosenberger, M., Buve, J. (2007). Emotionale, intuitive und rationale Konstrukte verstehen. *Personalfuehrung*, 4(7), 91-99.

## See Also

Import data [importDataframe\(\)](#), [importExcel\(\)](#), [importGridcor\(\)](#), [importGridstat\(\)](#), [importGridsuite\(\)](#), [importTxt\(\)](#)

## Examples

```
## 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")

## End(Not run)
```

---

importTxt

---

*Import grid data from a text file.*


---

## Description

You can define a grid using a standard text editor and saving it as a .txt file. The *Details* section describes the required format of the .txt file. However, you may also consider using the Excel format instead, as it has a more intuitive format (see [importExcel\(\)](#)).

## 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**

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. It contains one element per line. The other mandatory blocks are 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. The block PREFERRED is *optional*. Each line indicated the preferred construct pole. Allowed values are left, right, none (no pole preferred), and NA (unknown). The block RANGE is *optional* but recommended. It gives the rating scale range defined by two numbers. The order of the blocks is arbitrary. All text outside the blocks is discarded and can be used for comments.

The content of a sample .txt file is shown below. The package also contains a sample file (see *Examples*).

----- sample .txt file -----

Note: anything outside the tag pairs is 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
```

```
PREFERRED
left
left
right
none
END PREFERRED
```

```
RATINGS
1 3 2
```

```

4 1 1
1 4 4
3 1 1
END RATINGS

RANGE
1 4
END RANGE

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

```

Note that the maximum and minimum value has to be defined using the min and max arguments if no 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.

### Value

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

### See Also

Import data [importDataframe\(\)](#), [importExcel\(\)](#), [importGridcor\(\)](#), [importGridstat\(\)](#), [importGridsuite\(\)](#), [importScivesco\(\)](#)

### Examples

```

# Import a .txt file delivered along with the package
file <- system.file("extdata", "grid_01.txt", package = "OpenRepGrid")
rg <- importTxt(file)

# To see the structure of the file, try opening it as follows.
# (may not work on all systems)
## Not run:
file.show(file)

## End(Not run)

# Import more than one .txt file
files <- system.file("extdata", c("grid_01.txt", "grid_02.txt"), package = "OpenRepGrid")
rgs <- importTxt(files)

```

---

`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**

|                       |                                                                                 |
|-----------------------|---------------------------------------------------------------------------------|
| <code>x</code>        | repgid object.                                                                  |
| <code>min, max</code> | Minimum and maximum grid scale values. Not needed if they are set for the grid. |
| <code>digits</code>   | 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**

Slater, P. (1977). *The measurement of intrapersonal space by Grid technique*. London: Wiley.

**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))))
```

```
bieri <- sapply(1, function(x) indexBieri(x)$bieri)
hist(bieri, breaks = 50)
abline(v = mean(bieri), col = "red", lty = 2)
```

---

|                |                                                                                      |
|----------------|--------------------------------------------------------------------------------------|
| indexConflict1 | <i>Conflict measure for grids (Slade &amp; Sheehan, 1979) based on correlations.</i> |
|----------------|--------------------------------------------------------------------------------------|

---

**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:

| cor(A,B) | cor(A,C) | cor(B,C) | Triad characteristic |
|----------|----------|----------|----------------------|
| +        | +        | +        | balanced             |
| +        | +        | -        | imbalanced           |
| +        | -        | +        | imbalanced           |
| +        | -        | -        | balanced             |
| -        | +        | +        | imbalanced           |
| -        | +        | -        | balanced             |
| -        | -        | +        | balanced             |
| -        | -        | -        | imbalanced           |

**Value**

A list with the following elements:

- total: Total number of triads
- imbalanced: Number of imbalanced triads
- prop.balanced: Proportion of balanced triads
- prop.imbalanced: Proportion of imbalanced triads

**References**

- Bassler, M., Krauthauser, H., & Hoffmann, S. O. (1992). A new approach to the identification of cognitive conflicts in the repertory grid: An illustrative case study. *Journal of Constructivist Psychology*, 5(1), 95-111.
- Heider, F. (1958). *The Psychology of Interpersonal Relation*. John Wiley & Sons.
- Lauterbach, W. (1975). Assessing psychological conflict. *The British Journal of Social and Clinical Psychology*, 14(1), 43-47.
- Slade, P. D., & Sheehan, M. J. (1979). The measurement of 'conflict' in repertory grids. *British Journal of Psychology*, 70(4), 519-524.
- Winter, D. A. (1982). Construct relationships, psychological disorder and therapeutic change. *The British Journal of Medical Psychology*, 55 (Pt 3), 257-269.

**See Also**

[indexConflict2\(\)](#) for an improved version of this measure; see [indexConflict3\(\)](#) for a measure based on distances.

**Examples**

```
indexConflict1(feixas2004)
indexConflict1(boeker)
```

---

|                |                                                                                 |
|----------------|---------------------------------------------------------------------------------|
| indexConflict2 | <i>Conflict measure for grids (Bassler et al., 1992) based on correlations.</i> |
|----------------|---------------------------------------------------------------------------------|

---

**Description**

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).

**Usage**

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

**Arguments**

|                   |                                                                                                                                                                                                                   |
|-------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <code>x</code>    | A repgrid object.                                                                                                                                                                                                 |
| <code>crit</code> | 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**

Description of the balance / imbalance assessment:

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

**Personal remarks (MH)**

I am a bit suspicious about step 2 from above. To devide 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 devide by with a, the relation for the first case translates into  $aZ_{max}Z_{mdn} \leq \frac{crit}{a} + Z_{min}$ ,  $axZ_{max}xZ_{mdn} \leq crit/a + Z_{min}$ . This shows that a bigger value of a will make it more improbable that the relation will hold.

**References**

- Bassler, M., Krauthauser, H., & Hoffmann, S. O. (1992). A new approach to the identification of cognitive conflicts in the repertory grid: An illustrative case study. *Journal of Constructivist Psychology*, 5(1), 95-111.
- Slade, P. D., & Sheehan, M. J. (1979). The measurement of 'conflict' in repertory grids. *British Journal of Psychology*, 70(4), 519-524.

**See Also**

See [indexConflict1\(\)](#) for the older version of this measure; see [indexConflict3\(\)](#) for a measure based on distances instead of correlations.

**Examples**

```

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

```

---

|                |                                                                                     |
|----------------|-------------------------------------------------------------------------------------|
| indexConflict3 | <i>Conflict or inconsistency measure for grids (Bell, 2004) based on distances.</i> |
|----------------|-------------------------------------------------------------------------------------|

---

**Description**

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.

**Usage**

```

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

```

**Arguments**

x                      repgrid object.

|                          |                                                                                                                                                                                                                      |
|--------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <code>p</code>           | The power of the Minkowski distance. <code>p=2</code> (default) will result in euclidean distances, <code>p=1</code> in city block distances.                                                                        |
| <code>e.out</code>       | 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). |
| <code>e.threshold</code> | Numeric. Detailed stats are prompted for those elements with a an attributable percentage to the overall conflicts higher than the supplied threshold (default NA).                                                  |
| <code>c.out</code>       | 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).                                               |
| <code>c.threshold</code> | Numeric. Detailed stats are prompted for those constructs with a an attributable percentage to the overall conflicts higher than the supplied threshold (default NA).                                                |
| <code>trim</code>        | 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

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:

- `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
- `c.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

Bell, R. C. (2004). A new approach to measuring inconsistency or conflict in grids. *Personal Construct Theory & Practice*, (1), 53-59.

## See Also

See [indexConflict1\(\)](#) and [indexConflict2\(\)](#) for conflict measures based on triads of correlations.

## Examples

```
# 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)
```

---

indexDDI

*Dispersion of dependency index (DDI)*


---

## Description

Measures the degree of dispersion of dependency in a situation-resource grid (dependency grid), i.e. the degree to which a person dispersed critical situations over resource persons (Walker et al., 1988, p. 66). The index is a renamed adoption of the `diversity` index from the field of ecology where it is used to measure the diversity of species in a sample. Both are computationally identical. The index is applicable to dependency grids (e.g., situation-resource) only, i.e., all grid ratings must be 0 or 1.

## Usage

```
indexDDI(x, ds)
```

## Arguments

|    |                                                                         |
|----|-------------------------------------------------------------------------|
| x  | A repgrid object with 0/1 ratings only, where 1 indicates a dependency. |
| ds | Predetermined size of sample of dependencies.                           |

## Details

*Caveat:* The DDI depends on the chosen sample size ds. Also, its measurement range is not normalized between 0 and 1, allowing only comparison between similarly sized grids (see Bell, 2001).

**Theoretical Background:** *Dispersion of Dependency:* Kelly (1969) proposed that it is problematic to view people as either *independent* or *dependent* because everyone is, to greater or lesser degrees, dependent upon others in life. What Kelly felt was important was how well people disperse their dependencies across different people. Whereas young children tend to have their dependencies concentrated on a small number of people (typically parents), adults are more likely to spread their dependencies across a variety of others. Dispersing one's dependencies is generally considered more psychologically adjusted for adults (Walker et al., 1988).

## References

- Bell, R. C. (2001). Some new Measures of the Dispersion of Dependency in a Situation-Resource Grid. *Journal of Constructivist Psychology*, 14(3), 227-234, doi:10.1080/713840106.
- Kelly, G. A. (1962). In whom confide: On whom depend for what. In Maher, B. (Ed.). *Clinical psychology and personality: The selected papers of George Kelly*, 189-206. New York Krieger.
- Walker, B. M., Ramsey, F. L., & Bell, R. (1988). Dispersed and Undispersed Dependency. *International Journal of Personal Construct Psychology*, 1(1), 63-80, doi:10.1080/10720538808412765.

## See Also

[indexUncertainty](#)

## Examples

```
# sample grid from Walker et al. (1988), p. 67
file <- system.file("extdata", "dep_grid_walker_1988_2.xlsx" , package = "OpenRepGrid")
x <- importExcel(file)

indexDDI(x, ds = 2:5)

# using named vector
ds = c("2"=2, "3"=3, "4"=4, "5"=5)
indexDDI(x, ds)
```

## Description

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, Dorrough et al. 2007).

## Usage

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

## Arguments

|           |                                                                                                                                                                                                                                                         |
|-----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| x         | A 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 diff.mode=1, the minimal and maximal score difference criterion is applied. With diff.mode=0 the Mid-point rating criterion is applied. Default is diff.mode=1. |

|                              |                                                                                                                                                                                                                                                        |
|------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <code>diff.congruent</code>  | Is used if <code>diff.mode=1</code> . Maximal difference between element ratings to define construct as congruent (default <code>diff.congruent=1</code> ). Note that the value needs to be adjusted by the user according to the rating scale used.   |
| <code>diff.discrepant</code> | Is used if <code>diff.mode=1</code> . Minimal difference between element ratings to define construct as discrepant (default <code>diff.discrepant=3</code> ). Note that the value needs to be adjusted by the user according to the rating scale used. |
| <code>diff.poles</code>      | Not yet implemented.                                                                                                                                                                                                                                   |
| <code>r.min</code>           | Minimal correlation to determine implications between constructs.                                                                                                                                                                                      |
| <code>exclude</code>         | Whether to exclude the elements self and ideal self during the calculation of the inter-construct correlations. (default is FALSE).                                                                                                                    |
| <code>digits</code>          | Numeric. Number of digits to round to (default is 2).                                                                                                                                                                                                  |
| <code>show</code>            | Whether to additionally plot the distribution of correlations to help the user assess what level is adequate for <code>r.min</code> .                                                                                                                  |
| <code>output</code>          | The type of output to return.                                                                                                                                                                                                                          |
| <code>index</code>           | Whether to print index numbers in front of each construct (default is TRUE).                                                                                                                                                                           |
| <code>trim</code>            | The number of characters a construct (element) is trimmed to (default is 20). If NA no trimming is done. Trimming simply saves space when displaying the output.                                                                                       |

## Details

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:

| Scale                | 'A priori' criteria             |
|----------------------|---------------------------------|
| 1 2                  | -> con: $\leq 0$ disc: $\geq 1$ |
| 1 2 3                | -> con: $\leq 0$ disc: $\geq 2$ |
| 1 2 3 4              | -> con: $\leq 0$ disc: $\geq 2$ |
| 1 2 3 4 5            | -> con: $\leq 1$ disc: $\geq 3$ |
| 1 2 3 4 5 6          | -> con: $\leq 1$ disc: $\geq 3$ |
| 1 2 3 4 5 6 7        | -> con: $\leq 1$ disc: $\geq 4$ |
| 1 2 3 4 5 6 7 8      | -> con: $\leq 1$ disc: $\geq 5$ |
| 1 2 3 4 5 6 7 8 9    | -> con: $\leq 2$ disc: $\geq 5$ |
| 1 2 3 4 5 6 7 8 9 10 | -> con: $\leq 2$ disc: $\geq 6$ |

### 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 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

- Bell, R. C. (2009). *Gridstat version 5 - A Program for Analyzing the Data of A Repertory Grid* (manual). University of Melbourne, Australia: Department of Psychology.
- Dorough, S., Grice, J. W., & Parker, J. (2007). Implicative dilemmas and psychological well-being. *Personal Construct Theory & Practice*, (4), 83-101.
- Feixas, G., & Saul, L. A. (2004). The Multi-Center Dilemma Project: an investigation on the role of cognitive conflicts in health. *The Spanish Journal of Psychology*, 7(1), 69-78.
- Feixas, G., Saul, L. A., & Sanchez, V. (2000). Detection and analysis of implicative dilemmas: implications for the therapeutic process. In J. W. Scheer (Ed.), *The Person in Society: Challenges to a Constructivist Theory*. Giessen: Psychosozial-Verlag.
- Winter, D. A. (1982). Construct relationships, psychological disorder and therapeutic change. *British Journal of Medical Psychology*, 55 (Pt 3), 257-269.
- Grice, J. W. (2008). Idiogrid: Idiographic Analysis with Repertory Grids (Version 2.4). Oklahoma: Oklahoma State University.

### See Also

`print.indexDilemma()`, `plot.indexDilemma()`

### Examples

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

```

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

# adjust congruence and discrepance 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")

```

---

|                 |                              |
|-----------------|------------------------------|
| indexDilemmatic | <i>Dilemmatic constructs</i> |
|-----------------|------------------------------|

---

## 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

```
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**

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

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

---

|                |                        |
|----------------|------------------------|
| indexIntensity | <i>Intensity index</i> |
|----------------|------------------------|

---

**Description**

Calculate intensity index.

**Usage**

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

**Arguments**

- |      |                                                                                                                                                                                                  |
|------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| x    | A repgrid object.                                                                                                                                                                                |
| rc   | Whether to use Cohen’s rc for the calculation of inter-element correlations. See <a href="#">elementCor()</a> 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." (Gridcor manual). 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

Bannister, D. (1960). Conceptual structure in thought-disordered schizophrenics. *The Journal of mental science*, 106, 1230-49.

## Examples

```
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 | <i>Polarization (percentage of extreme ratings)</i> |
|-------------------|-----------------------------------------------------|

---

### 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 | <i>Percentage of Variance Accounted for by the First Factor (PVAFF)</i> |
|------------|-------------------------------------------------------------------------|

---

**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**

Bell, R. C. (2003). An evaluation of indices used to represent construct structure. In G. Chiari & M. L. Nuzzo (Eds.), *Psychological Constructivism and the Social World* (pp. 297-305). Milan: FrancoAngeli.

Bonarius, J. C. J. (1965). Research in the personal construct theory of George A. Kelly: role construct repertory test and basic theory. In B. A. Maher (Ed.), *Progress in experimental personality research* (Vol. 2). New York: Academic Press.

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**

```

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: <ul style="list-style-type: none"> <li>Distances: euclidean, manhattan, maximum, canberra, binary, minkowski</li> <li>Correlations: pearson, kendall, spearman</li> </ul> |
| 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

- 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

## 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
```

---

|                  |                          |
|------------------|--------------------------|
| indexUncertainty | <i>Uncertainty index</i> |
|------------------|--------------------------|

---

## Description

A measure for the degree of dispersion of dependency in a dependency grid (Bell, 2001). It is normalized measure with a value range between 0 and 1. The index is applicable to dependency grids (e.g., situation-resource) only, i.e., all grid ratings must be 0 or 1.

## Usage

```
indexUncertainty(x)
```

## Arguments

x                      A repgrid object with 0/1 ratings only, where 1 indicates a dependency.

Details

**Theoretical Background:** *Dispersion of Dependency*: Kelly (1969) proposed that it is problematic to view people as either *independent* or *dependent* because everyone is, to greater or lesser degrees, dependent upon others in life. What Kelly felt was important was how well people disperse their dependencies across different people. Whereas young children tend to have their dependencies concentrated on a small number of people (typically parents), adults are more likely to spread their dependencies across a variety of others. Dispersing one’s dependencies is generally considered more psychologically adjusted for adults (Walker et al., 1988).

References

Bell, R. C. (2001). Some new Measures of the Dispersion of Dependency in a Situation-Resource Grid. *Journal of Constructivist Psychology*, 14(3), 227-234, doi:10.1080/713840106.

See Also

[indexDDI](#)

Examples

```
# sample grid from Bell (2001, p.231)
file <- system.file("extdata", "dep_grid_bell_2001.xlsx" , package = "OpenRepGrid")
x <- importExcel(file)

indexUncertainty(x)
```

---

|                  |                                                                |
|------------------|----------------------------------------------------------------|
| 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. 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.88.

**References**

Slater, P. (1977). *The measurement of intrapersonal space by Grid technique*. London: Wiley.

**See Also**

[indexBias\(\)](#)

**Examples**

```
indexVariability(boeker)
```

---

|            |                                         |
|------------|-----------------------------------------|
| is.repgrid | <i>Test if object has class repgrid</i> |
|------------|-----------------------------------------|

---

**Description**

Test if object has class repgrid

**Usage**

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

**Arguments**

|   |             |
|---|-------------|
| x | Any object. |
|---|-------------|

---

|          |                                          |
|----------|------------------------------------------|
| midpoint | <i>Midpoint of the grid rating scale</i> |
|----------|------------------------------------------|

---

**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**

```
x <- matrix(sample(1:5, 20, rep = TRUE), 4)
normalize(x, 1) # normalizing rows
normalize(x, 2) # normalizing columns
```

---

OpenRepGridOpenRepGrid: *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](https://openrepgrid.org). On this site you will find tutorials, explanation about the theory, the analysis methods and the corresponding R code.

To see how to cite the OpenRepGrid package, type `citation("OpenRepGrid")` into the R console.

## Author(s)

- Maintainer: Mark Heckmann ([@markheckmann](https://twitter.com/markheckmann))
- Contributors: Richard C. Bell, Alejandro García Gutiérrez ([@j4n7](https://twitter.com/j4n7)), Diego Vitali ([@artoo-git](https://twitter.com/artoo-git)), José Antonio González Del Puerto ([@MindCartographer](https://twitter.com/MindCartographer)), Jonathan D. Raskin
- How to contribute: You can [contribute in various ways](#). The OpenRepGrid code is hosted on [GitHub](#), where you can issue bug reports or feature requests. You may email your request to the package maintainer.

## References

Fransella, F., Bell, R. C., & Bannister, D. (2003). *A Manual for Repertory Grid Technique* (2. Ed.). Chichester: John Wiley & Sons.

Kelly, G. A. (1955). *The psychology of personal constructs. Vol. I, II*. New York: Norton, (2nd printing: 1991, Routledge, London, New York).

## 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

|                      |                                |
|----------------------|--------------------------------|
| <code>left()</code>  | Move construct(s) to the left  |
| <code>right()</code> | Move construct(s) to the right |
| <code>up()</code>    | Move construct(s) upwards      |
| <code>down()</code>  | Move construct(s) downwards    |

### Loading and saving data

|                                |                                   |
|--------------------------------|-----------------------------------|
| <code>importGridcor()</code>   | Import GRIDCOR data files         |
| <code>importGridstat()</code>  | Import Gridstat data files        |
| <code>importGridsuite()</code> | Import Gridsuite data files       |
| <code>importScivesco()</code>  | Import sci:vesco data files       |
| <code>importTxt()</code>       | Import grid data from a text file |
| <code>saveAsTxt()</code>       | Save grid in a text file (txt)    |

### 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*

|                       |                                  |
|-----------------------|----------------------------------|
| <code>bertin()</code> | Make Bertin display of grid data |
|-----------------------|----------------------------------|

`bertinCluster()` 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 (PVAFF)

`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.

|                             |                                                 |
|-----------------------------|-------------------------------------------------|
| <code>settings()</code>     | Show and modify global settings for OpenRepGrid |
| <code>settingsSave()</code> | Save OpenRepGrid settings to file               |
| <code>settingsLoad()</code> | 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 the name of the dataset to the console and press enter.

### *Single grids*

|                                                       |                                                                                                   |
|-------------------------------------------------------|---------------------------------------------------------------------------------------------------|
| <code>bell2010()</code>                               | Grid data from a study by Haritos et al. (2004) on role titles; used for demonstration of cons    |
| <code>bellmcgorry1992()</code>                        | Grid from a psychotic patient used in Bell (1997, p. 6). Data originated from a study by Bel      |
| <code>boeker()</code>                                 | Grid from seventeen year old female schizophrenic patient undergoing last stage of psychoa        |
| <code>fbb2003()</code>                                | Dataset used in <i>A manual for Repertory Grid Technique</i> (Fransella, Bell, & Bannister, 2003) |
| <code>feixas2004()</code>                             | Grid from a 22 year old Spanish girl suffering self-worth problems (Feixas & Saul, 2004, p.       |
| <code>mackay1992()</code>                             | Dataset <i>Grid C</i> used in Mackay's paper on inter-element correlation (1992, p. 65).          |
| <code>leach2001a()</code> , <code>leach2001b()</code> | Pre- (a) and post-therapy (b) dataset from sexual child abuse survivor (Leach, Freshwater, A      |
| <code>raeithel()</code>                               | Grid data to demonstrate the use of Bertin diagrams (Raeithel, 1998, p. 223). The context of      |
| <code>slater1977a()</code>                            | Drug addict grid dataset from (Slater, 1977, p. 32).                                              |
| <code>slater1977b()</code>                            | Grid dataset (ranked) from a seventeen year old female psychiatric patient (Slater, 1977, p. 1    |

### *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 accessed 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.

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

### Author(s)

Current members of the **OpenRepGrid** development team: Mark Heckmann. Everyone who is interested in developing the package is invited to join.

The `\pkg{OpenRepGrid}` package development is hosted on github (<<https://github.com/markheckmann/0>>). 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](mailto:heckmann(dot)mark(at)gmail(dot)com)>.

**See Also**

Useful links:

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

---

|                   |                                                                           |
|-------------------|---------------------------------------------------------------------------|
| permuteConstructs | <i>Generate a list with all possible construct reflections of a grid.</i> |
|-------------------|---------------------------------------------------------------------------|

---

**Description**

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

**Usage**

```
permuteConstructs(x, progress = TRUE)
```

**Arguments**

|          |                                                                                                         |
|----------|---------------------------------------------------------------------------------------------------------|
| x        | regrid 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 regrid objects with all possible permutations of the grid.

**Examples**

```
## Not run:  
  
l <- permuteConstructs(mackay1992)  
l  
  
## End(Not run)
```

---

|            |                                |
|------------|--------------------------------|
| perturbate | <i>Perturbate grid ratings</i> |
|------------|--------------------------------|

---

**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 perturbed.                                                                         |
| 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 perturbed grid to generate.                                                                              |

**Examples**

```

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

```

---

|                |                                            |
|----------------|--------------------------------------------|
| preferredPoles | <i>Get / set preferred construct poles</i> |
|----------------|--------------------------------------------|

---

**Description**

Constructs are bipolar, usually with one pole being preferred (positive). Setting the preferred poles may be useful in some analyses.

**Usage**

```

preferredPoles(x)

preferredPoles(x) <- value

```

**Arguments**

|                    |                                                                                                                   |
|--------------------|-------------------------------------------------------------------------------------------------------------------|
| <code>x</code>     | A repgrid object.                                                                                                 |
| <code>value</code> | Vector of with preferred poles. One of 'left', 'right', 'none' or NA. Abbreviations are allowed ('l' for 'left'). |

**Examples**

```
x <- fbb2003

preferredPoles(x) # no preferences assigned yet

# set preference by ideal rating
x <- preferredPolesByIdeal(x, ideal = "as I would love to be")
x <- preferredPolesByIdeal(x, ideal = 7) # same with element index
x

# set preferred poles manually
preferredPoles(x) <- c("left", "right", "left", "r", "l", "l", "l", "r", "r")
x

# change preference for constructs 1 and 5
preferredPoles(x)[2] <- "left"
x

# remove preferences
preferredPoles(x) <- NA
x
```

---

preferredPolesByIdeal *Set preferred pole by ideal element*

---

**Description**

The preferred construct pole is inferred from the rating of the ideal element. The preferred pole is the side of the ideal element. If the ideal is rated on the scale midpoint (or within none\_range), none of the poles is preferred.

**Usage**

```
preferredPolesByIdeal(x, ideal, none_range = NULL, align = FALSE)
```

**Arguments**

|                         |                                                                                                  |
|-------------------------|--------------------------------------------------------------------------------------------------|
| <code>x</code>          | A repgrid object.                                                                                |
| <code>ideal</code>      | Index or name of ideal element.                                                                  |
| <code>none_range</code> | Range of ratings that do not allow assigning a preferred pole (NULL be default).                 |
| <code>align</code>      | Align preferred poles on same side (default FALSE). See <a href="#">alignByPreferredPole()</a> . |

---

|            |                                                          |
|------------|----------------------------------------------------------|
| randomGrid | <i>Generate a random grid (quasis) of prompted size.</i> |
|------------|----------------------------------------------------------|

---

### 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,
  preferred = TRUE
)
```

### 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. |
| preferred | Add preferred pole info? (default TRUE)                                                                                                       |

### Value

repgrid object.

### Examples

```
## Not run:
x <- randomGrid()
x
x <- randomGrid(10, 25, preferred = FALSE)
x
x <- randomGrid(10, 25, options = 0)
x
```

```
## End(Not run)
```

---

|             |                                                                   |
|-------------|-------------------------------------------------------------------|
| randomGrids | <i>Generate a list of random grids (quasis) of prompted size.</i> |
|-------------|-------------------------------------------------------------------|

---

### Description

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

### Usage

```
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**

```
## Not run:

x <- randomGrids()
x
x <- randomGrids(5, 3, 3)
x
x <- randomGrids(5, 3, 3, options = 0)
x

## End(Not run)
```

---

|         |                                              |
|---------|----------------------------------------------|
| ratings | <i>Extract ratings (wide or long format)</i> |
|---------|----------------------------------------------|

---

**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**

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

## get ratings
ratings(x)

## replace ratings

ratings(x)[1, 1] <- 1
# note 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 | <i>Invert construct and element order</i> |
|-----------------|-------------------------------------------|

---

**Description**

Invert construct and element order

**Usage**

```
## 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 ("E", 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**

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

**Arguments**

|                  |                                                                                    |
|------------------|------------------------------------------------------------------------------------|
| <code>x</code>   | regrid object.                                                                     |
| <code>dim</code> | Dimension of 2D solution used to calculate angles (default <code>c(1, 2)</code> ). |

|           |                                                                                                                                                                                                                                                                           |
|-----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 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).                                                                                                                                                                                                                   |
| ...       | Not evaluated.                                                                                                                                                                                                                                                            |

**Value**

Reordered repgrid object.

**Examples**

```
x <- feixas2004
reorder2d(x) # reorder grid by angles in first two dimensions
reorder2d(x, rc = FALSE) # reorder elements only
reorder2d(x, re = FALSE) # reorder constructs only
```

---

|             |                                                   |
|-------------|---------------------------------------------------|
| saveAsExcel | <i>Save grids as Microsoft Excel file (.xlsx)</i> |
|-------------|---------------------------------------------------|

---

**Description**

saveAsExcel will save one or more grids in an Excel file (.xlsx).

**Usage**

```
saveAsExcel(x, file, format = "wide", sheet = NULL, default_sheet = "grid")
```

**Arguments**

|        |                                                                                                                                                                                                                                                                                                                                |
|--------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| x      | A repgrid object or a list of grids.                                                                                                                                                                                                                                                                                           |
| file   | File path. Suffix must be .xlsx.                                                                                                                                                                                                                                                                                               |
| format | Two output formats are supported: wide (default) where each column represents one element, each row represent one constructs (a common grid representation), and long where each row contains an element-construct combination and the corresponding rating value. See <a href="#">importExcel()</a> for details and examples. |

**sheet**                Vector of sheet names with same length as *x*. If NULL (default), *default\_sheet* is used. If *x* is a list of grids, a sequential index is appended. For named list entries (if *x* is a list of grids), the name overwrites the default sheet name.

**default\_sheet**      Default sheet name to use if not supplied in *sheet* or via list names of *x*.

### Value

Invisibly returns file path.

### See Also

[importExcel\(\)](#), [saveAsWorksheet\(\)](#)

### Examples

```
# save one grid in wide format (default)
file <- tempfile(fileext = ".xlsx")
saveAsExcel(boeker, file)
## Not run:
browseURL(file) # open file, requires Excel, may not work on all system

## End(Not run)

# save one grid in log format
file <- tempfile(fileext = ".xlsx")
saveAsExcel(boeker, file, format = "long")
## Not run:
browseURL(file)

## End(Not run)

# save a list of grids
file <- tempfile(fileext = ".xlsx")
l <- list(boeker, feixas2004, bell2010)
saveAsExcel(l, file)
## Not run:
  browseURL(file)

## End(Not run)

# pass some sheet names (2nd with named sheet)
file <- tempfile(fileext = ".xlsx")
l <- list(boeker, "feixas' grid" = feixas2004)
saveAsExcel(l, file)
## Not run:
  browseURL(file)

## End(Not run)
```

---

|           |                                        |
|-----------|----------------------------------------|
| saveAsTxt | <i>Save grid in a text file (txt).</i> |
|-----------|----------------------------------------|

---

### 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

```
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)
```

---

|                 |                                                    |
|-----------------|----------------------------------------------------|
| saveAsWorksheet | <i>Add grids as sheets to an openxlsx Workbook</i> |
|-----------------|----------------------------------------------------|

---

Description

saveAsWorksheet will add one or more grids to an a **openxlsx** Workbook object.

Usage

```
saveAsWorksheet(x, wb, format = "wide", sheet = NULL, default_sheet = "grid")
```

Arguments

- |               |                                                                                                                                                                                                                                                                                                                             |
|---------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| x             | A repgrid object or a list of grids.                                                                                                                                                                                                                                                                                        |
| wb            | A <b>openxlsx</b> Workbook object.                                                                                                                                                                                                                                                                                          |
| format        | Two output formats are supported: wide (default) where each column represents one element, each row represent one constructs (a common grid representation), and long where each row contains an element-construct combination and the corresponding rating value. See <code>importExcel()</code> for details and examples. |
| sheet         | Vector of sheet names with same length as x. If NULL (default), <code>default_sheet</code> is used. If x is a list of grids, a sequential index is appended. For named list entries (if x is a list of grids), the name overwrites the default sheet name.                                                                  |
| default_sheet | Default sheet name to use if not supplied in sheet or via list names of x.                                                                                                                                                                                                                                                  |

Value

Invisibly returns Workbook object.

**See Also**[saveAsExcel\(\)](#)**Examples**

```
library(openxlsx)

wb <- createWorkbook()

# add grid to worksheet
saveAsWorksheet(boeker, wb, sheet = "boeker")

# add several grids with explicit sheet names
l <- list(bell2010, feixas2004)
saveAsWorksheet(l, wb, sheet = c("Bell 2010", "Feixas 2004"))

# list names are used as sheet names. Without name, the default applies.
l <- list(boeker, "Fransella et al. 2003" = fbb2003)
saveAsWorksheet(l, wb)

# save as Excel file
file <- tempfile(fileext = ".xlsx")
saveWorkbook(wb, file)
## Not run:
  browseURL(file) # may not work on all systems

## End(Not run)
```

---

|          |                                       |
|----------|---------------------------------------|
| setScale | <i>Set the scale range of a grid.</i> |
|----------|---------------------------------------|

---

**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**

```
## 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**

```
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.

- 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)
- e.no: Print element ID number? (TRUE)
- c.no: Print construct ID number? (TRUE)
- preferred: Print preferred pole indicator? (TRUE)

Examples

```
## 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 | <i>Load OpenRepGrid settings</i> |
|--------------|----------------------------------|

---

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 | <i>Save OpenRepGrid settings</i> |
|--------------|----------------------------------|

---

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.

---

|                     |                                |
|---------------------|--------------------------------|
| show,repgrid-method | <i>Show method for repgrid</i> |
|---------------------|--------------------------------|

---

**Description**

Show method for repgrid

**Usage**

```
## S4 method for signature 'repgrid'
show(object)
```

**Arguments**

object                    A repgrid object.

---

|               |                                                           |
|---------------|-----------------------------------------------------------|
| statsElements | <i>Descriptive statistics for constructs and elements</i> |
|---------------|-----------------------------------------------------------|

---

**Description**

Several descriptive measures for constructs and elements.

**Usage**

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

statsConstructs(x, index = T, trim = 20)
```

**Arguments**

x                          repgrid object.

index                      Whether to print the number of the element.

trim                        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.

**Value**

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

- item name
- item number
- number of valid cases
- mean standard deviation
- trimmed mean (default .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`.

**Examples**

```
statsConstructs(fbb2003)
statsConstructs(fbb2003, trim = 10)
statsConstructs(fbb2003, trim = 10, index = FALSE)

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

# 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
```

---

|                  |                                             |
|------------------|---------------------------------------------|
| [,repgrid-method | <i>Extract parts of the repgrid object.</i> |
|------------------|---------------------------------------------|

---

## 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    | Row index (numeric)                                         |
| j    | Column index. Either numeric or character (elements names). |
| ...  | Not evaluated.                                              |
| drop | Not used.                                                   |

## Examples

```
x <- boeker
x[1:4, ]
x[, 1:3]
x[1:4, 1:3]
x[1:4, c("self", "ideal self", "mother")]
```

---

|                    |                                                              |
|--------------------|--------------------------------------------------------------|
| [<-,repgrid-method | <i>Method for "&lt;-" assignment of the repgrid ratings.</i> |
|--------------------|--------------------------------------------------------------|

---

## 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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