Package ‘zenplots’

October 14, 2022

Version 1.0.4

Encoding UTF-8

Title Zigzag Expanded Navigation Plots

Description Graphical tools for visualizing high-dimensional data along a path of alternating one- and two-dimensional plots. Note that this includes interactive graphics plots based on 'loon' in turn based on 'tcltk' (included as part of the standard R distribution). It also requires 'graph' from Bioconductor. For more detail on use and algorithms, see <doi:10.18637/jss.v095.i04>.

Author Marius Hofert [aut],
Wayne Oldford [aut, cre]

Maintainer Wayne Oldford <rwoldford@uwaterloo.ca>

URL https://github.com/great-northern-diver/zenplots

Depends R (>= 3.4.0)

Imports grid, graphics, loon, stats, methods, MASS, graph, PairViz

Suggests knitr, markdown, Rgraphviz, ADGofTest, copula, Matrix, pcaPP, qtest, qrmdata, qrmtools, rugarch, zoo, ggplot2, lattice, gridExtra, scagnostics, testthat

Enhances

License GPL-2 | GPL-3

NeedsCompilation yes

VignetteBuilder knitr, rmarkdown

Repository CRAN

Date 2021-09-08

RoxygenNote 7.1.1

Date/Publication 2021-09-08 19:10:02 UTC
**R topics documented:**

<table>
<thead>
<tr>
<th>Topic</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>adjust_bb</td>
<td>4</td>
</tr>
<tr>
<td>arrow_1d_graphics</td>
<td>4</td>
</tr>
<tr>
<td>arrow_1d_grid</td>
<td>5</td>
</tr>
<tr>
<td>arrow_1d_loon</td>
<td>7</td>
</tr>
<tr>
<td>arrow_2d_graphics</td>
<td>8</td>
</tr>
<tr>
<td>arrow_2d_grid</td>
<td>9</td>
</tr>
<tr>
<td>arrow_2d_loon</td>
<td>10</td>
</tr>
<tr>
<td>as_numeric</td>
<td>11</td>
</tr>
<tr>
<td>axes_2d_graphics</td>
<td>12</td>
</tr>
<tr>
<td>axes_2d_grid</td>
<td>13</td>
</tr>
<tr>
<td>axes_2d_loon</td>
<td>14</td>
</tr>
<tr>
<td>boxplot_1d_graphics</td>
<td>16</td>
</tr>
<tr>
<td>boxplot_1d_grid</td>
<td>17</td>
</tr>
<tr>
<td>boxplot_1d_loon</td>
<td>18</td>
</tr>
<tr>
<td>burst</td>
<td>20</td>
</tr>
<tr>
<td>burst_aux</td>
<td>21</td>
</tr>
<tr>
<td>check_zargs</td>
<td>22</td>
</tr>
<tr>
<td>connect_pairs</td>
<td>23</td>
</tr>
<tr>
<td>convert_occupancy</td>
<td>24</td>
</tr>
<tr>
<td>density_1d_graphics</td>
<td>25</td>
</tr>
<tr>
<td>density_1d_grid</td>
<td>26</td>
</tr>
<tr>
<td>density_1d_loon</td>
<td>27</td>
</tr>
<tr>
<td>density_2d_graphics</td>
<td>29</td>
</tr>
<tr>
<td>density_2d_grid</td>
<td>30</td>
</tr>
<tr>
<td>density_2d_loon</td>
<td>31</td>
</tr>
<tr>
<td>de_elect</td>
<td>33</td>
</tr>
<tr>
<td>extract_1d</td>
<td>35</td>
</tr>
<tr>
<td>extract_2d</td>
<td>37</td>
</tr>
<tr>
<td>extract_pairs</td>
<td>39</td>
</tr>
<tr>
<td>get_layout</td>
<td>40</td>
</tr>
<tr>
<td>get_path</td>
<td>41</td>
</tr>
<tr>
<td>get_zigzag_turns</td>
<td>42</td>
</tr>
<tr>
<td>graph_pairs</td>
<td>42</td>
</tr>
<tr>
<td>groupData</td>
<td>44</td>
</tr>
<tr>
<td>group_2d_graphics</td>
<td>45</td>
</tr>
<tr>
<td>group_2d_grid</td>
<td>46</td>
</tr>
<tr>
<td>group_2d_loon</td>
<td>47</td>
</tr>
<tr>
<td>happiness</td>
<td>48</td>
</tr>
<tr>
<td>hist_1d_graphics</td>
<td>50</td>
</tr>
<tr>
<td>hist_1d_grid</td>
<td>51</td>
</tr>
<tr>
<td>hist_1d_loon</td>
<td>52</td>
</tr>
<tr>
<td>indexData</td>
<td>53</td>
</tr>
<tr>
<td>is.standard</td>
<td>54</td>
</tr>
<tr>
<td>jitter_1d_graphics</td>
<td>55</td>
</tr>
<tr>
<td>jitter_1d_grid</td>
<td>56</td>
</tr>
<tr>
<td>jitter_1d_loon</td>
<td>57</td>
</tr>
</tbody>
</table>
R topics documented:

- label_1d_graphics ......................................................... 59
- label_1d_grid ................................................................. 60
- label_1d_loon ................................................................. 61
- label_2d_graphics ............................................................. 63
- label_2d_grid ................................................................. 64
- label_2d_loon ................................................................. 65
- layout_1d_graphics ......................................................... 67
- layout_1d_grid ................................................................. 67
- layout_1d_loon ................................................................. 68
- layout_2d_graphics ............................................................. 68
- layout_2d_grid ................................................................. 69
- layout_2d_loon ................................................................. 70
- lines_1d_graphics ............................................................. 70
- lines_1d_grid ................................................................. 71
- lines_1d_loon ................................................................. 72
- l_ispace_config ............................................................... 74
- move ............................................................................. 75
- n2dcols_aux ................................................................. 75
- na_omit_loon ................................................................. 76
- next_move_tidy ............................................................... 77
- num_cols ................................................................. 77
- olive ................................................................. 78
- plot_exists ................................................................. 79
- plot_indices ................................................................. 79
- plot_region ............................................................... 80
- points_1d_graphics ......................................................... 81
- points_1d_grid ................................................................. 82
- points_1d_loon ................................................................. 83
- points_2d_graphics ............................................................. 84
- points_2d_grid ................................................................. 85
- points_2d_loon ................................................................. 87
- qq_2d_graphics ............................................................... 88
- qq_2d_grid ................................................................. 89
- rect_1d_graphics ............................................................. 91
- rect_1d_grid ................................................................. 92
- rect_1d_loon ................................................................. 93
- rect_2d_graphics ............................................................. 94
- rect_2d_grid ................................................................. 95
- rect_2d_loon ................................................................. 96
- rug_1d_graphics ............................................................. 98
- rug_1d_grid ................................................................. 99
- rug_1d_loon ................................................................. 100
- turn_checker .............................................................. 101
- unfold ................................................................. 102
- vport ................................................................. 104
- wine ................................................................. 105
- zenarrow ................................................................. 106
- zenpath ................................................................. 107
**Description**

Auxiliary function for adjusting a bounding box

**Usage**

`adjust_bb(lastturn, coordslastBB, w, h)`

**Arguments**

- `lastturn` last turn
- `coordslastBB` coordinates of the last bounding box
- `w` width
- `h` height

**Value**

Coordinates of the adjusted bounding box

**Author(s)**

Wayne Oldford

---

**arrow_1d_graphics**  
*Arrow plot in 1d using R’s base graphics*

**Description**

Arrow plot in 1d using R’s base graphics

**Usage**

```r
arrow_1d_graphics(
  zargs,
  loc = c(0.5, 0.5),
  angle = 60,
  length = 0.6,
  add = FALSE,
  plot... = NULL,
  ...
)
```
Arrow plot in 1d using the grid package

Description

Arrow plot in 1d using the grid package
arrow_1d_grid

Usage

arrow_1d_grid(
  zargs,
  loc = c(0.5, 0.5),
  angle = 60,
  length = 0.6,
  draw = FALSE,
  ...
)

Arguments

zargs argument list as passed from zenplot()
loc (x,y)-location in [0,1]^2; 0 corresponds to left, 1 to right (in the direction of the path)
angle angle from the shaft to the edge of the arrow head
length length of the arrow in [0,1] from tip to base
draw logical indicating whether drawing should take place
... additional arguments passed to gpar()

Value

grob (invisibly)

Author(s)

Marius Hofert and Wayne Oldford

See Also

Other default 1d plot functions using the grid package: boxplot_1d_grid(), density_1d_grid(), hist_1d_grid(), jitter_1d_grid(), label_1d_grid(), lines_1d_grid(), points_1d_grid(), rect_1d_grid(), rug_1d_grid()

Other default 1d plot functions: arrow_1d_graphics(), arrow_1d_loon(), boxplot_1d_graphics(), boxplot_1d_grid(), boxplot_1d_loon(), density_1d_graphics(), density_1d_grid(), density_1d_loon(), extract_1d(), hist_1d_graphics(), hist_1d_grid(), hist_1d_loon(), jitter_1d_graphics(), jitter_1d_grid(), jitter_1d_loon(), label_1d_graphics(), label_1d_grid(), label_1d_loon(), lines_1d_graphics(), lines_1d_grid(), lines_1d_loon(), points_1d_graphics(), points_1d_grid(), points_1d_loon(), rect_1d_graphics(), rect_1d_grid(), rect_1d_loon(), rug_1d_graphics(), rug_1d_grid(), rug_1d_loon()
Arrow plot in 1d using the interactive loon package

Description

Arrow plot in 1d using the interactive loon package

Usage

arrow_1d_loon(
  zargs,
  loc = c(0.5, 0.5),
  length = 0.6,
  angle = NULL,
  linkingGroup = NULL,
  showLabels = FALSE,
  showScales = FALSE,
  showGuides = FALSE,
  baseplot = NULL,
  parent = NULL,
  ...
)

Arguments

  zargs  The argument list as passed from `zenplot()
  loc    The (x,y) location of the center of the arrow
  length The length of the arrow
  angle  The angle from the shaft to the edge of the arrow head
  linkingGroup  A string specifying the initial group of plots to be linked to this plot
  showLabels Logical determining whether axis labels are displayed
  showScales  Logical determining whether scales are displayed
  showGuides  Logical determining whether the background guidelines are displayed
  baseplot  If non-null the base plot on which the plot should be layered
  parent The tk parent for this loon plot widget
  ...  Additional parameters passed to loon::l_layer_line(...)

Value

A loon loon::l_plot(...)

Author(s)

Marius Hofert and Wayne Oldford
See Also

Other default 1d plot functions using the interactive loon package: boxplot_1d_loon(), density_1d_loon(), hist_1d_loon(), jitter_1d_loon(), label_1d_loon(), lines_1d_loon(), rect_1d_loon(), rug_1d_loon()

Other default 1d plot functions: arrow_1d_graphics(), arrow_1d_grid(), boxplot_1d_graphics(), boxplot_1d_grid(), boxplot_1d_loon(), density_1d_graphics(), density_1d_grid(), density_1d_loon(), extract_1d(), hist_1d_graphics(), hist_1d_grid(), hist_1d_loon(), jitter_1d_graphics(). jitter_1d_grid(), jitter_1d_loon(), label_1d_graphics(), label_1d_grid(), label_1d_loon(), lines_1d_graphics(), lines_1d_grid(), lines_1d_loon(), points_1d_graphics(), points_1d_grid(), points_1d_loon(), rect_1d_graphics(), rect_1d_grid(), rect_1d_loon(), rug_1d_graphics(), rug_1d_grid(), rug_1d_loon()

arrow_2d_graphics

Arrow plot in 2d using R’s base graphics

Description

Arrow plot in 2d using R’s base graphics

Usage

arrow_2d_graphics(
  zargs,
  loc = c(0.5, 0.5),
  angle = 60,
  length = 0.2,
  add = FALSE,
  group... = NULL,
  plot... = NULL,
  ...
)

Arguments

zargs argument list as passed from zenplot()
loc (x,y)-location (in (0,1)^2) of the center of the arrow
angle angle from the shaft to the edge of the arrow head
length length of the arrow in [0,1] from tip to base
add logical indicating whether this plot should be added to the last one
group... list of arguments passed to group_2d_graphics (or NULL)
plot... additional arguments passed to plot_region()
... additional arguments passed to points()
**arrow_2d_grid**

**Value**

invisible()

**Author(s)**

Marius Hofert and Wayne Oldford

**See Also**

Other default 2d plot functions using R’s base graphics: `axes_2d_graphics()`, `density_2d_graphics()`, `group_2d_graphics()`, `label_2d_graphics()`, `points_2d_graphics()`, `qq_2d_graphics()`, `rect_2d_graphics()`

Other default 2d plot functions: `arrow_2d_grid()`, `arrow_2d_loon()`, `axes_2d_graphics()`, `axes_2d_grid()`, `axes_2d_loon()`, `density_2d_graphics()`, `density_2d_grid()`, `density_2d_loon()`, `extract_2d()`, `group_2d_graphics()`, `group_2d_grid()`, `group_2d_loon()`, `label_2d_graphics()`, `label_2d_grid()`, `label_2d_loon()`, `points_2d_graphics()`, `points_2d_grid()`, `points_2d_loon()`, `qq_2d_graphics()`, `qq_2d_grid()`, `rect_2d_graphics()`, `rect_2d_grid()`, `rect_2d_loon()`

---

**arrow_2d_grid**  
*Arrow plot in 2d using the grid package*

**Description**

Arrow plot in 2d using the grid package

**Usage**

```r
arrow_2d_grid(
  zargs,
  loc = c(0.5, 0.5),
  angle = 60,
  length = 0.2,
  group... = list(cex = 0.66),
  draw = FALSE,
  ...
)
```

**Arguments**

- `zargs` argument list as passed from `zenplot()`
- `loc` (x,y)-location of the center of the arrow
- `angle` angle from the shaft to the edge of the arrow head
- `length` length of the arrow in [0,1] from tip to base
- `group...` list of arguments passed to group_2d_grid (or NULL)
- `draw` logical indicating whether drawing should take place
- `...` additional arguments passed to gpar()
arrow_2d_loon

Arrow plot in 2d using the interactive loon package

Description

Arrow plot in 2d using the interactive loon package

Usage

```r
arrow_2d_loon(
  zargs,
  loc = rep(0.5, 2),
  length = 0.2,
  angle = 30,
  linkingGroup = NULL,
  color = NULL,
  showLabels = FALSE,
  showScales = FALSE,
  showGuides = FALSE,
  baseplot = NULL,
  parent = NULL,
  group... = NULL,
  ...
)
```
as_numeric

Arguments

zargs  The argument list as passed from `zenplot()`
loc  The (x,y) location of the center of the arrow
length  The length of the arrow
angle  The angle from the shaft to the edge of the arrow head
linkingGroup  The initial linking group
color  The color
showLabels  Logical determining whether axis labels are displayed
showScales  Logical determining whether scales are displayed
showGuides  Logical determining whether the background guidelines are displayed;baseplot  If non-null the base plot on which the plot should be layered
parent  The tk parent for this loon plot widget
group...  A list of arguments passed to `group_2d_loon` (or NULL)
...  Additional parameters passed to loon::l_layer_line()

Value

the plot (invisibly)

Author(s)

Marius Hofert and Wayne Oldford

See Also

Other default 2d plot functions using the interactive loon package: `axes_2d_loon()`, `density_2d_loon()`, `group_2d_loon()`, `label_2d_loon()`, `points_2d_loon()`, `rect_2d_loon()

Other default 2d plot functions: `arrow_2d_graphics()`, `arrow_2d_grid()`, `axes_2d_graphics()`, `axes_2d_grid()`, `density_2d_graphics()`, `density_2d_grid()`, `extract_2d()`, `group_2d_graphics()`, `group_2d_grid()`, `group_2d_loon()`, `label_2d_graphics()`, `label_2d_grid()`, `label_2d_loon()`, `points_2d_graphics()`, `points_2d_grid()`, `points_2d_loon()`, `rect_2d_graphics()`, `rect_2d_grid()`, `rect_2d_loon()`

---

as_numeric  A list of columns

Description

A list of columns

Usage

as_numeric(x)
axes_2d_graphics

Arguments

x A list of columns

Value

A list where each column is converted to data (range() works, can be plotted, etc.)

Note

See plot.default -> xy.coords()

Author(s)

Marius Hofert

axes_2d_graphics Axes arrows in 2d using R's base graphics

Description

Axes arrows in 2d using R’s base graphics

Usage

axes_2d_graphics(
  zargs,
  length = 0.1,
  eps = 0.04,
  code = 2,
  xpd = NA,
  add = FALSE,
  group... = NULL,
  plot... = NULL,
  ...
)

Arguments

zargs argument list as passed from zenplot()
length length of the arrow head
eps distance by which the axes are moved away from the plot region
code integer code determining the kind of arrows to be drawn; see ?arrows
xpd logical or NA, determining the region with respect to which clipping takes place; see ?par
add logical indicating whether this plot should be added to the last one
**axes_2d_grid**  

Axes arrow using the grid package

### Description

Axes arrow using the grid package

### Usage

```r
axes_2d_grid(
  zargs,
  angle = 30,
  length = unit(0.05, "npc"),
  type = "open",
  eps = 0.02,
  group... = list(cex = 0.66),
  draw = FALSE,
  ...
)
```

---

**Value**

invisible()

**Note**


**Author(s)**

Marius Hofert and Wayne Oldford

**See Also**

Other default 2d plot functions using R’s base graphics: `arrow_2d_graphics()`, `density_2d_graphics()`, `group_2d_graphics()`, `label_2d_graphics()`, `points_2d_graphics()`, `qq_2d_graphics()`, `rect_2d_graphics()`

Other default 2d plot functions: `arrow_2d_graphics()`, `arrow_2d_grid()`, `arrow_2d_loon()`, `axes_2d_grid()`, `axes_2d_loon()`, `density_2d_graphics()`, `density_2d_grid()`, `density_2d_loon()`, `extract_2d()`, `group_2d_graphics()`, `group_2d_grid()`, `group_2d_loon()`, `label_2d_graphics()`, `label_2d_grid()`, `label_2d_loon()`, `points_2d_graphics()`, `points_2d_grid()`, `points_2d_loon()`, `qq_2d_graphics()`, `qq_2d_grid()`, `rect_2d_graphics()`, `rect_2d_grid()`, `rect_2d_loon()`
Axes arrows in 2d using the interactive loon package

Description

Axes arrows in 2d using the interactive loon package
axes_2d_loon

Usage

axes_2d_loon(
    zargs,
    angle = 30,
    length = 0.05,
    eps = 0.02,
    linkingGroup = NULL,
    color = NULL,
    showLabels = FALSE,
    showScales = FALSE,
    showGuides = FALSE,
    baseplot = NULL,
    parent = NULL,
    group... = NULL,
    ...
)

Arguments

zargs The argument list as passed from zenplot()
angle The angle of the arrow head
length The length of the arrow head
eps The distance by which the axes are moved away from the plot region
linkingGroup The initial linking group
color Colour used fill if ccol is NULL, a grey palette is used otherwise.
showLabels Logical determining whether axis labels are displayed
showScales Logical determining whether scales are displayed
showGuides Logical determining whether the background guidelines are displayed
baseplot If non-null the base plot on which the plot should be layered
parent The tk parent for this loon plot widget
group... A list of arguments passed to group_2d_loon (or NULL)
... Additional arguments passed to loon::l_plot()

Value

the loon plot

Note


Author(s)

Marius Hofert and Wayne Oldford
See Also

Other default 2d plot functions using the interactive loon package: arrow_2d_loon(), density_2d_loon(), group_2d_loon(), label_2d_loon(), points_2d_loon(), rect_2d_loon()

Other default 2d plot functions: arrow_2d_graphics(), arrow_2d_grid(), arrow_2d_loon(), axes_2d_graphics(), axes_2d_grid(), density_2d_graphics(), density_2d_grid(), density_2d_loon(), extract_2d(), group_2d_graphics(), group_2d_grid(), group_2d_loon(), label_2d_graphics(), label_2d_grid(), label_2d_loon(), points_2d_graphics(), points_2d_grid(), points_2d_loon(), qq_2d_graphics(), qq_2d_grid(), rect_2d_graphics(), rect_2d_grid(), rect_2d_loon()

boxplot_1d_graphics  Box plot in 1d using R’s base graphics

Description

Box plot in 1d using R’s base graphics

Usage

boxplot_1d_graphics(
  zargs,
  cex = 0.4,
  range = NULL,
  axes = FALSE,
  add = FALSE,
  ...
)

Arguments

zargs  The argument list as passed from zenplot()
cex  The character expansion factor
range  A numerical value which determines how far the plot whiskers extend. If NULL, the whiskers (range) grows with sample size.
axes  A logical indicating whether axes should be drawn
add  A logical indicating whether this plot should be added to the last one
...  Additional arguments passed to boxplot()

Value

invisible()

Author(s)

Marius Hofert and Wayne Oldford
See Also

Other default 1d plot functions using R’s base graphics: 
arrow_1d_graphics(), density_1d_graphics(), 
hist_1d_graphics(), jitter_1d_graphics(), label_1d_graphics(), 
lines_1d_graphics(), points_1d_graphics(), rect_1d_graphics(), rug_1d_graphics()

Other default 1d plot functions: 
arrow_1d_graphics(), arrow_1d_grid(), arrow_1d_loon(), 
boxplot_1d_grid(), boxplot_1d_loon(), density_1d_graphics(), density_1d_grid(), density_1d_loon(), 
extract_1d(), hist_1d_graphics(), hist_1d_grid(), hist_1d_loon(), jitter_1d_graphics(), 
jitter_1d_grid(), jitter_1d_loon(), label_1d_graphics(), label_1d_grid(), label_1d_loon(), 
lines_1d_graphics(), lines_1d_grid(), lines_1d_loon(), points_1d_graphics(), points_1d_grid(), 
points_1d_loon(), rect_1d_graphics(), rect_1d_grid(), rect_1d_loon(), rug_1d_graphics(), 
rug_1d_grid(), rug_1d_loon

---

boxplot_1d_grid

Boxplot in 1d using the grid package

Description

Boxplot in 1d using the grid package

Usage

boxplot_1d_grid(
  zargs, 
  pch = 21, 
  size = 0.02, 
  col = NULL, 
  lwd = 2, 
  bpwidth = 0.5, 
  range = NULL, 
  draw = FALSE, 
  ... 
)

Arguments

zargs argument list as passed from zenplot()
pch plot symbol
size size of the plot symbol
col color
lwd graphical parameter line width for whiskers and median
bpwidth width of boxplot on scale of default.units
range numerical value used to determine how far the plot whiskers extend. If NULL, the whiskers (range) grows with sample size.
draw logical indicating whether drawing should take place
... additional arguments passed to gpar()
Value

gTree grob containing the boxplot components as grobs

Author(s)

Marius Hofert and Wayne Oldford

See Also

Other default 1d plot functions using the grid package: arrow_1d_grid(), density_1d_grid(), hist_1d_grid(), jitter_1d_grid(), label_1d_grid(), lines_1d_grid(), points_1d_grid(), rect_1d_grid(), rug_1d_grid()

Other default 1d plot functions: arrow_1d_graphics(), arrow_1d_grid(), arrow_1d_loon(), boxplot_1d_graphics(), boxplot_1d_loon(), density_1d_graphics(), density_1d_grid(), density_1d_loon(), extract_1d(), hist_1d_graphics(), hist_1d_grid(), hist_1d_loon(), jitter_1d_graphics(), jitter_1d_grid(), jitter_1d_loon(), label_1d_graphics(), label_1d_grid(), label_1d_loon(), lines_1d_graphics(), lines_1d_grid(), lines_1d_loon(), points_1d_graphics(), points_1d_grid(), points_1d_loon(), rect_1d_graphics(), rect_1d_grid(), rect_1d_loon(), rug_1d_graphics(), rug_1d_grid(), rug_1d_loon()

Description

Boxplot in 1d using the interactive loon package

Usage

boxplot_1d_loon(
  zargs,
  color = NULL,
  linecolor = NULL,
  lwd = 2,
  range = NULL,
  showLabels = FALSE,
  showScales = FALSE,
  showGuides = FALSE,
  linkingGroup = NULL,
  baseplot = NULL,
  parent,
  ...
)
Arguments

- **zargs**: The argument list as passed from `zenplot()`
- **color**: colour for boxplot
- **linecolor**: Colour used for the lines to draw the boxplot
- **lwd**: The parameter line width for whiskers and median and box boundaries
- **range**: numerical value used to determine how far the plot whiskers extend. If NULL, the whiskers (range) grows with sample size.
- **showLabels**: Logical determining whether axis labels are displayed
- **showScales**: Logical determining whether scales are displayed
- **showGuides**: Logical determining whether the background guidelines are displayed
- **linkingGroup**: A string specifying the initial group of plots to be linked to this plot
- **baseplot**: If non-null the base plot on which the plot should be layered
- **parent**: The tk parent for this loon plot widget
- **...**: Additional parameters passed to gpar()

Value

A loon loon::l_plot(...)

Author(s)

Marius Hofert and Wayne Oldford

See Also

Other default 1d plot functions using the interactive loon package: `arrow_1d_loon()`, `density_1d_loon()`, `hist_1d_loon()`, `jitter_1d_loon()`, `label_1d_loon()`, `lines_1d_loon()`, `points_1d_loon()`, `rect_1d_loon()`, `rug_1d_loon()`

Other default 1d plot functions: `arrow_1d_graphics()`, `arrow_1d_grid()`, `arrow_1d_loon()`, `boxplot_1d_graphics()`, `boxplot_1d_grid()`, `density_1d_graphics()`, `density_1d_grid()`, `extract_1d()`, `hist_1d_graphics()`, `hist_1d_grid()`, `hist_1d_loon()`, `jitter_1d_graphics()`, `jitter_1d_grid()`, `jitter_1d_loon()`, `label_1d_graphics()`, `label_1d_grid()`, `label_1d_loon()`, `lines_1d_graphics()`, `lines_1d_grid()`, `lines_1d_loon()`, `points_1d_grid()`, `points_1d_loon()`, `rect_1d_graphics()`, `rect_1d_grid()`, `rect_1d_loon()`, `rug_1d_graphics()`, `rug_1d_grid()`, `rug_1d_loon()`
**burst**

*Splitting an Input Object into a List of Columns*

**Description**

Splits a (numeric/logical/character) vector, matrix, data.frame or a list of such into a list of columns, with corresponding group and variable information as well as labels. This is an auxiliary function for checking and converting the data argument of zenplot().

**Usage**

```r
burst(x, labs = list())
```

**Arguments**

- `x`  
  A numeric vector, matrix, data.frame or, for `burst()`, a list of such.
- `labs`  
  Either `NULL` (in which case neither group nor variable labels are used or computed) or a list with components:
  - `group` - the group label basename or labels for the groups (or `NULL` for no group labels)
  - `var` - the variable label basename or labels for the variables (or `NULL` for no variable labels)
  - `sep` - the string used as the separator between group and variable labels
  - `group2d` - a logical indicating whether labels of `group_2d_*()` plots are affected by `group = NULL` (or printed anyway)
  If any of these components is not given, it is set to the defaults as described in `zenplot()`. Note that if at least one (group or variable) label is given in `x`, then those (original) labels will be used. If `labs = NULL`, neither group nor variable labels are used.

**Value**

A list with components:
- `xcols` - a list containing the column vectors of `x`
- `groups` - the group number for each column of `x`
- `vars` - the variable number (within each group) for each column of `x`
- `glabs` - the group label for each column of `x`
- `labs` - the group and variable labels for each column of `x`

**Note**

Performance critical

**Author(s)**

Marius Hofert
$burst\_aux$

### See Also

Other tools for constructing your own plot1d and plot2d functions: $burst\_aux()$, $check\_zargs()$, extract\_1d(), extract\_2d(), plot\_indices() 

### Examples

#### ## Unnamed list of (some named, some unnamed) valid components

A <- matrix(1:12, ncol = 3)
x <- list(A, 1:4, as.data.frame(A))

$burst(x, labs = list(group = "G", var = "V", sep = ", "))$
$burst(x) \# \text{the same defaults as above}$
$burst(x, labs = list(sep = " ")) \# \text{only changing the separator}$

#### ## Note: - No group labels are given in 'x' and thus they are constructed
#### \text{in the above call}
#### - The variable names are only constructed if not given

$burst(x, labs = list(group = ""))$
$burst(x, labs = list(group = NULL, group2d = TRUE)) \# \text{no group labels}$

#### ## Note: There's no effect of 'group2d = TRUE' visible here as
#### 'x' doesn't contain group labels

$burst(x, labs = list(group = NULL, group2d = TRUE)) \# \text{no group labels unless groups change}$
$burst(x, labs = list(var = NULL)) \# \text{no variable labels}$

#### ## Named list

x <- list(mat = A, vec = 1:4, df = as.data.frame(A))

$burst(x)$

#### ## Note: - The given group labels are used
#### - The variable names are only constructed if not given

$burst(x, labs = list(group = NULL, group2d = TRUE)) \# \text{no group labels}$
$burst(x, labs = list(group = NULL)) \# \text{no group labels unless groups change}$

#### ## Note: Now the effect of 'group2d' is visible.

$burst(x, labs = list(group = NULL, group2d = TRUE)) \# \text{no group labels}$

#### ## Partially named list

x <- list(mat = A, vec = 1:4, as.data.frame(A))

$burst(x)$

$burst(x, labs = list(group = NULL, group2d = TRUE)) \# \text{no group labels}$
$burst(x, labs = list(group = NULL)) \# \text{no group labels unless groups change}$
$burst(x, labs = list(var = NULL)) \# \text{no variable labels}$
$burst(x, labs = list(group = NULL, var = NULL)) \# \text{only group labels and only if groups change}$
$burst(x, labs = NULL) \# \text{neither group nor variable labels}$
Description

Auxiliary function for burst()

Usage

burst_aux(x, labs = "V")

Arguments

x  
A vector, matrix or data.frame (or a (pure) list, but that we don’t use here)

labs  
The variable labels: - if NULL, no labels are used - if of length 1, use this label and append 1:ncol(x) but only if x doesn’t have any column names (otherwise use the latter) - if of length ncol(x), use that but only if x doesn’t have any column names (otherwise use the latter)

Value

’x’ as a list of named columns

Note

- Performance critical (no checks here) - Data frames always have default names. They are possibly ugly but we have to use them here as we cannot determine whether they were assigned automatically or on purpose.

Author(s)

Marius Hofert

See Also

Other tools for constructing your own plot1d and plot2d functions: burst(), check_zargs(), extract_1d(), extract_2d(), plot_indices()

Description

Checking whether certain arguments appear in zargs

Usage

check_zargs(zargs, ...)

check_zargs  
Checking whether certain arguments appear in zargs
connect_pairs

Arguments

zargs The argument list as passed from zenplot()
... The arguments to be checked for presence in zargs

Value

A logical indicating whether some arguments are missing in zargs

Author(s)

Marius Hofert

See Also

Other tools for constructing your own plot1d and plot2d functions: burst_aux(), burst(), extract_1d(), extract_2d(), plot_indices()

---

connect_pairs Connecting Possibly Overlapping Pairs Into a List of Paths

Description

Pairs, given as rows of a matrix, data.frame, or list, are processed to return a list of paths, each identifying the connected pairs in the rows of x.

Usage

connect_pairs(x, duplicate.rm = FALSE)

Arguments

x two-column matrix, data.frame, or list containing vectors of length two representing the pairs to be connected.

duplicate.rm logical indicating whether equal pairs (up to permutation) are to be omitted.

Value

A list each of whose elements give a path of connected pairs. Each list element is a vector of length at least 2 (longer vectors > 2 in length identify the pairs connected in a path).

Author(s)

Marius Hofert and Wayne Oldford
convert_occupancy

Converting an Occupancy Matrix

Description

Convert an occupancy matrix to matrix with different symbols.

Usage

convert_occupancy(x, to = c("", "<", ">", "v", "^"))

Arguments

x an occupancy matrix consisting of the character "" (unoccupied), "1" (left), "r" (right), "d" (down) or "u" (up) as returned by zenplot().

to a vector of symbols to which "", "1", "r", "d" and "u" should be mapped.
density_1d_graphics

Value

matrix as the occupancy matrix but with entries replaced by those in to.

Author(s)

Marius Hofert

See Also

Other zenplot technical tools: is.standard(), n2dcols_aux(), num_cols(), turn_checker()

Examples

## Generate some data
n <- 1000 # sample size
d <- 20 # dimension
set.seed(271) # set seed (for reproducibility)
x <- matrix(rnorm(n * d), ncol = d) # i.i.d. N(0,1) data

## Extract the occupancy matrix from a zenplot
res <- zenplot(x)
(occ <- res["path"]["occupancy"])

## Convert the occupancy matrix
convert_occupancy(occ)
Arguments

- **zargs**: argument list as passed from `zenplot()`
- **density...**: list of arguments for `density()`
- **offset**: number in [0, 0.5] determining how far away the density stays from the plot margins (for creating space between the two)
- **add**: logical indicating whether this plot should be added to the last one
- **plot...**: additional arguments passed to `plot_region()`
- **...**: additional arguments passed to `polygon()`

Value

- `invisible()`

Author(s)

Marius Hofert and Wayne Oldford

See Also

Other default 1d plot functions using R’s base graphics: `arrow_1d_graphics()`, `boxplot_1d_graphics()`, `hist_1d_graphics()`, `jitter_1d_graphics()`, `label_1d_graphics()`, `lines_1d_graphics()`, `points_1d_graphics()`, `rect_1d_graphics()`, `rug_1dGraphics()`

Other default 1d plot functions: `arrow_1d_grid()`, `arrow_1d_loon()`, `boxplot_1d_grid()`, `boxplot_1d_loon()`, `density_1d_grid()`, `density_1d_loon()`, `extract_1d()`, `hist_1d_grid()`, `hist_1d_loon()`, `jitter_1d_grid()`, `jitter_1d_loon()`, `label_1d_grid()`, `label_1d_loon()`, `lines_1d_grid()`, `lines_1d_loon()`, `points_1d_grid()`, `points_1d_loon()`, `rect_1d_grid()`, `rect_1d_loon()`, `rug_1d_grid()`, `rug_1d_loon()`

---

density_1d_grid  

**Density plot in 1d using the grid package**

Description

Density plot in 1d using the grid package

Usage

```r
density_1d_grid(zargs, density... = NULL, offset = 0.08, draw = FALSE, ...)
```
**Arguments**

- `zargs`: argument list as passed from `zenplot()`
- `density.args`: list of arguments for `density()`
- `offset`: numerical value in $[0, 0.5]$ used to offset the density within the height 1 box in which it appears
- `draw`: logical indicating whether drawing should take place
- `...`: additional arguments passed to `gpar()`

**Value**

- `grob (invisibly)`

**Author(s)**

Marius Hofert and Wayne Oldford

**See Also**

Other default 1d plot functions using the grid package: `arrow_1d_grid()`, `boxplot_1d_grid()`, `hist_1d_grid()`, `jitter_1d_grid()`, `label_1d_grid()`, `lines_1d_grid()`, `points_1d_grid()`, `rect_1d_grid()`, `rug_1d_grid()`

Other default 1d plot functions using the loon package: `arrow_1d_loon()`, `arrow_1d_grid()`, `boxplot_1d_loon()`, `boxplot_1d_grid()`, `density_1d_loon()`, `extract_1d()`, `hist_1d_graphics()`, `hist_1d_grid()`, `hist_1d_loon()`, `jitter_1d_graphics()`, `jitter_1d_grid()`, `jitter_1d_loon()`, `label_1d_graphics()`, `label_1d_grid()`, `label_1d_loon()`, `lines_1d_graphics()`, `lines_1d_grid()`, `lines_1d_loon()`, `points_1d_graphics()`, `points_1d_grid()`, `points_1d_loon()`, `rect_1d_graphics()`, `rect_1d_grid()`, `rect_1d_loon()`, `rug_1d_graphics()`, `rug_1d_grid()`, `rug_1d_loon()`

---

**Description**

Density plot in 1d using the interactive loon package

**Usage**

```r
density_1d_loon(
  zargs,  # argument list as passed from zenplot()
  density.args = list(),
  method = c("single", "double"),
  lwd = NULL,
  linewidth = NULL,
)```
color = NULL,
fill = NULL,
linecolor = NULL,
linkingGroup = NULL,
showLabels = FALSE,
showScales = FALSE,
showGuides = FALSE,
baseplot = NULL,
parent = NULL,
...
)

Arguments

zargs The argument list as passed from zenplot()
density.args A list of arguments for density()
method A character specifying the type of density used
lwd Line width used only when linewidth = NULL, value of 1 used otherwise.
linewidth Line width of outline for density polygons (highest priority)
color Colour used to fill the density when fill is NULL and to outline the density when linecolor is NULL, foreground colour used otherwise.
fill Colour used to fill the density polygon
linecolor Colour used for the outline of the density
linkingGroup A string specifying the initial group of plots to be linked to this plot
showLabels Logical determining whether axis labels are displayed
showScales Logical determining whether scales are displayed
showGuides Logical determining whether the background guidelines are displayed
baseplot If non-null the base plot on which the plot should be layered
parent The tk parent for this loon plot widget
... Additional parameters passed to loon::l_layer()

Value

A loon loon::l_plot(...)

Author(s)

Marius Hofert and Wayne Oldford

See Also

Other default 1d plot functions using the interactive loon package: arrow_1d_loon(), boxplot_1d_loon(), hist_1d_loon(), jitter_1d_loon(), label_1d_loon(), lines_1d_loon(), points_1d_loon(), rect_1d_loon(), rug_1d_loon()
Other default 1d plot functions: `arrow_1d_graphics()`, `arrow_1d_grid()`, `arrow_1d_loon()`, `boxplot_1d_graphics()`, `boxplot_1d_grid()`, `boxplot_1d_loon()`, `density_1d_graphics()`, `density_1d_grid()`, `extract_1d()`, `hist_1d_graphics()`, `hist_1d_grid()`, `hist_1d_loon()`, `jitter_1d_graphics()`, `jitter_1d_grid()`, `jitter_1d_loon()`, `label_1d_graphics()`, `label_1d_grid()`, `label_1d_loon()`, `lines_1d_graphics()`, `lines_1d_grid()`, `lines_1d_loon()`, `points_1d_grid()`, `points_1d_loon()`, `rect_1d_graphics()`, `rect_1d_grid()`, `rect_1d_loon()`, `rug_1d_graphics()`, `rug_1d_grid()`, `rug_1d_loon()`

density_2d_graphics  

Density plot in 2d using R’s base graphics

Description

Density plot in 2d using R’s base graphics

Usage

density_2d_graphics(
    zargs,
    ngrids = 25,
    drawlabels = FALSE,
    axes = FALSE,
    box = FALSE,
    add = FALSE,
    group... = NULL,
    ...
)

Arguments

zargs  
argument list as passed from zenplot()

ngirds  
number of grid points in each dimension. Can be scalar or a length-2 integer vector.

drawlabels  
logical indicating whether the contours should be labelled

axes  
logical indicating whether axes should be drawn

box  
logical indicating whether a box should be drawn

add  
logical indicating whether this plot should be added to the last one

group...  
list of arguments passed to group_2d_graphics (or NULL)

...  
additional arguments passed to points()

Value

invisible()
density_2d_grid

Density plot in 2d using the grid package

Description

Density plot in 2d using the grid package

Usage

density_2d_grid(
  zargs,
  ngrids = 25,
  ccol = NULL,
  clwd = 1,
  clty = 1,
  box = FALSE,
  box.width = 1,
  box.height = 1,
  group... = list(cex = 0.66),
  draw = FALSE,
  ...
)

Arguments

zargs: argument list as passed from `zenplot()`

ngrids: number of grid points in each direction. Can be scalar or a length-2 integer vector.

ccol: vector (which is then recycled to the appropriate length) giving the color of the contours

clwd: vector (which is then recycled to the appropriate length) giving the line widths of the contours
Density plot in 2d using the interactive loon package

density_2d_loon

clty vector (which is then recycled to the appropriate length) giving the line types of the contours
box logical indicating whether a box should be drawn
box.width width of the box
box.height height of the box
group... list of arguments passed to group_2d_grid (or NULL)
draw logical indicating whether drawing should take place
... additional arguments passed to gpar()

Value

grob (invisibly)

Note

- We use names depending on the 'type' here since otherwise, if one calls it once for 'p' and once for 'l', only one of them is plotted - The default point size was chosen to match the default of graphics

Author(s)

Marius Hofert and Wayne Oldford
Marius Hofert and Wayne Oldford

See Also

Other default 2d plot functions using the grid package: arrow_2d_grid(), axes_2d_grid(),
group_2d_grid(), label_2d_grid(), points_2d_grid(), qq_2d_grid(), rect_2d_grid()

Other default 2d plot functions: arrow_2d_graphics(), arrow_2d_grid(), arrow_2d_loon(),
axes_2d_graphics(), axes_2d_grid(), axes_2d_loon(), density_2d_graphics(), density_2d_loon(),
extact_2d(), group_2d_graphics(), group_2d_grid(), group_2d_loon(), label_2d_graphics(),
label_2d_grid(), label_2d_loon(), points_2d_graphics(), points_2d_grid(), points_2d_loon(),
qq_2d_graphics(), qq_2d_grid(), rect_2d.Graphics(), rect_2d_grid(), rect_2d_loon()
Usage

density_2d_loon(
  zargs,
  ngrids = 25,
  ccol = NULL,
  color = NULL,
  clwd = NULL,
  lwd = NULL,
  linewidth = 1,
  showLabels = FALSE,
  showScales = FALSE,
  showGuides = FALSE,
  linkingGroup = NULL,
  baseplot = NULL,
  parent = NULL,
  group... = NULL,
  ...
)

Arguments

zargs The argument list as passed from zenplot()
ngrids Number of grid points in each direction. Can be scalar or a length-2 integer vector.
ccol A vector (which is then recycled to the appropriate length) giving the color of the contours
color Colour used fill if ccol is NULL, a grey palette is used otherwise.
clwd A vector (which is then recycled to the appropriate length) giving the line widths of the contours
lwd Line width used only when clwd = NULL
linewidth Line width used when both clwd and lwd are NULL, value of 1 used otherwise.
showLabels Logical determining whether axis labels are displayed
showScales Logical determining whether scales are displayed
showGuides Logical determining whether the background guidelines are displayed
linkingGroup The initial linking group
baseplot If non-null the base plot on which the plot should be layered
parent The tk parent for this loon plot widget
group... A list of arguments passed to group_2d_loon (or NULL)
... Additional parameters passed to loon::l_layer_line()

Value

invisible()
Data set consisting of 68 columns of data about the German elections 2002 and 2005.

Usage

data("de_elect")

Format

A data.frame() with 68 columns:

District: electoral district
State: federal state (Bundesland)
Num.comm: number of communities
Area: area 2004-12-31 (in square km)
Pop: population 2004-12-31 (in 1000)
Men: men (in 1000)
Citizens: germans (in 1000)
Density: population density 2004-12-31 (in square km)
Pop.15.18: population younger than (or equal to) 15 years 2002-12-31 (in percent)
Pop.18.25: population between 18 and 25 years old 2002-12-31 (in percent)
Pop.25.35: population between 25 and 35 years old 2002-12-31 (in percent)
Pop.35.60: population between 35 and 60 years old 2002-12-31 (in percent)
Pop.g.60: population older than 60 years 2002-12-31 (in percent)
Births: live births (per 1000)
Deaths: deaths (per 1000)
Move.in: moving there in 2003 (per 1000)
Move.out: moving away in 2003 (per 1000)
Increase: increase in population (per 1000)
Farms: number of farms in 2001 (per 1000)
Agriculture: agriculturally used land (in ha)
Mining: mining companies and processing trade 2002-09-30 (per 1000)
Mining.employees: employees in mining and processing trade 2002-09-30 (per 1000)
Apt.new: new apartments 2002 (per 1000)
Apt: apartments 2002-12-31 (per 1000)
Motorized: motor vehicles 2003-01-31 (per 1000)
School.finishers: school finishers 2002 (per 1000)
School.wo.2nd: without secondary school (ohne Hauptschule) 2002 (in percent)
School.2nd: with secondary school (Hauptschule) 2002 (in percent)
School.Real: with graduation from Realschule 2002 (in percent)
School.UED: with university-entrance diploma (Gymnasium) 2002 (in percent)
Unemployment.03: unemployment 2003-12-31 (in percent)
Unemployment.04: unemployment 2004-12-31 (in percent)
Employed: employed subject to social insurance contribution (per 1000)
FFF: farmers, foresters, fishermen (in percent)
Industry: industry employees subject to social insurance contribution (in percent)
CTT: commerce, transportation and telecommunication employees subject to social insurance con-
tribution (in percent)
OS: other services (in percent)
Voters.05: eligible voters 2005
Voters.02: eligible voters 2002
Votes.05: number of votes 2005
Votes.02: number of votes 2002
Invalid.05: invalid votes 2005
Invalid.02: invalid votes 2002
Valid.05: valid votes 2005
Valid.02: valid votes 2002
Votes.SPD.05: votes for SPD 2005
Votes.SPD.02: votes for SPD 2002
Votes.CDU.CSU.05: votes for CDU/CSU 2005
Votes.CDU.CSU.02: votes for CDU/CSU 2002
Votes.Gruene.05: votes for Gruene 2005
extract_1d

Votes.Gruene.02: votes for Gruene 2002
Votes.FDP.05: votes for FDP 2005
Votes.FDP.02: votes for FDP 2002
Votes.Linke.05: votes for Linke 2005
Votes.Linke.02: votes for Linke 2002
SPD.05: SPD 2005 (as a fraction in [0,1])
CDU.CSU.05: CDU/CSU 2005 (as a fraction in [0,1])
Gruene.05: Gruene 2005 (as a fraction in [0,1])
FDP.05: FDP 2005 (as a fraction in [0,1])
Linke.05: Linke 2005 (as a fraction in [0,1])
Others.05: Other parties 2005 (as a fraction in [0,1])
SPD.02: SPD 2002 (as a fraction in [0,1])
CDU.CSU.02: CDU/CSU 2002 (as a fraction in [0,1])
Gruene.02: Gruene 2002 (as a fraction in [0,1])
FDP.02: FDP 2002 (as a fraction in [0,1])
Linke.02: Linke 2002 (as a fraction in [0,1])
Others.02: other parties 2002 (as a fraction in [0,1])

Source

The data was obtained from http://www.bundeswahlleiter.de but is not available under this link anymore. Furthermore, the first column of the original data set is omitted as it only contained the row numbers.

Examples

data("de_elect")

extract_1d  Extracting information for our default/provided plot1d()

Description

Extracting information for our default/provided plot1d()

Usage

extract_1d(zargs)

Arguments

zargs The argument list as passed from zenplot(). This must at least contain x, orientations, vars, num, lim and labs; see zenplot() for an explanation of these variables.
Details

This is an auxiliary function called on zargs within any 1d plotting function (e.g. `hist_1d_grid`, `density_1d_graphics`, or `points_1d_loon`) to extract the 1d data from zargs needed for plotting. For performance reasons, no checking of the input object is done.

Value

A list `list` with

- `x`: the data to be plotted in the 1d plot
- `xcols`: a list with all columns of `x`
- `groups`: the group numbers for each column of `x`
- `vars`: the variable numbers for each column of `x`
- `glabs`: the group labels for each column of `x`
- `vlabs`: the variable labels for each column of `x`
- `horizontal`: a `logical` indicating whether the plot is horizontal or vertical, and
- `xlim`: the axis limits.

Note

Performance critical

Author(s)

Marius Hofert and Wayne Oldford

See Also

Other tools for constructing your own plot1d and plot2d functions: `burst_aux()`, `burst()`, `check_zargs()`, `extract_2d()`, `plot_indices()`

Other data extraction functions to build plots: `extract_2d()`

Other default 1d plot functions: `arrow_1d_graphics()`, `arrow_1d_grid()`, `arrow_1d_loon()`, `boxplot_1d_graphics()`, `boxplot_1d_grid()`, `boxplot_1d_loon()`, `density_1d_graphics()`, `density_1d_grid()`, `density_1d_loon()`, `hist_1d_graphics()`, `hist_1d_grid()`, `hist_1d_loon()`, `jitter_1d_graphics()`, `jitter_1d_grid()`, `jitter_1d_loon()`, `label_1d_graphics()`, `label_1d_grid()`, `label_1d_loon()`, `lines_1d_graphics()`, `lines_1d_grid()`, `lines_1d_loon()`, `points_1d_graphics()`, `points_1d_grid()`, `points_1d_loon()`, `rect_1d_graphics()`, `rect_1d_grid()`, `rect_1d_loon()`, `rug_1d_graphics()`, `rug_1d_grid()`, `rug_1d_loon()`

Examples

```r
## This function is used within the default (any user defined) 1d plots
my_1d_plot <- function(zargs, your_name = "Bob", ...) {
  data_1d <- extract_1d(zargs)
  msg <- paste("Components of zargs available",
    "to construct a 1d plot for ",
  
```
$\text{your\_name}$

```r
print(msg)
## just print the names of the data components
## which you might want to use in your plot
print(names(data_1d))
## You might have to draw your 1d plot differently depending
## upon whether it is to appear horizontally or vertically
if (data_1d$horizontal) {
  print("This plot would be horizontal")
} else {
  print("This one would be vertical")
}
## You can plot whatever you want using the information in
## could use any of these to construct any 1d plot you want
## using R's graphics or any of zemplot's built in 1d plots.
##
## For example, here we use zenplot's base graphics functions
## First a histogram
hist_1d_graphics(zargs, ...)
## to which we add the variable label
label_1d_graphics(zargs, add = TRUE, col = "red", ...)
## similar functions could be called for the other packages.
## You can print the source of anyone of the default functions
## to get some idea of managing details.
}
```

```r
## And now try it out
zenplot(iris[,1:3], plot1d = my_1d_plot)
```

---

### extract_2d

**Extracting information for our default/provided plot2d()**

---

**Description**

Extracting information for our default/provided plot2d()

**Usage**

```r
extract_2d(zargs)
```

**Arguments**

- **zargs**
  The argument list as passed from `zenplot()`. This must at least contain `x, vars, num, lim and labs` (for `extract_2d()`); see `zenplot()` for an explanation of these variables.
Details

This is an auxiliary function called on zargs within any 1d plotting function (e.g. `hist_1d_grid`, `density_1d_graphics`, or `points_1d_loon`) to extract the 1d data from zargs needed for plotting.

For performance reasons, no checking of the input object is done.

Value

A list `list` with

- **x** and **y**: the data to be plotted in the 2d plot
- **xcols**: a list with all columns of **x**
- **groups**: the group numbers for each column of **x**
- **vars**: the variable numbers for each column of **x**
- **glabs**: the group labels for each column of **x**
- **vlabs**: the variable labels for each column of **x**
- **xlim** and **ylim**: the x-axis and y-axis limits, and
- **same.group**: a `logical` indicating whether the x and y variables belong to the same group.

Note

Performance critical

Author(s)

Marius Hofert and Wayne Oldford

See Also

Other tools for constructing your own plot1d and plot2d functions: `burst_aux()`, `burst()`, `check_zargs()`, `extract_1d()`, `plot_indices()`

Other data extraction functions to build plots: `extract_2d()`

Other default 2d plot functions: `arrow_2d_graphics()`, `arrow_2d_grid()`, `arrow_2d_loon()`, `axes_2d_graphics()`, `axes_2d_grid()`, `axes_2d_loon()`, `density_2d_graphics()`, `density_2d_grid()`, `density_2d_loon()`, `group_2d_graphics()`, `group_2d_grid()`, `group_2d_loon()`, `label_2d_graphics()`, `label_2d_grid()`, `label_2d_loon()`, `points_2d_graphics()`, `points_2d_grid()`, `points_2d_loon()`, `qq_2d_graphics()`, `qq_2d_grid()`, `rect_2d_graphics()`, `rect_2d_grid()`, `rect_2d_loon()`

Examples

```r
## This function is used within the default (any user defined)
## 2d plot functions

my_2d_plot <- function(zargs, your_name = "BillyBob", ...) {
  data_2d <- extract_2d(zargs)
  msg <- paste("Components of zargs available",
               "to construct a 2d plot for ",
               your_name)
```

## extract_pairs

Extract Pairs from a Path of Indices

### Description

Extracts pairs from a path of indices, representing the path by the pairs (connected by common variable) and return a shortened path.

### Usage

```r
extract_pairs(x, n)
```

### Arguments

- `x`  
  the path, a vector or list of indices of the variables to be plotted.

- `n`  
  A vector of length two giving the number of pairs to extract from the path `x` (if `NULL`, all pairs are returned (nothing extracted); if of length one, it is replicated in the pair). The first number corresponds to the beginning of the path, the second to the end; at least one of the two numbers should be \( \geq 1 \).

### Value

returns an object of the same type as the input `x` but (possibly) shortened. It extracts the first/last so-many pairs of `x`. 

### Example

```r
## just print the names of the data components
## which you might want to use in your plot
print(names(data_2d))

## You can plot whatever you want using the information in
## could use any of these to construct any 1d plot you want
## using R's graphics or any of zemplot's built in 1d plots.
##
## For example, here we could use
## use zemplot's base graphics functions
## First a scatterplot
points_2d_graphics(zargs, ...)
## to which we overlay density contours
density_2d_graphics(zargs, add = TRUE, col = "steelblue", ...)
## similar functions could be called for the other packages.
## You can print the source of anyone of the default functions
## to get some idea of managing details.

## And now try it out
zenplot(iris, plot2d = my_2d_plot)
```
Author(s)

Marius Hofert and Wayne Oldford

See Also

zenplot() which provides the zenplot.

Other tools related to constructing zenpaths: connect_pairs(), graph_pairs(), groupData(), indexData(), zenpath()

Examples

```r
## Begin with a path
(zp <- zenpath(c(3, 5), method = "eulerian.cross")) # integer(2) argument

## Extract the first two pairs and last four of indices
extract_pairs(zp, n = c(2, 4))

## Extract the first and last three pairs of indices
extract_pairs(zp, n = 3) # the 3 is repeated automatically
```

Description

Compute the layout of the zen plot

Usage

```r
get_layout(
  turns,
  n2dplots,
  first1d = TRUE,
  last1d = TRUE,
  width1d = 1,
  width2d = 10
)
```

Arguments

- **turns**: turns (character vector consisting if "u", "d", "l", "r")
- **n2dplots**: the number of 2d plots (faces of the hypercube to be laid out)
- **first1d**: logical indicating whether the first 1d plot should be plotted
- **last1d**: logical indicating whether the last 1d plot should be plotted
- **width1d**: width of 1d plots
- **width2d**: width of 2d plots
get_path

Value
list containing 1) the plot orientations (c("h", "s", "v", "s", ...)) 2) the plot dimensions (1d plot, 2d plot, 1d plot, ...) 3) the variable numbers plotted (an (nPlots, 2)-matrix) 4) the total width of the layout 5) the total height of the layout 6) coordinates of the bounding boxes

Author(s)
Marius Hofert and Wayne Oldford

get_path Computing the path according to the provided method

Description
Computing the path according to the provided method

Usage
get_path(
  turns = NULL,
  n2dcols = c("letter", "square", "A4", "golden", "legal"),
  n2dplots,
  method = c("tidy", "double.zigzag", "single.zigzag", "rectangular"),
  first1d = TRUE,
  last1d = TRUE
)

Arguments
turns The turns
n2dcols The number of columns of 2d plots (>= 1) or one of "letter", "square", "A4", "golden", "legal". Note that n2dcols is ignored if turns is not NULL.
n2dplots The number of 2d plots to be laid out
method A character string indicating the method according to which the path is built
first1d A logical indicating whether the first 1d plot should be plotted
last1d A logical indicating whether the last 1d plot should be plotted

Value
the path, a list containing the turns, the positions (indices in the occupancy matrix) and the the occupancy matrix

Author(s)
Marius Hofert and Wayne Oldford
**get_zigzag_turns**  
*Compute turns for zigzag*

**Description**
Compute turns for zigzag

**Usage**

```r
get_zigzag_turns(
  nPlots,
  n2dcols,
  method = c("tidy", "double.zigzag", "single.zigzag")
)
```

**Arguments**
- `nPlots` total number of plots
- `n2dcols` number of columns of 2d plots (>= 1)
- `method` character string indicating which zigzag method to use

**Value**

`turns`

**Author(s)**
Marius Hofert and Wayne Oldford

---

**graph_pairs**  
*Turn pairs or paths into a graph*

**Description**
Pairs are processed to produce a graph with the elements of the pairs as vertices and the pairs as undirected edges. The result can be displayed using `plot()`.

**Usage**

```r
graph_pairs(x, var.names = NULL, edgemode = c("undirected", "directed"))
```
Arguments

- **x**: matrix or list of pairs along a zenpath. Can also be a list containing vectors representing paths in the graph. Every path must be of length at least 2 (i.e. each vector element of the list).
- **var.names**: names of the variables appearing in `x`.
- **edgemode**: type of edges to be used: either "undirected" (the default) or "directed" (in which case the order of the nodes in each pair matters).

Value

A graphNEL object; can be displayed using `plot()`.

Note

`zenplot()` never use directed graphs nor graphs with isolated (disconnected) nodes.

Author(s)

Marius Hofert and Wayne Oldford

See Also

- `zenplot()` which provides the zenplot.
- Other tools related to constructing zenpaths: `connect_pairs()`, `extract_pairs()`, `groupData()`, `indexData()`, `zenpath()`

Examples

```r
## To display the graphs constructed the packages
## graph and Rgraphviz packages need to be loaded
library(graph)
library(Rgraphviz)
##
## Get some pairs
pairs <- matrix(c(1,2, 5,1, 3,4, 2,3, 4,2), ncol = 2, byrow = TRUE)
g <- graph_pairs(pairs)
## which can be displayed using plot(g)
plot(g)

## Build a graph from a list of paths
paths <- list(3:1, c(3,5,7), c(1,4,7), c(6,7))
gp <- graph_pairs(paths)
## graph package draws with grid, so clear
grid.newpage()
plot(gp)

## Nodes do not need to be numbers
alpha_paths <- list(letters[3:1], letters[c(3,5,7)],
letters[c(1,4,7)], letters[c(6,7)])
grid.newpage()
```
plot(graph_pairs(alpha_paths))

## Zenplots never uses this feature but you could
## build a directed graph with a single isolated node
dg <- graph_pairs(alpha_paths,
  var.names = c(letters[1:7], "ALONE"),
  edgemode = "directed" )
grid.newpage()
plot(dg)

---

**groupData**

### Splitting a Matrix into a List of Matrices

#### Description

Takes a matrix `x` and groups its rows (or columns) as specified by `indices`. Returns a list of matrices, one for each group.

#### Usage

```r
groupData(x, indices, byrow = FALSE)
```

#### Arguments

- **x**: A matrix (or an object convertible to such via `as.matrix()`).
- **indices**: list of vectors of indices according to which `x` is grouped; each vector of indices define a group.
- **byrow**: logical indicating whether the grouping is done by row (`byrow = TRUE`) or by column (`byrow = FALSE`, the default).

#### Value

A list of matrices (one per group). Such a list, grouped by columns, is then typically passed on to `zenplot()`.

#### Author(s)

Marius Hofert and Wayne Oldford

#### See Also

- `zenplot()` which provides the zenplot.
- Other tools related to constructing zenpaths: `connect_pairs()`, `extract_pairs()`, `graph_pairs()`, `indexData()`, `zenpath()`
Examples

```r
## get a matrix
x <- matrix(1:15, ncol = 3)
colGroups <- list(c(1,2), list(2:3))
rowGroups <- list(c(1,4), list(2:3))
groupData(x, indices = colGroups)
groupData(x, indices = rowGroups, byrow = TRUE)
```

Description

Plot of labels indicating adjacent groups using R’s base graphics

Usage

```r
group_2d_graphics(
  zargs,
  glabs = NULL,
  sep = "\n",
  loc = c(0.5, 0.5),
  add = FALSE,
  plot... = NULL,
  ...
)
```

Arguments

- `zargs`: argument list as passed from `zenplot()`
- `glabs`: group labels being indexed by the plot variables (and thus of length as the number of variables); if NULL then they are determined with `extract_2d()`
- `sep`: group label separator
- `loc`: (x,y)-location in [0,1]^2; 0 corresponds to left, 1 to right (in the direction of the path)
- `add`: logical indicating whether this plot should be added to the last one
- `plot...`: additional arguments passed to `plot_region()`
- `...`: additional arguments passed to `text()`

Value

`invisible()`
group_2d_grid

Plot of labels indicating adjacent groups using the grid package

Description
Plot of labels indicating adjacent groups using the grid package

Usage

```r
group_2d_grid(
  zargs,
  glabs = NULL,
  sep = "\n",
  loc = c(0.5, 0.5),
  draw = FALSE,
  ...
)
```

Arguments

- `zargs`: argument list as passed from `zenplot()`
- `glabs`: group labels being indexed by the plot variables (and thus of length as the number of variables); if `NULL` then they are determined with `extract_2d()`
- `sep`: group label separator
- `loc`: (x,y)-location in [0,1]^2; 0 corresponds to left, 1 to right (in the direction of the path)
- `draw`: logical indicating whether drawing should take place
- `...`: additional arguments passed to `gpar()`

Note
For performance reasons (avoiding having to call `extract_2d()` twice), `glabs` is an extra argument

Author(s)
Marius Hofert and Wayne Oldford

See Also
Other default 2d plot functions using R’s base graphics: `arrow_2d_graphics()`, `axes_2d_graphics()`, `density_2d_graphics()`, `label_2d_graphics()`, `points_2d_graphics()`, `qq_2d_graphics()`, `rect_2d_graphics()`

Other default 2d plot functions: `arrow_2d_grid()`, `arrow_2d_loon()`, `axes_2d_grid()`, `axes_2d_loon()`, `density_2d_grid()`, `density_2d_loon()`, `extract_2d()`, `group_2d_grid()`, `group_2d_loon()`, `label_2d_grid()`, `label_2d_loon()`, `points_2d_grid()`, `points_2d_loon()`, `qq_2d_grid()`, `qq_2d_loon()`, `rect_2d_grid()`, `rect_2d_loon()`
group_2d_loon

Value

grob (invisibly)

Note

For performance reasons (avoiding having to call extract_2d() twice), 'glabs' is an extra argument

Author(s)

Marius Hofert

See Also

Other default 2d plot functions using the grid package: arrow_2d_grid(), axes_2d_grid(), density_2d_grid(), label_2d_grid(), points_2d_grid(), qq_2d_grid(), rect_2d_grid()

Other default 2d plot functions: arrow_2d_graphics(), arrow_2d_grid(), arrow_2d_loon(), axes_2d_graphics(), axes_2d_grid(), axes_2d_loon(), density_2d_graphics(), density_2d_grid(), density_2d_loon(), extract_2d(), group_2d_graphics(), group_2d_loon(), label_2d_graphics(), label_2d_grid(), label_2d_loon(), points_2d_graphics(), points_2d_grid(), points_2d_loon(), qq_2d_graphics(), qq_2d_grid(), rect_2d_graphics(), rect_2d_grid(), rect_2d_loon()

---

group_2d_loon  Plot of labels indicating adjacent groups using the interactive loon package

Description

Plot of labels indicating adjacent groups using the interactive loon package

Usage

group_2d_loon(
  zargs,
  glabs = NULL,
  sep = "\n",
  size = 8,
  rot = 0,
  baseplot = NULL,
  parent = NULL,
  ...
)
Arguments

- **zargs**: argument list as passed from `zenplot()`
- **glabs**: group labels being indexed by the plot variables (and thus of length as the number of variables); if NULL then they are determined with `extract_2d()`
- **sep**: group label separator
- **size**: plot size
- **rot**: rotation
- **baseplot**: If non-NULL the base plot on which the plot should be layered
- **parent**: tk parent for this loon plot widget
- **...**: Additional arguments passed to `text()`

Value

invisible()

Note

For performance reasons (avoiding having to call `extract_2d()` twice), 'glabs' is an extra argument

Author(s)

Marius Hofert & Wayne Oldford

See Also

Other default 2d plot functions using the interactive loon package: `arrow_2d_loon()`, `axes_2d_loon()`, `density_2d_loon()`, `label_2d_loon()`, `points_2d_loon()`, `rect_2d_loon()`

Other default 2d plot functions: `arrow_2d_graphics()`, `arrow_2d_grid()`, `arrow_2d_loon()`, `axes_2d_graphics()`, `axes_2d_grid()`, `axes_2d_loon()`, `density_2d_graphics()`, `density_2d_grid()`, `density_2d_loon()`, `extract_2d()`, `group_2d_graphics()`, `group_2d_grid()`, `label_2d_graphics()`, `label_2d_grid()`, `label_2d_loon()`, `points_2d_graphics()`, `points_2d_grid()`, `points_2d_loon()`, `qq_2d_graphics()`, `qq_2d_grid()`, `rect_2d_graphics()`, `rect_2d_grid()`, `rect_2d_loon()`

---

**happiness**  
*World Happiness Data Set*

Description

Data set consisting of 498 rows and 12 columns containing data from the World Happiness Report over three years.

Usage

data("happiness")
Format

data.frame() with 12 columns:

Region: region of the world.
Country: country.
Happiness: happiness score measured in the respective year (see Time) by asking “How would you rate your happiness on a scale of 0 to 10 where 10 is happiest?”.
Rank: rank of the country based on Happiness.
GDP: extent to which the gross domestic product per capita contributed to the calculation of Happiness.
Family: extent to which family contributed to the calculation of Happiness.
Health: extent to which life expectancy contributed to the calculation of Happiness.
Freedom: extent to which freedom contributed to the calculation of Happiness.
Corruption: extent to which the perception of corruption contributed to the calculation of Happiness.
Generosity: extent to which generosity contributed to the calculation of Happiness.
Dystopia: extent to which the dystopia residual contributed to the calculation of Happiness.
   Dystopia is an imaginary country with the world’s least-happy people (which can act as a benchmark against which all countries can be favorably compared).

Details

GDP, Family, Health, Freedom, Corruption and Generosity describe the extent to which these factors contribute in evaluating the happiness in each country. If added together with Dystopia, one receives the happiness score.

Source

The data set was obtained from https://www.kaggle.com/unsdsn/world-happiness on 2018-04-20 in three different .csv files (one for each year). Joint columns (variables) where then built, the rows expanded (to be the same for each year) and sorted according to Region and Country. Finally, Time was added to obtain a single data set.

References

https://www.kaggle.com/unsdsn/world-happiness

Examples

data("happiness")
stopifnot(all.equal(rowSums(happiness[,c("GDP", "Family", "Health", "Freedom",
    "Corruption", "Generosity",
    "Dystopia")]),
    happiness[, "Happiness"], tol = 5e-5))
hist_1d_graphics

Histogram as 1d plot using R’s base graphics

Description

Histogram as 1d plot using R’s base graphics

Usage

hist_1d_graphics(
  zargs,
  breaks = NULL,
  length.out = 21,
  col = NULL,
  axes = FALSE,
  add = TRUE,
  plot... = NULL,
  ...
)

Arguments

  zargs  argument list as passed from zenplot()
  breaks see ?hist; the default is 20 equi-width bins covering the data range
  length.out number of break points if breaks = NULL
  col vector of colors for the bars or bar components; see ?barplot
  axes logical indicating whether axes should be drawn
  add logical indicating whether this plot should be added to the last one
  plot... additional arguments passed to plot_region()
  ... additional arguments passed to barplot()

Value

invisible()

Author(s)

Marius Hofert and Wayne Oldford

See Also

Other default 1d plot functions using R’s base graphics: arrow_1d_graphics(), boxplot_1d_graphics(), density_1d_graphics(), jitter_1d_graphics(), label_1d_graphics(), lines_1d_graphics(), points_1d_graphics(), rect_1d_graphics(), rug_1d_graphics()
Other default 1d plot functions: `arrow_1d_graphics()`, `arrow_1d_grid()`, `arrow_1d_loon()`,
`boxplot_1d_graphics()`, `boxplot_1d_grid()`, `boxplot_1d_loon()`, `density_1d_graphics()`,
`density_1d_grid()`, `density_1d_loon()`, `extract_1d()`, `hist_1d_grid()`, `hist_1d_loon()`,
`jitter_1d_graphics()`, `jitter_1d_grid()`, `jitter_1d_loon()`, `label_1d_graphics()`, `label_1d_grid()`,
`label_1d_loon()`, `lines_1d_graphics()`, `lines_1d_grid()`, `lines_1d_loon()`, `points_1d_graphics()`,
`points_1d_grid()`, `points_1d_loon()`, `rect_1d_graphics()`, `rect_1d_grid()`, `rect_1d_loon()`,
`rug_1d_graphics()`, `rug_1d_grid()`, `rug_1d_loon()`

---

**hist_1d_grid**

*Histogram in 1d using the grid package*

**Description**

Histogram in 1d using the grid package

**Usage**

```r
hist_1d_grid(
  zargs,
  breaks = NULL,
  length.out = 21,
  col = NULL,
  fill = NULL,
  draw = FALSE,
  ...
)
```

**Arguments**

- `zargs` argument list as passed from `zenplot()`
- `breaks` see `?hist`; the default is 20 equi-width bins covering the data range
- `length.out` number of break points if `breaks = NULL`
- `col` colour of the histogram bar interiors, unless `fill` is specified, then this is the colour of the border
- `fill` logical passed to the underlying `rectGrob()`
- `draw` logical indicating whether drawing should take place
- `...` additional arguments passed to `gpar()`

**Value**

`grob (invisibly)`

**Author(s)**

Marius Hofert and Wayne Oldford
See Also

Other default 1d plot functions using the grid package: arrow_1d_grid(), boxplot_1d_grid(), density_1d_grid(), jitter_1d_grid(), label_1d_grid(), lines_1d_grid(), points_1d_grid(), rect_1d_grid(), rug_1d_grid()

Other default 1d plot functions: arrow_1d_graphics(), arrow_1d_grid(), arrow_1d_loon(), boxplot_1d_graphics(), boxplot_1d_grid(), boxplot_1d_loon(), density_1d_graphics(), density_1d_grid(), density_1d_loon(), extract_1d(), hist_1d_graphics(), hist_1d_grid(), hist_1d_loon(), jitter_1d_graphics(), jitter_1d_grid(), jitter_1d_loon(), label_1d_graphics(), label_1d_grid(), label_1d_loon(), lines_1d_graphics(), lines_1d_grid(), lines_1d_loon(), points_1d_graphics(), points_1d_grid(), points_1d_loon(), rect_1d_graphics(), rect_1d_grid(), rect_1d_loon(), rug_1d_graphics(), rug_1d_grid(), rug_1d_loon()

---

hist_1d_loon  

Histogram in 1d using the interactive loon package

Description

Histogram in 1d using the interactive loon package

Usage

```r
hist_1d_loon(
  zargs,
  breaks = NULL,
  color = NULL,
  fill = NULL,
  showStackedColors = TRUE,
  showBinHandle = FALSE,
  showLabels = FALSE,
  linkingGroup = NULL,
  showScales = FALSE,
  showGuides = FALSE,
  parent = NULL,
  ...
)
```

Arguments

- **zargs**: The argument list as passed from `zenplot()`
- **breaks**: Argument passed to `hist()` to get information on bins. Default is 20 equi-width bins covering the range of x
- **color**: colour of the histogram bar interiors, unless `fill` is specified, then this is the colour of the border
- **fill**: colour of the histogram bar interior if given
showStackedColors  Logical determining whether to show the individual point colours stacked in the histogram
showBinHandle  Logical to show a handle to adjust bins
showLabels  Logical determining whether axis labels are displayed
linkingGroup  A string specifying the initial group of plots to be linked to this plot
showScales  Logical determining whether scales are displayed
showGuides  Logical determining whether the background guidelines are displayed
parent  The tk parent for this loon plot widget
...  Additional parameters passed to loon::l_hist()

Value
A loon loon::l_plot(...)

Author(s)
Marius Hofert and Wayne Oldford

See Also
Other default 1d plot functions using the interactive loon package: arrow_1d_loon(), boxplot_1d_loon(), density_1d_loon(), jitter_1d_loon(), label_1d_loon(), lines_1d_loon(), points_1d_loon(), rect_1d_loon(), rug_1d_loon()

Other default 1d plot functions: arrow_1d_graphics(), arrow_1d_grid(), arrow_1d_loon(), boxplot_1d_graphics(), boxplot_1d_grid(), boxplot_1d_loon(), density_1d_graphics(), density_1d_grid(), extract_1d(), hist_1d_graphics(), hist_1d_grid(), jitter_1d_graphics(), jitter_1d_grid(), jitter_1d_loon(), label_1d_graphics(), label_1d_grid(), label_1d_loon(), lines_1d_graphics(), lines_1d_grid(), lines_1d_loon(), points_1d_graphics(), points_1d_grid(), points_1d_loon(), rect_1d_graphics(), rect_1d_grid(), rect_1d_loon(), rect_1d_grid(), rect_1d_loon(), rug_1d_graphics(), rug_1d_grid(), rug_1d_loon()
Arguments

x  A matrix or data.frame (most useful for the latter).
indices  vector of column indices of x (typically obtained from zenpath()).

Value

An object as x (typically a data.frame or matrix) containing x indexed by indices.

Note

Useful for constructing data.frames without .1, .2, ... in their names when indexing a data.frame with a zenpath.

Author(s)

Marius Hofert and Wayne Oldford

See Also

zenplot() which provides the zenplot.
Other tools related to constructing zenpaths: connect_pairs(), extract_pairs(), graph_pairs(), groupData(), zenpath()

Examples

## The function is handiest for data frames
## where we want to reuse the variable names
## without adding a suffix like ".1" etc.
## For example,
x <- BOD  # Biochemical Oxygen Demand data in base R
indices <- rep(1:2, 2)
## now compare
indexData(x, indices)
## to
x[, indices]
## zenplots prefer not to have the suffixes.

is.standard

Check Argument for Being a Vector, Matrix, Data Frame or a List of such

Description

Check Argument for Being a Vector, Matrix, Data Frame or a List of such

Usage

is.standard(x)
**jitter_1d_graphics**  

**Arguments**

- **x**: A vector, matrix, data.frame or list of such

**Value**

A logical indicating whether x is of the above type

**Author(s)**

Marius Hofert

**See Also**

Other zenplot technical tools: `convert_occupancy()`, `n2dcols_aux()`, `num_cols()`, `turn_checker()`

---

**jitter_1d_graphics**  

**Jittered dot plot in 1d using R’s base graphics**

**Description**

Jittered dot plot in 1d using R’s base graphics

**Usage**

```r
jitter_1dGraphics(
  zargs,
  loc = 0.5,
  offset = 0.25,
  cex = 0.4,
  add = FALSE,
  plot... = NULL,
  ...
)
```

**Arguments**

- **zargs**: argument list as passed from `zenplot()`
- **loc**: location in [0,1]; 0 corresponds to left, 1 to right (in the direction of the path)
- **offset**: number in [0,0.5] determining how far off the center the jittered points reach maximally
- **cex**: character expansion factor
- **add**: logical indicating whether this plot should be added to the last one
- **plot...**: additional arguments passed to `plot_region()`
- **...**: additional arguments passed to `points()`
jitter_1d_grid

Jittered dot plot in 1d using the grid package

Description

Jittered dot plot in 1d using the grid package

Usage

jitter_1d_grid(
  zargs,
  loc = 0.5,
  offset = 0.25,
  pch = 21,
  size = 0.02,
  draw = FALSE,
  ...
)

Arguments

zargs argument list as passed from `zenplot`
loc location in [0,1]; 0 corresponds to left, 1 to right (in the direction of the path)
offset number in [0,0.5] determining how far off the center the jittered points reach maximally
pch plotting symbol

Author(s)

Marius Hofert and Wayne Oldford

See Also

Other default 1d plot functions using R’s base graphics: `arrow_1d_graphics()`, `boxplot_1d_graphics()`, `density_1d_graphics()`, `hist_1d_graphics()`, `label_1d_graphics()`, `lines_1d.Graphics()`, `points_1d_graphics()`, `rect_1d_graphics()`, `rug_1d.Graphics()

Other default 1d plot functions: `arrow_1d_graphics()`, `arrow_1d_grid()`, `arrow_1d_loon()`, `boxplot_1d_graphics()`, `boxplot_1d_grid()`, `boxplot_1d_loon()`, `density_1d_graphics()`, `density_1d_grid()`, `density_1d_loon()`, `extract_1d()`, `hist_1d_graphics()`, `hist_1d_grid()`, `hist_1d_loon()`, `jitter_1d_grid()`, `jitter_1d_loon()`, `label_1d_graphics()`, `label_1d_grid()`, `label_1d_loon()`, `lines_1d_graphics()`, `lines_1d_grid()`, `lines_1d_loon()`, `points_1d_graphics()`, `points_1d_grid()`, `points_1d_loon()`, `rect_1d_graphics()`, `rect_1d_grid()`, `rect_1d_loon()`, `rug_1d_graphics()`, `rug_1d_grid()`, `rug_1d_loon()`
jitter_1d_loon

Description

Jittered dot plot in 1d using the interactive loon package

Usage

jitter_1d_loon(
  zargs,
  linkingGroup = NULL,
  showLabels = FALSE,
  showScales = FALSE,
  showGuides = FALSE,
  glyph = "ocircle",
  itemLabel = NULL,
  showItemLabels = TRUE,
jitter_1d_loon

parent = NULL,
...
)

Arguments

zargs The argument list as passed from zenplot()
linkingGroup A string specifying the initial group of plots to be linked to this plot
showLabels Logical determining whether axis labels are displayed
showScales Logical determining whether scales are displayed
showGuides Logical determining whether the background guidelines are displayed
glyph Glyph to be used for points, default is the open circle: "ocircle"
itemLabel A vector of strings to serve as the item labels
showItemLabels Logical determining whether item labels display on mouse hover
parent The tk parent for this loon plot widget
... Additional parameters passed to loon::l_plot()

Value

A loon loon::l_plot(...)

Author(s)

Marius Hofert and Wayne Oldford

See Also

Other default 1d plot functions using the interactive loon package: arrow_1d_loon(), boxplot_1d_loon(), density_1d_loon(), hist_1d_loon(), label_1d_loon(), lines_1d_loon(), points_1d_loon(), rect_1d_loon(), rug_1d_loon()

Other default 1d plot functions: arrow_1d_graphics(), arrow_1d_grid(), arrow_1d_loon(), boxplot_1d_graphics(), boxplot_1d_grid(), boxplot_1d_loon(), density_1d_graphics(), density_1d_grid(), density_1d_loon(), extract_1d(), hist_1d_graphics(), hist_1d_grid(), hist_1d_loon(), jitter_1d_graphics(), jitter_1d_grid(), label_1d_graphics(), label_1d_grid(), label_1d_loon(), lines_1d_graphics(), lines_1d_grid(), lines_1d_loon(), points_1d_graphics(), points_1d_grid(), points_1d_loon(), rect_1d_graphics(), rect_1d_grid(), rect_1d_loon(), rug_1d_graphics(), rug_1d_grid(), rug_1d_loon()
Description

Label plot in 1d using R’s base graphics

Usage

```r
label_1d_graphics(
  zargs, 
  loc = c(0.5, 0.5), 
  label = NULL, 
  box = FALSE, 
  add = FALSE, 
  plot... = NULL, 
  ...
)
```

Arguments

- `zargs`: argument list as passed from `zenplot()`
- `loc`: (x,y)-location in [0,1]^2; 0 corresponds to left, 1 to right (in the direction of the path)
- `label`: label to be used
- `box`: logical indicating whether a box is to be drawn.
- `add`: logical indicating whether this plot should be added to the last one
- `plot...`: additional arguments passed to `plot_region()`
- `...`: additional arguments passed to `text()` and `box()`

Value

`invisible()`

Author(s)

Marius Hofert and Wayne Oldford

See Also

Other default 1d plot functions using R’s base graphics: `arrow_1d_graphics()`, `boxplot_1d_graphics()`, `density_1d_graphics()`, `hist_1d_graphics()`, `jitter_1d_graphics()`, `lines_1d_graphics()`, `points_1d_graphics()`, `rect_1d_graphics()`, `rug_1d_graphics()`

Other default 1d plot functions: `arrow_1d_grid()`, `arrow_1d_loon()`, `boxplot_1d_grid()`, `boxplot_1d_loon()`, `density_1d_grid()`, `density_1d_loon()`
\texttt{label\_1d\_grid} \hspace{1cm} \textit{Label plot in 1d using the grid package}

\textbf{Description}

Label plot in 1d using the grid package

\textbf{Usage}

\begin{verbatim}
label\_1d\_grid(
zargs,
locate = c(0.5, 0.5),
label = NULL,
cex = 0.66,
box = FALSE,
box.width = 1,
box.height = 1,
draw = FALSE,
...
)
\end{verbatim}

\textbf{Arguments}

\begin{itemize}
  \item \texttt{zargs} \hspace{1cm} argument list as passed from \texttt{zenplot()}
  \item \texttt{loc} \hspace{1cm} (x,y)-location in [0,1]^2; 0 corresponds to left, 1 to right (in the direction of the path)
  \item \texttt{label} \hspace{1cm} label to be used
  \item \texttt{cex} \hspace{1cm} character expansion factor
  \item \texttt{box} \hspace{1cm} logical indicating whether a box should be drawn around the text
  \item \texttt{box.width} \hspace{1cm} width of the box
  \item \texttt{box.height} \hspace{1cm} height of the box
  \item \texttt{draw} \hspace{1cm} logical indicating whether drawing should take place
  \item … \hspace{1cm} additional arguments passed to \texttt{gpar()}
\end{itemize}

\textbf{Value}

grob (invisibly)
**label_1d_loon**

*Label plot in 1d using the interactive loon package*

**Description**

Label plot in 1d using the interactive loon package

**Usage**

```r
label_1d_loon(
  zargs,
  loc.x = NULL,
  loc.y = NULL,
  label = NULL,
  rot = NULL,
  size = 8,
  box = FALSE,
  color = NULL,
  linkingGroup = NULL,
  showLabels = FALSE,
  showScales = FALSE,
  showGuides = FALSE,
  baseplot = NULL,
  parent = NULL,
  ...
)
```
Arguments

zargs The argument list as passed from `zenplot()`
loc.x x-location of the label
loc.y y-location of the label
label The label to be used
rot The rotation of the label
size The font size
box A `logical` indicating whether the label is to be enclosed in a box.
color Color of the label (and of box when `box = TRUE`).
linkingGroup A string specifying the initial group of plots to be linked to this plot
showLabels Logical determining whether axis labels are displayed
showScales Logical determining whether scales are displayed
showGuides Logical determining whether the background guidelines are displayed
baseplot If non-null the base plot on which the plot should be layered
parent The tk parent for this loon plot widget
... Additional parameters passed to loon::l_layer_text(...)

Value

A loon::l_plot(...)

Author(s)

Marius Hofert and Wayne Oldford

See Also

Other default 1d plot functions using the interactive loon package: `arrow_1d_loon()`, `boxplot_1d_loon()`, `density_1d_loon()`, `hist_1d_loon()`, `jitter_1d_loon()`, `lines_1d_loon()`, `points_1d_loon()`, `rect_1d_loon()`, `rug_1d_loon()`

Other default 1d plot functions: `arrow_1d_graphics()`, `arrow_1d_grid()`, `arrow_1d_loon()`,
`boxplot_1d_graphics()`, `boxplot_1d_grid()`, `boxplot_1d_loon()`, `density_1d_graphics()`,
`density_1d_grid()`, `density_1d_loon()`, `extract_1d()`, `hist_1d_graphics()`, `hist_1d_grid()`,
`hist_1d_loon()`, `jitter_1d_graphics()`, `jitter_1d_grid()`, `jitter_1d_loon()`, `label_1d_graphics()`,
`label_1d_grid()`, `lines_1d_graphics()`, `lines_1d_grid()`, `lines_1d_loon()`, `points_1d_graphics()`,
`points_1d_grid()`, `points_1d_loon()`, `rect_1d_graphics()`, `rect_1d_grid()`, `rect_1d_loon()`,
`rug_1d_graphics()`, `rug_1d_grid()`, `rug_1d_loon()`
label_2d_graphics  Label plot in 2d using R's base graphics

Description
Label plot in 2d using R’s base graphics

Usage

```r
label_2d_graphics(
  zargs,
  loc = c(0.98, 0.05),
  label = NULL,
  adj = 1:0,
  box = FALSE,
  add = FALSE,
  group... = NULL,
  plot... = NULL,
  ...
)
```

Arguments

- `zargs` argument list as passed from `zenplot()`
- `loc` (x,y)-location (in (0,1)^2) of the center of the rectangle
- `label` label to be used
- `adj` x (and optionally y) adjustment of the label
- `box` logical indicating whether a box should be drawn
- `add` logical indicating whether this plot should be added to the last one
- `group...` list of arguments passed to `group_2d_graphics` (or `NULL`)
- `plot...` additional arguments passed to `plot_region()`
- `...` additional arguments passed to `rect()`

Value
invisible()

Author(s)
Marius Hofert and Wayne Oldford
See Also

Other default 2d plot functions using R’s base graphics: `arrow_2d_graphics()`, `axes_2d_graphics()`, `density_2d_graphics()`, `group_2d_graphics()`, `points_2d_graphics()`, `qq_2d_graphics()`, `rect_2d_graphics()`

Other default 2d plot functions: `arrow_2d_graphics()`, `arrow_2d_grid()`, `arrow_2d_loon()`, `axes_2d_graphics()`, `axes_2d_grid()`, `axes_2d_loon()`, `density_2d_graphics()`, `density_2d_grid()`, `density_2d_loon()`, `extract_2d()`, `group_2d_graphics()`, `group_2d_grid()`, `group_2d_loon()`, `label_2d_grid()`, `label_2d_loon()`, `points_2d_graphics()`, `points_2d_grid()`, `points_2d_loon()`, `qq_2d_graphics()`, `qq_2d_grid()`, `rect_2d_graphics()`, `rect_2d_grid()`, `rect_2d_loon()`

---

**Description**

Label plot in 2d using the grid package

**Usage**

```r
label_2d_grid(
  zargs,
  loc = c(0.98, 0.05),
  label = NULL,
  cex = 0.66,
  just = c("right", "bottom"),
  rot = 0,
  box = FALSE,
  box.width = 1,
  box.height = 1,
  group... = list(cex = cex),
  draw = FALSE,
  ...
)
```

**Arguments**

- **zargs**: argument list as passed from `zenplot()`
- **loc**: (x,y)-location in [0,1]^2; 0 corresponds to left, 1 to right (in the direction of the path)
- **label**: label to be used
- **cex**: character expansion factor
- **just**: (x,y)-justification of the label
- **rot**: rotation of the label
- **box**: logical indicating whether a box should be drawn
label_2d_loon

Description
Label plot in 2d using the interactive loon package

Usage

label_2d_loon(
  zargs,
  loc = NULL,
  label = NULL,
  rot = 0,
  size = 8,
  box = FALSE,
  color = NULL,
  linkingGroup = NULL,
  showLabels = FALSE,
  showScales = FALSE,
  showGuides = FALSE,
  baseplot = NULL,
)
parent = NULL,
group... = NULL,

Arguments

zargs The argument list as passed from `zenplot()`
loc The location of the label
label The label to be used
rot The rotation of the label
size The font size
box A logical indicating whether the label is to be enclosed in a box.
color Color of the label (and of box when `box = TRUE`).
linkingGroup The initial linking group
showLabels Logical determining whether axis labels are displayed
showScales Logical determining whether scales are displayed
showGuides Logical determining whether the background guidelines are displayed
baseplot If non-null the base plot on which the plot should be layered
parent The tk parent for this loon plot widget
group... A list of arguments passed to `group_2d_loon` (or `NULL`)
... Additional parameters passed to `loon::l_layer_text(...)`

Value

The base loon::l_plot with the added text layer

Author(s)

Marius Hofert and Wayne Oldford

See Also

Other default 2d plot functions using the interactive loon package: `arrow_2d_loon()`, `axes_2d_loon()`, `density_2d_loon()`, `group_2d_loon()`, `points_2d_loon()`, `rect_2d_loon()`

Other default 2d plot functions: `arrow_2d_graphics()`, `arrow_2d_grid()`, `arrow_2d_loon()`, `axes_2d_graphics()`, `axes_2d_grid()`, `axes_2d_loon()`, `density_2d_graphics()`, `density_2d_grid()`, `density_2d_loon()`, `extract_2d()`, `group_2d_graphics()`, `group_2d_grid()`, `group_2d_loon()`, `label_2d_graphics()`, `label_2d_grid()`, `points_2d_graphics()`, `points_2d_grid()`, `points_2d_loon()`, `qq_2d_graphics()`, `qq_2d_grid()`, `rect_2d_graphics()`, `rect_2d_grid()`, `rect_2d_loon()`
Description

Layout plot in 1d

Usage

layout_1d_graphics(zargs, ...)

Arguments

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>zargs</td>
<td>argument list as passed from \texttt{zenplot()}</td>
</tr>
<tr>
<td>...</td>
<td>additional arguments passed to \texttt{label_1d_graphics()}</td>
</tr>
</tbody>
</table>

Value

\texttt{invisible()}

Author(s)

Marius Hofert and Wayne Oldford

Description

Layout plot in 1d using the grid package

Usage

layout_1d_grid(zargs, ...)

Arguments

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>zargs</td>
<td>argument list as passed from \texttt{zenplot()}</td>
</tr>
<tr>
<td>...</td>
<td>additional arguments passed to \texttt{label_1d_grid()}</td>
</tr>
</tbody>
</table>

Value

grob (invisibly)

Author(s)

Marius Hofert and Wayne Oldford
layout_1d_loon  Layout plot in 1d using the interactive loon package

Description
Layout plot in 1d using the interactive loon package

Usage
layout_1d_loon(zargs, ...)

Arguments
zargs The argument list as passed from zenplot()
... Additional arguments passed to label_1d_loon()

Value
invisible()

Author(s)
Marius Hofert and Wayne Oldford

layout_2d_graphics  Layout plot in 2d

Description
Layout plot in 2d

Usage
layout_2d_graphics(zargs, ...)

Arguments
zargs argument list as passed from zenplot()
... additional arguments passed to label_2d_graphics()

Value
invisible()
**Note**

Here we also pass `...'` to `group_2d_grid()` (to easily adjust font size etc.)

**Author(s)**

Marius Hofert and Wayne Oldford

---

`layout_2d_grid`  
*Layout plot in 2d using the grid package*

**Description**

Layout plot in 2d using the grid package

**Usage**

```r
layout_2d_grid(zargs, ...)
```

**Arguments**

- `zargs`: argument list as passed from `zenplot()`
- `...`: additional arguments passed to `label_2d_grid()`

**Value**

grob (invisibly)

**Note**

Here we also pass `...'` to `group_2d_grid()` (to easily adjust font size etc.)

**Author(s)**

Marius Hofert and Wayne Oldford
layout_2d_loon  
*Layout plot in 2d using the interactive loon package*

**Description**

Layout plot in 2d using the interactive loon package

**Usage**

```r
layout_2d_loon(zargs, ...)```

**Arguments**

- `zargs`: The argument list as passed from `zenplot()`
- `...`: Additional arguments passed to `label_2d_grid()`

**Value**

A loon plot

**Note**

Here we also pass `...` to `group_2d_loon()` (to easily adjust font size etc.)

**Author(s)**

Marius Hofert and Wayne Oldford

lines_1d_graphics  
*Line plot in 1d using R’s base graphics*

**Description**

Line plot in 1d using R’s base graphics

**Usage**

```r
lines_1d_graphics(
  zargs,     
  loc = c(0.5, 0.5),
  length = 1,
  add = FALSE,
  plot..., = NULL,
  ...
)```
Lines plot in 1d using the grid package

Description

Lines plot in 1d using the grid package

Usage

lines_1d_grid(
  zargs,
  loc = c(0.5, 0.5),
  length = 1,
  arrow = NULL,
  draw = FALSE,
  ...
Arguments

- `zargs`: argument list as passed from `zenplot()`
- `loc`: (x,y)-location in [0,1]^2; 0 corresponds to left, 1 to right (in the direction of the path)
- `length`: length of the line (in [0,1])
- `arrow`: list describing the arrow head
- `draw`: logical indicating whether drawing should take place
- `...`: additional arguments passed to `gpar()`

Value

grob (invisibly)

Author(s)

Marius Hofert and Wayne Oldford

See Also

Other default 1d plot functions using the grid package: `arrow_1d_grid()`, `boxplot_1d_grid()`, `density_1d_grid()`, `hist_1d_grid()`, `jitter_1d_grid()`, `label_1d_grid()`, `points_1d_grid()`, `rect_1d_grid()`, `rug_1d_grid()`

Other default 1d plot functions: `arrow_1d_graphics()`, `arrow_1d_grid()`, `arrow_1d_loon()`, `boxplot_1d_graphics()`, `boxplot_1d_grid()`, `boxplot_1d_loon()`, `density_1d_graphics()`, `density_1d_grid()`, `density_1d_loon()`, `extract_1d()`, `hist_1d_graphics()`, `hist_1d_grid()`, `hist_1d_loon()`, `jitter_1d_graphics()`, `jitter_1d_grid()`, `jitter_1d_loon()`, `label_1d_graphics()`, `label_1d_grid()`, `label_1d_loon()`, `lines_1d_graphics()`, `lines_1d_grid()`, `lines_1d_loon()`, `points_1d_graphics()`, `points_1d_grid()`, `points_1d_loon()`, `rect_1d_graphics()`, `rect_1d_grid()`, `rect_1d_loon()`, `rug_1d_graphics()`, `rug_1d_grid()`, `rug_1d_loon()`

Description

Lines plot in 1d using the interactive loon package

Usage

```r
lines_1d_loon(
  zargs,
  loc.x = NULL,
  loc.y = NULL,
  color = NULL,
  lwd = 1,
)```
lines_1d_loon

linkingGroup = NULL,
showLabels = FALSE,
showScales = FALSE,
showGuides = FALSE,
baseplot = NULL,
parent = NULL,
...
)

Arguments

zargs The argument list as passed from zenplot()
loc.x x-coordinates of the points on the line
loc.y y-coordinates of the points on the line
color Colour of the line
lwd line width
linkingGroup A string specifying the initial group of plots to be linked to this plot (ignored)
showLabels Logical determining whether axis labels are displayed
showScales Logical determining whether scales are displayed
showGuides Logical determining whether the background guidelines are displayed
baseplot If non-null the base plot on which the plot should be layered
parent The tk parent for this loon plot widget
... Additional parameters passed to loon::l_layer_text(...)

Value

A loon loon::l_plot(...)

Author(s)

Marius Hofert and Wayne Oldford

See Also

Other default 1d plot functions using the interactive loon package: arrow_1d_loon(), boxplot_1d_loon(),
density_1d_loon(), hist_1d_loon(), jitter_1d_loon(), label_1d_loon(), points_1d_loon(),
rect_1d_loon(), rug_1d_loon()

Other default 1d plot functions: arrow_1d_graphics(), arrow_1d_grid(), arrow_1d_loon(),
boxplot_1d_graphics(), boxplot_1d_grid(), boxplot_1d_loon(), density_1d_graphics(),
density_1d_grid(), density_1d_loon(), extract_1d(), hist_1d_graphics(), hist_1d_grid(),
hist_1d_loon(), jitter_1d_graphics(), jitter_1d_grid(), jitter_1d_loon(), label_1d_graphics(),
label_1d_grid(), label_1d_loon(), lines_1d_graphics(), lines_1d_grid(), points_1d_graphics(),
points_1d_grid(), points_1d_loon(), rect_1d_graphics(), rect_1d_grid(), rect_1d_loon(),
rug_1d_graphics(), rug_1d_grid(), rug_1d_loon()
Configuring a loon plot to accommodate ispace

Description

Configuring a loon plot to accommodate ispace

Usage

```r
l_ispace_config(
  baseplot,
  ispace = NULL,
  x = NULL,
  y = NULL,
  xlim = NULL,
  ylim = NULL,
  ...
)
```

Arguments

- `baseplot`: The plot to be modified
- `ispace`: The inner space (in [0,1])
- `x`: The x data
- `y`: The y data
- `xlim`: The x-axis limits; if NULL, the data limits are used
- `ylim`: The y-axis limits; if NULL, the data limits are used
- `...`: Additional arguments passed to loon::l_configure

Value

The baseplot

Author(s)

R. W. Oldford

See Also

Other graphical tools: `na_omit_loon()`, `plot_region()`, `vport()`, `zenarrow()`
move

Determine the new position when moving from the current position in a given direction

Usage

move(curpos, dir, method = c("in.occupancy", "in.plane"))

Arguments

curpos current position (i, j) in the occupancy matrix
dir direction in which we move ("d", "u", "r" or "l")
method choice of method ("in.occupancy" means the (current/new) position is given in terms of (row, column) indices in the occupancy matrix; "in.plane" means the directions are interpreted as in the (x,y)-plane).

Value

new position in the occupancy matrix

Author(s)

Marius Hofert and Wayne Oldford

n2dcols_aux

Auxiliary Function for Constructing Default n2dcols

Description

Auxiliary Function for Constructing Default n2dcols

Usage

n2dcols_aux(n2dplots, method = c("letter", "square", "A4", "golden", "legal"))

Arguments

n2dplots The number of variates (= nfaces)
method One of "letter", "square", "A4", "golden", "legal"
Value
An odd integer for n2dcols

Author(s)
Wayne Oldford

See Also
Other zenplot technical tools: convert_occupancy(), is.standard(), num_cols(), turn_checker()

---

na_omit_loon   Helper function to remove NAs for loon plots

Description
Helper function to remove NAs for loon plots

Usage
na_omit_loon(x, y = NULL, linkingKey = NULL, itemLabel = NULL)

Arguments

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>x</td>
<td>The vector of x values (required)</td>
</tr>
<tr>
<td>y</td>
<td>The vector of y values (optional) of the same length as x; if NULL then it’s ignored.</td>
</tr>
<tr>
<td>linkingKey</td>
<td>The vector of keys used to define links between points, of the same length as x; if NULL it will be 0:(length(x)-1).</td>
</tr>
<tr>
<td>itemLabel</td>
<td>The vector of labels for the points, of the same length as x; if NULL it will be constructed.</td>
</tr>
</tbody>
</table>

Value
A list(x, y, linkingKey, itemLabel) where any NA in x or y will have been omitted from all

Author(s)
R. W. Oldford

See Also
Other graphical tools: l_ispace_config(), plot_region(), vport(), zenarrow()
next_move_tidy

Determine the next position to move to and the turn out of there

Usage

\texttt{next\_move\_tidy(plotNo, nPlots, curpath)}

Arguments

\begin{itemize}
  \item \texttt{plotNo} \quad \text{current plot number}
  \item \texttt{nPlots} \quad \text{total number of plots}
  \item \texttt{curpath} \quad \text{the current path}
\end{itemize}

Value

a list containing the next position to move to \texttt{(nextpos)} and the turn out of there \texttt{(nextout)}; Interpretation: \texttt{nextpos}: position of plot number \texttt{plotNo+1} in the (non-trimmed) occupancy matrix \texttt{nextout}: turn out of \texttt{nextpos}

Note

- This assumes that the last plot is a 1d plot! - It also assumes that first1d = TRUE; will be adapted later in \texttt{get\_path()} in case first1d = FALSE. - We start in (1, 2) and also have an additional last column in the occupancy matrix to have the first and last column left in case we end up there with the last 1d plot; this cannot happen for 'zigzag' but for 'tidy'.

Author(s)

Marius Hofert and Wayne Oldford

num_cols

Determine the number of columns if \texttt{is.standard(x)}

Description

Determine the number of columns if \texttt{is.standard(x)}

Usage

\texttt{num\_cols(x)}
Arguments
x A numeric vector, matrix, data.frame or a list of such.

Value
The number of data columns of 'x'

Author(s)
Marius Hofert

See Also
Other zenplot technical tools: convert_occupancy(), is.standard(), n2dcols_aux(), turn_checker()

olive Olive Oil Data Set

Description
Data set consisting of 572 rows and 10 columns containing data about olive oil.

Usage
data("olive")

Format
A data.frame() with 10 columns:
Area: (larger) area.
Region: (local) region.
palmitic, palmitoleic, stearic, oleic, linoleic, linolenic, arachidic, eicosenoic: the fatty acids measured.

Source
The data set was obtained from the package pdfCluster (for convenience). It contains 572 rows of observations. The first and the second column correspond to the area (Centre-North, South, Sardinia) and the geographical region of origin of the olive oils (northern Apulia, southern Apulia, Calabria, Sicily, inland Sardinia and coast Sardinia, eastern and western Liguria, Umbria), respectively. The remaining columns represent the chemical measurements (on the acid components for the oil specimens) palmitic, palmitoleic, stearic, oleic, linoleic, linolenic, arachidic, eicosenoic.

Examples
data("olive")
**plot_exists**

*Check whether functions (plot*d to zenplot()) exist*

**Description**

Check whether functions (plot*d to zenplot()) exist

**Usage**

```r
plot_exists(x)
```

**Arguments**

- `x` arguments plot1d or plot2d of zenplot()

**Value**

logical indicating whether `x` exists

**Note**

Check first whether it’s a function (have to rely on it being able to be evaluated, cannot do more checks then) or, if a string, whether it exists

**Author(s)**

Marius Hofert

---

**plot_indices**

*Plot Indices of the Current Plot*

**Description**

Determining the indices of the x and y variables of the current plot

**Usage**

```r
plot_indices(zargs)
```

**Arguments**

- `zargs` argument list as passed from `zenplot()`. This must at least contain `vars` and `num`; see `zenplot()` for an explanation of these variables..
Details

This is an auxiliary function useful, for example, when writing user-provided 1d and 2d plot functions.

Value

A numeric(2) containing the indices of the x and y variables to be plotted in the current plot (the plot with number num). If the current plot is a 2d plot, the same variable is used twice.

Note

This is exported so that one doesn’t always have to figure out whether the variables (axes) in the current plot need to be switched manually.

Author(s)

Marius Hofert

See Also

Other tools for constructing your own plot1d and plot2d functions: burst_aux(), burst(), check_zargs(), extract_1d(), extract_2d()
points_1d_graphics

Author(s)
Marius Hofert

See Also
Other graphical tools: `l_ispace_config()`, `na_omit_loon()`, `vport()`, `zenarrow()`

---

**Description**

Dot plot in 1d using R’s base graphics

**Usage**

```r
points_1d_graphics(
  zargs,
  loc = 0.5,
  cex = 0.4,
  add = FALSE,
  plot... = NULL,
  ...
)
```

**Arguments**

- `zargs` argument list as passed from `zenplot()`
- `loc` location in [0,1]; 0 corresponds to left, 1 to right (in the direction of the path)
- `cex` character expansion factor
- `add` logical indicating whether this plot should be added to the last one
- `plot...` additional arguments passed to `plot_region()`
- `...` additional arguments passed to `points()`

**Value**

`invisible()`

**Author(s)**
Marius Hofert and Wayne Oldford
points_1d_grid

Dot plot in 1d using the grid package

Description

Dot plot in 1d using the grid package

Usage

points_1d_grid(zargs, loc = 0.5, pch = 21, size = 0.02, draw = FALSE, ...)

Arguments

zargs    argument list as passed from zenplot()
loc      location in [0,1]; 0 corresponds to left, 1 to right (in the direction of the path)
pch      plotting symbol
size     size of the plotting symbol
draw     logical indicating whether drawing should take place
...      additional arguments passed to gpar()

Value

invisible()

Note

The default point size was chosen to match the default of graphics

Author(s)

Marius Hofert and Wayne Oldford
see also

other default 1d plot functions using the grid package: arrow_1d_grid(), boxplot_1d_grid(), density_1d_grid(), hist_1d_grid(), jitter_1d_grid(), label_1d_grid(), lines_1d_grid(), rect_1d_grid(), rug_1d_grid()

other default 1d plot functions: arrow_1d_graphics(), arrow_1d_grid(), arrow_1d_loon(), boxplot_1d_graphics(), boxplot_1d_grid(), boxplot_1d_loon(), density_1d_graphics(), density_1d_grid(), density_1d_loon(), extract_1d(), hist_1d_graphics(), hist_1d_grid(), hist_1d_loon(), jitter_1d_graphics(), jitter_1d_grid(), jitter_1d_loon(), label_1d_graphics(), label_1d_grid(), label_1d_loon(), lines_1d_graphics(), lines_1d_grid(), lines_1d_loon(), points_1d_graphics(), points_1d_loon(), rect_1d_graphics(), rect_1d_grid(), rect_1d_loon(), rect_1d_loon(), rug_1d_graphics(), rug_1d_grid(), rug_1d_loon()

points_1d_loon

Dot plot in 1d using the interactive loon package

Description

Dot plot in 1d using the interactive loon package

Usage

points_1d_loon(
  zargs,
  linkingGroup = NULL,
  linkingKey = NULL,
  showLabels = FALSE,
  showScales = FALSE,
  showGuides = FALSE,
  glyph = "ocircle",
  itemLabel = NULL,
  showItemLabels = TRUE,
  parent = NULL,
  ...
)

Arguments

zargs The argument list as passed from zenplot()
linkingGroup A string specifying the initial group of plots to be linked to this plot
linkingKey List of IDs to link on
showLabels Logical determining whether axis labels are displayed
showScales Logical determining whether scales are displayed
showGuides Logical determining whether the background guidelines are displayed
glyph The plot glyph
itemLabel A vector of strings to serve as the item labels
showItemLabels Logical determining whether item labels display on mouse hover
parent The tk parent for this loon plot widget
... Additional parameters passed to loon::l_plot()

Value

A loon loon::l_plot(...)

Author(s)

Marius Hofert and Wayne Oldford

See Also

Other default 1d plot functions using the interactive loon package: arrow_1d_loon(), boxplot_1d_loon(), density_1d_loon(), hist_1d_loon(), jitter_1d_loon(), label_1d_loon(), lines_1d_loon(), rect_1d_loon(), rug_1d_loon()

Other default 1d plot functions: arrow_1d_graphics(), arrow_1d_grid(), arrow_1d_loon(), boxplot_1d_graphics(), boxplot_1d_grid(), boxplot_1d_loon(), density_1d_graphics(), density_1d_grid(), density_1d_loon(), extract_1d(), hist_1d_graphics(), hist_1d_grid(), hist_1d_loon(), jitter_1d_graphics(), jitter_1d_grid(), jitter_1d_loon(), label_1d_graphics(), label_1d_grid(), label_1d_loon(), lines_1d_graphics(), lines_1d_grid(), lines_1d_loon(), points_1d_graphics(), points_1d_grid(), rect_1d_graphics(), rect_1d_grid(), rect_1d_loon(), rug_1d_graphics(), rug_1d_grid(), rug_1d_loon()
**points_2d_grid**

**Point plot in 2d using the grid package**

**Description**

Point plot in 2d using the grid package

**Usage**

```r
points_2d_grid(
  zargs,
  type = c("p", "l", "o"),
  pch = NULL,
  size = 0.02,
  box = FALSE,
  box.width = 1,
  box.height = 1,
)```

**Arguments**

- `zargs` argument list as passed from `zenplot()`
- `cex` character expansion factor
- `box` logical indicating whether a box should be drawn
- `add` logical indicating whether this plot should be added to the last one
- `group...` list of arguments passed to `group_2d_graphics` (or NULL)
- `plot...` additional arguments passed to `plot_region()`
- `...` additional arguments passed to `points()`

**Value**

`invisible()`

**Author(s)**

Marius Hofert and Wayne Oldford

**See Also**

Other default 2d plot functions using R’s base graphics:
- `arrow_2d_graphics()`, `axes_2d_graphics()`, `density_2d_graphics()`, `group_2d_graphics()`, `label_2d_graphics()`, `qq_2d_graphics()`, `rect_2d_graphics()`

Other default 2d plot functions using grid package:
- `arrow_2d_graphics()`, `arrow_2d_grid()`, `arrow_2d_loon()`, `axes_2d_graphics()`, `axes_2d_grid()`, `axes_2d_loon()`, `density_2d_graphics()`, `density_2d_grid()`, `density_2d_loon()`, `extract_2d()`, `group_2d_graphics()`, `group_2d_grid()`, `group_2d_loon()`, `label_2d_graphics()`, `label_2d_grid()`, `label_2d_loon()`, `points_2d_grid()`, `points_2d_loon()`, `qq_2d_graphics()`, `qq_2d_grid()`, `rect_2d_graphics()`, `rect_2d_grid()`, `rect_2d_loon()`
group... = list(cex = 0.66),
draw = FALSE,
...

Arguments

zargs    argument list as passed from zenplot()
type     line type
pch      plot symbol
type     size of the plot symbol
box      logical indicating whether a box should be drawn
box.width width of the box
box.height height of the box
group... list of arguments passed to group_2d_grid (or NULL)
draw     logical indicating whether drawing should take place
...      additional arguments passed to gpar()

Value

grob (invisibly)

Note

- We use names depending on the 'type' here since otherwise, if one calls it once for 'p' and once for 'l', only one of them is plotted - The default point size was chosen to match the default of graphics

Author(s)

Marius Hofert and Wayne Oldford

See Also

Other default 2d plot functions using the grid package: arrow_2d_grid(), axes_2d_grid(), density_2d_grid(), group_2d_grid(), label_2d_grid(), qq_2d_grid(), rect_2d_grid()

Other default 2d plot functions: arrow_2d_graphics(), arrow_2d_grid(), arrow_2d_loon(), axes_2d_graphics(), axes_2d_grid(), axes_2d_loon(), density_2d_graphics(), density_2d_grid(), density_2d_loon(), extract_2d(), group_2d_graphics(), group_2d_grid(), group_2d_loon(), label_2d_graphics(), label_2d_grid(), label_2d_loon(), points_2d_graphics(), points_2d_grid(), points_2d_loon(), qq_2d_graphics(), qq_2d_grid(), rect_2d_graphics(), rect_2d_grid(), rect_2d_loon()
points_2d_loon  

Point plot in 2d using the interactive loon package

Description

Point plot in 2d using the interactive loon package

Usage

points_2d_loon(
  zargs,
  showLabels = FALSE,
  showScales = FALSE,
  showGuides = FALSE,
  linkingGroup = NULL,
  linkingKey = NULL,
  glyph = "ocircle",
  itemLabel = NULL,
  showItemLabels = TRUE,
  parent = NULL,
  group... = NULL,
  ...
)

Arguments

  zargs           The argument list as passed from zenplot()
  showLabels     Logical determining whether axis labels are displayed
  showScales     Logical determining whether scales are displayed
  showGuides     Logical determining whether the background guidelines are displayed
  linkingGroup   The initial linking group
  linkingKey     List of IDs to link on
  glyph          String determining the glyph type to be displayed for points, default is an open circle: "ocircle"
  itemLabel      A vector of strings to serve as the item label
  showItemLabels Logical determining whether item labels display on mouse hover
  parent         The tk parent for this loon plot widget
  group...       A list of arguments passed to group_2d_loon (or NULL)
  ...            Additional arguments passed to loon::l_plot()

Value

  A loon plot
Author(s)
Marius Hofert and Wayne Oldford

See Also
Other default 2d plot functions using the interactive loon package: arrow_2d_loon(), axes_2d_loon(), density_2d_loon(), group_2d_loon(), label_2d_loon(), rect_2d_loon()
Other default 2d plot functions: arrow_2d_graphics(), arrow_2d_grid(), arrow_2d_loon(), axes_2d_graphics(), axes_2d_grid(), axes_2d_loon(), density_2d_graphics(), density_2d_grid(), density_2d_loon(), extract_2d(), group_2d_graphics(), group_2d_grid(), group_2d_loon(), label_2d_graphics(), label_2d_grid(), label_2d_loon(), points_2d_graphics(), points_2d_grid(), qq_2d_graphics(), qq_2d_grid(), rect_2d_graphics(), rect_2d_grid(), rect_2d_loon()

qq_2d_graphics

Quantile-quantile plot in 2d using R’s base graphics

Description
Quantile-quantile plot in 2d using R’s base graphics

Usage
qq_2d_graphics(
  zargs,
  do.line = TRUE,
  lines... = NULL,
  cex = 0.4,
  box = FALSE,
  add = FALSE,
  group... = NULL,
  plot... = NULL,
  ...
)

Arguments
zargs argument list as passed from zenplot()
do.line logical indicating whether a line is drawn (through both empirical c(0.25, 0.75)-quantiles)
lines... additional arguments passed to lines()
cex character expansion factor
box logical indicating whether a box should be drawn
add logical indicating whether this plot should be added to the last one
group... list of arguments passed to group_2d_graphics (or NULL)
plot... additional arguments passed to plot_region()
... additional arguments passed to qqplot()
**qq_2d_grid**

Quantile-quantile plot in 2d using the grid package

### Description

Quantile-quantile plot in 2d using the grid package

### Usage

```r
qq_2d_grid(
  zargs,
  do.line = TRUE,
  lines... = NULL,
  pch = NULL,
  size = 0.02,
  box = FALSE,
  box.width = 1,
  box.height = 1,
  group... = list(cex = 0.66),
  draw = FALSE,
  ...
)
```
Arguments

zargs  argument list as passed from `zenplot()`
do.line  logical indicating whether a line is drawn (through both empirical c(0.25, 0.75)-quantiles)
lines...  additional arguments passed to `lines()`
pch  plot symbol
size  size of the plot symbol
box  logical indicating whether a box should be drawn
box.width  width of the box
box.height  height of the box
group...  list of arguments passed to `group_2d_grid` (or NULL)
draw  logical indicating whether drawing should take place
...  additional arguments passed to `gpar()`

Value

grob (invisibly)

Note

- line iff both margins are of the same *type* - The default point size was chosen to match the default of graphics

Author(s)

Marius Hofert and Wayne Oldford

See Also

Other default 2d plot functions using the grid package: `arrow_2d_grid()`, `axes_2d_grid()`, `density_2d_grid()`, `group_2d_grid()`, `label_2d_grid()`, `points_2d_grid()`, `rect_2d_grid()`

Other default 2d plot functions: `arrow_2d_graphics()`, `arrow_2d_grid()`, `arrow_2d_loon()`, `axes_2d_graphics()`, `axes_2d_grid()`, `axes_2d_loon()`, `density_2d_graphics()`, `density_2d_grid()`, `density_2d_loon()`, `extract_2d()`, `group_2d_graphics()`, `group_2d_grid()`, `group_2d_loon()`, `label_2d_graphics()`, `label_2d_grid()`, `label_2d_loon()`, `points_2d_graphics()`, `points_2d_grid()`, `points_2d_loon()`, `qq_2d_graphics()`, `rect_2d_graphics()`, `rect_2d_grid()`, `rect_2d_loon()`
rect_1d_graphics

Rectangle plot in 1d using R's base graphics

Description

Rectangle plot in 1d using R’s base graphics

Usage

rect_1d_graphics(
  zargs,
  loc = c(0.5, 0.5),
  width = 1,
  height = 1,
  add = FALSE,
  plot... = NULL,
  ...
)

Arguments

  zargs    argument list as passed from zenplot()
  loc      (x,y)-location in [0,1]^2; 0 corresponds to left, 1 to right (in the direction of the path)
  width    width of the rectangle (when viewed in walking direction)
  height   height of the rectangle (when viewed in walking direction)
  add      logical indicating whether this plot should be added to the last one
  plot...  additional arguments passed to plot_region()
  ...      additional arguments passed to lines()

Value

ingvisible()

Author(s)

Marius Hofert and Wayne Oldford

See Also

Other default 1d plot functions using R’s base graphics: arrow_1d_graphics(), boxplot_1d_graphics(),
density_1d_graphics(), hist_1d_graphics(), jitter_1d_graphics(), label_1d_graphics(),
lines_1d_graphics(), points_1d_graphics(), rug_1d_graphics()

Other default 1d plot functions: arrow_1d_graphics(), arrow_1d_grid(), arrow_1d_loon(),
boxplot_1d_graphics(), boxplot_1d_grid(), boxplot_1d_loon(), density_1d_graphics()
rect_1d_grid

Rectangle plot in 1d using the grid package

Description

Rectangle plot in 1d using the grid package

Usage

rect_1d_grid(
  zargs,
  loc = c(0.5, 0.5),
  width = 1,
  height = 1,
  draw = FALSE,
  ...,
)

Arguments

- zargs: argument list as passed from `zenplot()`
- loc: (x,y)-location of the rectangle
- width: width of the rectangle (when viewed in walking direction)
- height: height of the rectangle (when viewed in walking direction)
- draw: logical indicating whether drawing should take place
- ...: additional arguments passed to `gpar()`

Value

- grob (invisibly)

Author(s)

Marius Hofert and Wayne Oldford
See Also

Other default 1d plot functions using the grid package: `arrow_1d_grid()`, `boxplot_1d_grid()`, `density_1d_grid()`, `hist_1d_grid()`, `jitter_1d_grid()`, `label_1d_grid()`, `lines_1d_grid()`, `points_1d_grid()`, `rug_1d_grid()`

Other default 1d plot functions: `arrow_1d_graphics()`, `arrow_1d_grid()`, `arrow_1d_loon()`, `boxplot_1d_graphics()`, `boxplot_1d_grid()`, `boxplot_1d_loon()`, `density_1d_graphics()`, `density_1d_grid()`, `density_1d_loon()`, `extract_1d()`, `hist_1d_graphics()`, `hist_1d_grid()`, `hist_1d_loon()`, `jitter_1d_graphics()`, `jitter_1d_grid()`, `jitter_1d_loon()`, `label_1d_graphics()`, `label_1d_grid()`, `label_1d_loon()`, `lines_1d_graphics()`, `lines_1d_grid()`, `lines_1d_loon()`, `points_1d_graphics()`, `points_1d_grid()`, `points_1d_loon()`, `rect_1d_graphics()`, `rect_1d_loon()`, `rug_1d_graphics()`, `rug_1d_grid()`, `rug_1d_loon()`

rect_1d_loon  Rectangle plot in 1d using the interactive loon package

Description

Rectangle plot in 1d using the interactive loon package

Usage

```r
rect_1d_loon(
  zargs,
  loc.x = NULL,
  loc.y = NULL,
  color = NULL,
  fill = NULL,
  lwd = 1,
  linkingGroup = NULL,
  showLabels = FALSE,
  showScales = FALSE,
  showGuides = FALSE,
  baseplot = NULL,
  parent = NULL,
  ...
)
```

Arguments

- `zargs`: The argument list as passed from `zenplot()`
- `loc.x`: x-location of rectangle
- `loc.y`: y-location of rectangle
- `color`: Colour of the rectangle outline
- `fill`: Colour of the rectangle interior
- `lwd`: line width for rectangle outline
rect_2d_graphics

Rectangle plot in 2d using R’s base graphics

Description

Rectangle plot in 2d using R’s base graphics

Usage

rect_2d_graphics(
  zargs,
  loc = c(0.5, 0.5),
  width = 1,
  height = 1,
  add = FALSE,
  group... = NULL,
  plot... = NULL,
  ...
Arguments

- `zargs` argument list as passed from `zenplot()`
- `loc` (x,y)-location (in (0,1)^2) of the center of the rectangle
- `width` width of the rectangle as a fraction of 1
- `height` height of the rectangle as a fraction of 1
- `add` logical indicating whether this plot should be added to the last one
- `group...` list of arguments passed to `group_2d_graphics` (or NULL)
- `plot...` additional arguments passed to `plot_region()
- `...` additional arguments passed to `rect()`

Value

invisible()

Author(s)

Marius Hofert and Wayne Oldford

See Also

Other default 2d plot functions using R’s base graphics: `arrow_2d_graphics()`, `axes_2d_graphics()`, `density_2d_graphics()`, `group_2d_graphics()` `label_2d_graphics()`, `points_2d_graphics()` `qq_2d_graphics()`

Other default 2d plot functions: `arrow_2d_graphics()`, `arrow_2d_grid()`, `arrow_2d_loon()`, `axes_2d_graphics()`, `axes_2d_grid()`, `axes_2d_loon()`, `density_2d_graphics()`, `density_2d_grid()`, `density_2d_loon()`, `extract_2d()`, `group_2d_graphics()`, `group_2d_grid()`, `group_2d_loon()`, `label_2d_graphics()`, `label_2d_grid()`, `label_2d_loon()`, `points_2d_graphics()`, `points_2d_grid()`, `points_2d_loon()`, `qq_2d_graphics()`, `qq_2d_grid()`, `rect_2d_grid()`, `rect_2d_loon()`

---

**rect_2d_grid**  
*Rectangle plot in 2d using the grid package*

Description

Rectangle plot in 2d using the grid package

Usage

```r
call_2d_grid(
  zargs,
  loc = c(0.5, 0.5),
  width = 1,
  height = 1,
  group... = list(cex = 0.66),
  draw = FALSE,
  ...
)
```
Arguments

zargs argument list as passed from `zenplot()`
loc (x,y)-location of the rectangle
width rectangle width as a fraction of 1
height rectangle height as a fraction of 1
group... list of arguments passed to `group_2d_grid` (or NULL)
draw logical indicating whether drawing should take place
... additional arguments passed to `gpar()`

Value
grob (invisibly)

Author(s)
Marius Hofert and Wayne Oldford

See Also
Other default 2d plot functions using the grid package: `arrow_2d_grid()`, `axes_2d_grid()`, `density_2d_grid()`, `group_2d_grid()`, `label_2d_grid()`, `points_2d_grid()`, `qq_2d_grid()`
Other default 2d plot functions: `arrow_2d_graphics()`, `arrow_2d_grid()`, `arrow_2d_loon()`, `axes_2d_graphics()`, `axes_2d_grid()`, `axes_2d_loon()`, `density_2d_graphics()`, `density_2d_grid()`, `density_2d_loon()`, `extract_2d()`, `group_2d_graphics()`, `group_2d_grid()`, `group_2d_loon()`, `label_2d_graphics()`, `label_2d_grid()`, `label_2d_loon()`, `points_2d_graphics()`, `points_2d_grid()`, `points_2d_loon()`, `qq_2d_graphics()`, `qq_2d_grid()`, `rect_2d_graphics()`, `rect_2d_loon()`

---

**rect_2d_loon**

Rectangle plot in 2d using the interactive loon package

Description

Rectangle plot in 2d using the interactive loon package

Usage

```r
rect_2d_loon(
  zargs,
  loc.x = NULL,
  loc.y = NULL,
  color = NULL,
  fill = NULL,
  lwd = 1,
  linkingGroup = NULL,
  showLabels = FALSE,
)```
showScales = FALSE,
showGuides = FALSE,
baseplot = NULL,
parent = NULL,
group... = NULL,
...}

Arguments

zargs The argument list as passed from zenplot()
loc.x x-location of rectangle
loc.y y-location of rectangle
color Colour of the rectangle outline
fill Colour of the rectangle interior
lwd line width for rectangle outline
linkingGroup The initial linking group (ignored)
showLabels Logical determining whether axis labels are displayed
showScales Logical determining whether scales are displayed
showGuides Logical determining whether the background guidelines are displayed
baseplot If non-null the base plot on which the plot should be layered
parent The tk parent for this loon plot widget
group... A list of arguments passed to group_2d_loon (or NULL)
... Additional parameters passed to loon::l_layer_text(...)

Value

The base loon::l_plot with the added text layer

Author(s)

Marius Hofert and Wayne Oldford

See Also

Other default 2d plot functions using the interactive loon package: arrow_2d_loon(), axes_2d_loon(), density_2d_loon(), group_2d_loon(), label_2d_loon(), points_2d_loon()

Other default 2d plot functions: arrow_2d_graphics(), arrow_2d_grid(), arrow_2d_loon(), axes_2d_graphics(), axes_2d_grid(), axes_2d_loon(), density_2d_graphics(), density_2d_grid(), density_2d_loon(), extract_2d(), group_2d_graphics(), group_2d_grid(), group_2d_loon(), label_2d_graphics(), label_2d_grid(), label_2d_loon(), points_2d_graphics(), points_2d_grid(), points_2d_loon(), qq_2d_graphics(), qq_2d_grid(), rect_2d_graphics(), rect_2d_grid()
rug_1d_graphics  

Rug plot in 1d using R’s base graphics

Description
Rug plot in 1d using R’s base graphics

Usage
rug_1d_graphics(
  zargs,
  loc = 0.5,
  length = 0.5,
  width = 1,
  col = par("fg"),
  add = FALSE,
  plot... = NULL,
  ...
)

Arguments
zargs      argument list as passed from zenplot()
loc        location in [0,1]: 0 corresponds to left, 1 to right (in the direction of the path)
length     length of the rugs
width      line width of the rugs
col        color of the rugs
add        logical indicating whether this plot should be added to the last one
plot...    additional arguments passed to plot_region()
...         additional arguments passed to segments()

Value
invisible()

Author(s)
Marius Hofert and Wayne Oldford

See Also
Other default 1d plot functions using R’s base graphics: arrow_1d_graphics(), boxplot_1d_graphics(), density_1d_graphics(), hist_1d_graphics(), jitter_1d_graphics(), label_1d_graphics(), lines_1d_graphics(), points_1d_graphics(), rect_1d_graphics()
rug_1d_grid

Other default 1d plot functions: arrow_1d_graphics(), arrow_1d_grid(), arrow_1d_loon(), boxplot_1d_graphics(), boxplot_1d_grid(), boxplot_1d_loon(), density_1d_graphics(), density_1d_grid(), density_1d_loon(), extract_1d(), hist_1d_graphics(), hist_1d_grid(), hist_1d_loon(), jitter_1d_graphics(), jitter_1d_grid(), jitter_1d_loon(), label_1d_graphics(), label_1d_grid(), label_1d_loon(), lines_1d_graphics(), lines_1d_grid(), lines_1d_loon(), points_1d_graphics(), points_1d_grid(), points_1d_loon(), rect_1d_graphics(), rect_1d_grid(), rect_1d_loon(), rug_1d_grid(), rug_1d_loon()

rug_1d_grid

Rug plot in 1d using the grid package

Description

Rug plot in 1d using the grid package

Usage

rug_1d_grid(
  zargs,
  loc = 0.5,
  length = 0.5,
  width = 0.001,
  col = par("fg"),
  draw = FALSE,
  ...
)

Arguments

zargs argument list as passed from zenplot()
loc location in [0,1]; 0 corresponds to left, 1 to right (in the direction of the path)
length length of the rugs
width line width of the rugs
col default color of the rectangles/rugs
draw logical indicating whether drawing should take place
...

Value

grob (invisibly)

Note

The choice of width and height is to leave the rugs enough space to not touch points (so to avoid points and rugs overplotting).
rug_1d_loon

Rug in 1d using the interactive loon package

Description

Rug plot in 1d using the interactive loon package

Usage

rug_1d_loon(zargs, ...)

Arguments

zargs

The argument list as passed from zenplot()

... Additional parameters passed to loon::l_plot()

Value

A loon loon::l_plot(...)

Note

Just calls points_1d_loon with glyph = "osquare" to preserve linking

Author(s)

Marius Hofert and Wayne Oldford
See Also

Other default 1d plot functions using the interactive loon package: `arrow_1d_loon()`, `boxplot_1d_loon()`, `density_1d_loon()`, `hist_1d_loon()`, `jitter_1d_loon()`, `label_1d_loon()`, `lines_1d_loon()`, `points_1d_loon()`, `rect_1d_loon()`.

Other default 1d plot functions: `arrow_1d_graphics()`, `arrow_1d_grid()`, `arrow_1d_loon()`, `boxplot_1d_graphics()`, `boxplot_1d_grid()`, `boxplot_1d_loon()`, `density_1d_graphics()`, `density_1d_grid()`, `density_1d_loon()`, `extract_1d()`, `hist_1d_graphics()`, `hist_1d_grid()`, `hist_1d_loon()`, `jitter_1d_graphics()`, `jitter_1d_grid()`, `jitter_1d_loon()`, `label_1d_graphics()`, `label_1d_grid()`, `label_1d_loon()`, `lines_1d_graphics()`, `lines_1d_grid()`, `lines_1d_loon()`, `points_1d_graphics()`, `points_1d_grid()`, `points_1d_loon()`, `rect_1d_graphics()`, `rect_1d_grid()`, `rect_1d_loon()`, `rug_1d_graphics()`, `rug_1d_grid()`.

---

**turn_checker**

*Check the Turns (Number/Type)*

**Description**

Check the Turns (Number/Type)

**Usage**

```r
turn_checker(turns, n2dplots, first1d, last1d)
```

**Arguments**

- `turns`: The turns
- `n2dplots`: The number of 2d plots
- `first1d`: A logical indicating whether the first 1d plot should be plotted
- `last1d`: A logical indicating whether the last 1d plot should be plotted

**Value**

TRUE (unless it fails)

**Author(s)**

Marius Hofert

**See Also**

Other zenplot technical tools: `convert_occupancy()`, `is.standard()`, `n2dcols_aux()`, `num.cols()`
unfold

Unfold the hypercube and produce all information concerning the zen-path and zenplot layout

Description

The unfold() function imagines each pair of variables/dimensions as a "face" of a high dimensional cube. These faces are "unfolded" from one 2d space or "face" to the next about the 1d face or "edge" they share. The unfold() function takes, as first argument, nfaces, the number of 2d plots/spaces to be "unfolded" and produces the zenpath and zenplot layout required for the function zenplot(). Laying out these pairs with a zenplot is what is alluded to as an "unfolding" of (at least a part of) the high dimensional space.

Usage

unfold(nfaces, turns = NULL,
       n2dcols = c("letter", "square", "A4", "golden", "legal"),
       method = c("tidy", "double.zigzag", "single.zigzag", "rectangular"),
       first1d = TRUE, last1d = TRUE, width1d = 1, width2d = 10)

Arguments

nfaces The number of faces of the hypercube to unfold

turns A character vector (of length two times the number of variables to be plotted minus 1) consisting of "d", "u", "r" or "l" indicating the turns out of the current plot position; if NULL, the turns are constructed.

n2dcols number of columns of 2d plots (≥ 1) or one of "letter", "square", "A4", "golden" or "legal" in which case a similar layout is constructed. Note that n2dcols is ignored if !is.null(turns).

method The type of zigzag plot (a character).
Available are:
tidy: more tidied-up double.zigzag (slightly more compact placement of plots towards the end).
double.zigzag: zigzag plot in the form of a flipped “S”. Along this path, the plots are placed in the form of an “S” which is rotated counterclockwise by 90 degrees.
single.zigzag: zigzag plot in the form of a flipped “S”.
rectangular: plots that fill the page from left to right and top to bottom. This is useful (and most compact) for plots that do not share an axis.

Note that method is ignored if turns are provided.

first1d A logical indicating whether the first one-dimensional (1d) plot should be plotted.

last1d A logical indicating whether the last one-dimensional (1d) plot should be plotted

width1d A graphical parameter > 0 giving the width of 1d plots.

width2d A graphical parameter > 0 giving the width of 2d plots.
Value

A list describing the unfolded path and its layout as a list of named components:

- path: the path of the unfolding, itself given as a structured list having components
  - turns: the sequence of turns – each being one of “l” (for left), “r” (for right), “d” (for down), and “u” (for up) – required to move from the current plot location in the display to the next along the unfolded path.
  - positions: the path as a matrix of \((x, y)\) positions giving the indices in the occupancy matrix of each plot in the path.
- occupancy: A rectangular array whose cells indicate the positions of the plots on the page.
- layout: the details of the visual layout of the plots and given as a structured list having components
  - orientations: a vector indicating the orientation of each of the displays in order – “h” for horizontal, “v” for vertical, and “s” for square.
  - dimensions: a vector giving the dimensionality of each plot in order.
  - vars: A matrix of the variable indices to be used in each plot – \(x\) being the horizontal variable and \(y\) the vertical.
  - layoutWidth: A positive integer giving the display width of a 2d plot.
  - layoutHeight: A positive integer giving the display height of a 2d plot.
  - boundingBoxes: A matrix of 4 columns giving locations (left, right, bottom, and top) of the box which bound each of the plots in order.

Note

Although unfold() is probably rather rarely used directly by a user, it provides insight into how zenplots are constructed.

Author(s)

Marius Hofert and Wayne Oldford

See Also

Other creating zenplots: zenplot()

Examples

dim <- 20
unfolding <- unfold(nfaces = dim -1)
names(unfolding)
Viewport Constructing Function for Grid Functions

Description

Auxiliary function for constructing viewports for 1d and 2d (default) plots.

Usage

vport(ispace, xlim = NULL, ylim = NULL, x = NULL, y = NULL, ...)

Arguments

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ispace</td>
<td>inner space (in ([0, 1]))</td>
</tr>
<tr>
<td>xlim</td>
<td>x-axis limits; if NULL, the data limits are used.</td>
</tr>
<tr>
<td>ylim</td>
<td>y-axis limits; if NULL, the data limits are used.</td>
</tr>
<tr>
<td>x</td>
<td>x data (only used if is.null(xlim)); if NULL, (0:1) is used.</td>
</tr>
<tr>
<td>y</td>
<td>y data (only used if is.null(ylim)); if NULL, (0:1) is used.</td>
</tr>
<tr>
<td>...</td>
<td>additional arguments passed to the underlying viewport().</td>
</tr>
</tbody>
</table>

Details

This is an auxiliary function used by the provided grid-related 1d and 2d plots.

Value

The viewport.

Note

Ideas from dataViewport() and extendrange() Omitted check: if(length(ispace) != 4) ispace <- rep(ispace, length.out = 4) stopifnot(0 <= ispace, ispace <= 1)

Author(s)

Marius Hofert

See Also

Other graphical tools: l_ispace_config(), na_omit_loon(), plot_region(), zenarrow()
Wine Data Set

Description

Data set consisting of 178 rows and 27 columns containing data about wine from the Piedmont region of Italy.

Usage

data("wine")

Format

data.frame() with 27 columns:

- wine: wine name (categorical variable with levels Barbera, Barolo, Grignolino).
- alcohol: alcohol percentage (numeric).
- sugar: sugar-free extract (numeric).
- acidity: fixed acidity (numeric).
- tartaric: tartaric acid (numeric).
- malic: malic acid (numeric).
- uronic: uronic acids (numeric).
- pH: pH (numeric).
- ash: ash (numeric).
- alcal_ash: alcalinity of ash (numeric).
- potassium: potassium (numeric).
- calcium: calcium (numeric).
- magnesium: magnesium (numeric).
- phosphate: phosphate (numeric).
- chloride: chloride (numeric).
- phenols: total phenols (numeric).
- flavanoids: flavanoids (numeric).
- nonflavanoids: nonflavanoid phenols (numeric).
- proanthocyanins: proanthocyanins (numeric).
- colour: colour intensity (numeric).
- hue: hue (numeric).
- OD_dw: $OD_{280}/OD_{315}$ of diluted wines (numeric).
- OD_fl: $OD_{280}/OD_{315}$ of flavanoids (numeric).
- glycerol: glycerol (numeric).
- butanediol: 2,3-butanediol (numeric).
- nitrogen: total nitrogen (numeric).
- proline: proline (numeric).
- methanol: methanol (numeric).
Source

The data set was obtained from the \texttt{R} package \texttt{sn} (for convenience). It represent chemical measurements on each of 178 wine specimens belonging to three types of wine produced in the Piedmont region of Italy. The data set includes all variables listed by Forina \textit{et al.} (1986) with the exception of ‘Sulphate’. The first variable is categorical, all others are numeric.


References


Examples

data("wine")

\begin{verbatim}
zenarrow

\end{verbatim}

\begin{verbatim}
Defining an arrow

Description

Defining an arrow

Usage

zenarrow(turn, angle = 80, length = 1, coord.scale = 1)

Arguments

\begin{verbatim}
turn angle length coord.scale

\end{verbatim}

The direction in which the arrow will point ("l", "r", "d", "u")

The angle

The length of the arrow in [0,1] from tip to base

Scale the coordinates of the arrow

Value

A 3-column matrix containing the (x,y) coordinates of the left edge end point, the arrow head and the right edge end point

Author(s)

Marius Hofert
zenpath

Construct a Path of Indices to Order Variables

Description

Constructing zenpaths and tools for extracting, connecting and displaying pairs, as well as grouping and indexing data structures.

Usage

zenpath(x, pairs = NULL,
    method = c("front.loaded", "back.loaded",
    "balanced", "eulerian.cross",
    "greedy.weighted", "strictly.weighted"),
    decreasing = TRUE)

Arguments

x

  for method

  single integer >= 1.

  "front.loaded", "back.loaded": as for method = "front.loaded".

  "balanced": as for method = "front.loaded".

  "eulerian.cross": two integers >= 1 representing the group sizes.

  "greedy.weighted": numeric weight vector (or matrix or distance matrix).

  "strictly.weighted": as for method = "greedy.weighted".

pairs

a two-column matrix containing (row-wise) the pairs of connected variables to be sorted according to the weights. Note that the resulting graph must be connected (i.e. any variable can be reached from any other variable following the connections given by pairs). The pairs argument is only used for the methods greedy.weighted and strictly.weighted and can be NULL (in which case a default is constructed in lexicographical order).

method

character string indicating the sorting method to be used. Available methods are:

  "front.loaded": Sort all pairs such that the first variables appear the most frequently early in the sequence; an Eulerian path; note that it might be slightly longer than the number of pairs because, first, an even graph has to be made.

  "back.loaded": Sort all pairs such that the later variables appear the most frequently later in the sequence; an Eulerian path (+ see front.loaded concerning length)

See Also

Other graphical tools: l_ispace_config(), na_omit_loon(), plot_region(), vport()
"balanced": Sort all pairs such that all variables appear in balanced blocks throughout the sequence (a Hamiltonian Decomposition; Eulerian, too).
"eulerian.cross": Generate a sequence of pairs such that each is formed with one variable from each group.
"greedy.weighted": Sort all pairs according to a greedy (heuristic) Euler path with \( x \) as weights visiting each edge precisely once.
"strictly.weighted": Strictly respect the order of the weights - so the first, second, third, and so on, adjacent pair of numbers of the output of `zenpath()` corresponds to the pair with largest, second-largest, third-largest, and so on, weight.

decreasing  A logical indicating whether the sorting is done according to increasing or decreasing weights.

Value

Returns a sequence of variables (indices or names, possibly a list of such), which can then be used to index the data (via `groupData()` for plotting via `zenplot()`).

Author(s)

Marius Hofert and Wayne Oldford

See Also

`zenplot()` which provides the zenplot.
Other tools related to constructing zenpaths: `connect_pairs()`, `extract_pairs()`, `graph_pairs()`, `groupData()`, `indexData()`

Examples

```r
## Some calls of zenpath()
zenpath(10) # integer argument
## Note that the result is of length 50 > 10 choose 2 as the underlying graph has to
## be even (and thus edges are added here)
(zp <- zenpath(c(3, 5), method = "eulerian.cross")) # integer(2) argument
```

---

**zenplot**

*Main function to create a zenplot*

**Description**

Constructs and draws a zigzag expanded navigation plot for a graphical exploratory analysis of a path of variables. The result is an alternating sequence of one-dimensional (1d) and two-dimensional (2d) plots laid out in a zigzag-like structure so that each consecutive pair of 2d plots has one of its variates (or coordinates) in common with that of the 1d plot appearing between them.
Usage

```r
zenplot(x, turns = NULL,
       first1d = TRUE, last1d = TRUE,
       n2dcols = c("letter", "square", "A4", "golden", "legal"),
       n2dplots = NULL,
       plot1d = c("label", "points", "jitter", "density", "boxplot", "hist",
                   "rug", "arrow", "rect", "lines", "layout"),
       plot2d = c("points", "density", "axes", "label", "arrow", "rect", "layout"),
       zargs = c(x = TRUE, turns = TRUE, orientations = TRUE,
                 vars = TRUE, num = TRUE, lim = TRUE, labs = TRUE,
                 width1d = TRUE, width2d = TRUE,
                 ispace = match.arg(pkg) != "graphics"),
       lim = c("individual", "groupwise", "global"),
       labs = list(group = "G", var = "V", sep = ", ", group2d = FALSE),
       pkg = c("graphics", "grid", "loon"),
       method = c("tidy", "double.zigzag", "single.zigzag", "rectangular"),
       width1d = if(is.null(plot1d)) 0.5 else 1,
       width2d = 10,
       ospace = if(pkg == "loon") 0 else 0.02,
       ispace = if(pkg == "graphics") 0 else 0.037,
       draw = TRUE,
       ...)```

Arguments

- **x**: A data object of "standard forms", being a `vector`, or a `matrix`, or a `data.frame`, or a `list` of any of these. In the case of a list, the components of `x` are interpreted as groups of data which are visually separated by a two-dimensional (group) plot.

- **turns**: A `character` vector (of length two times the number of variables to be plotted minus 1) consisting of "d", "u", "r" or "l" indicating the turns out of the current plot position; if `NULL`, the turns are constructed (if `x` is of the "standard form" described above).

- **first1d**: A `logical` indicating whether the first one-dimensional plot is included.

- **last1d**: A `logical` indicating whether the last one-dimensional plot is included.

- **n2dcols**: number of columns of 2d plots (`≥ 1`) or one of "letter", "square", "A4", "golden" or "legal" in which case a similar layout is constructed. Note that `n2dcols` is ignored if `!is.null(turns)`.

- **n2dplots**: The number of 2d plots.

- **plot1d**: A `function` to use to return a one-dimensional plot constructed with package `pkg`. Alternatively, a `character` string of an existing function. For the defaults provided, the corresponding functions are obtained when appending `_1d_graphics`, `_1d_grid` or `_1d_loon` depending on which `pkg` is used. If `plot1d` is `NULL`, then no 1d plot is produced in the `zenplot`.

- **plot2d**: A `function` returning a two-dimensional plot constructed with package `pkg`. Alternatively, a `character` string of an existing function. For the defaults pro-
vided, the corresponding functions are obtained when appending `_2d_graphics`, `_2d_grid` or `_2d_loon` depending on which pkg is used. As for `plot1d`, `plot2d` omits 2d plots if `plot2d = NULL`.

zargs
A fully named **logical vector** indicating whether the respective arguments are (possibly) passed to `plot1d()` and `plot2d()` (if the latter contain the formal argument `zargs`, which they typically do/should, but see below for an example in which they do not).

zargs can maximally contain all variables as given in the default. If one of those variables does not appear in zargs, it is treated as `TRUE` and the corresponding arguments are passed on to `plot1d` and `plot2d`. If one of them is set to `FALSE`, the argument is not passed on.

lim
(x-/y-)axis limits. This can be a **character** string or a **numeric(2)**.

If `lim = "groupwise"` and `x` does not contain groups, the behaviour is equivalent to `lim = "global"`.

labs
The plot labels to be used; see the argument `labs` of `burst()` for the exact specification. labs can, in general, be anything as long as `plot1d` and `plot2d` know how to deal with it.

pkg
The R package used for plotting (depends on how the functions `plot1d` and `plot2d` were constructed; the user is responsible for choosing the appropriate package among the supported ones).

method
The type of zigzag plot (a **character**).

Available are:

- **tidy**: more tidied-up `double.zigzag` (slightly more compact placement of plots towards the end).
- **double.zigzag**: zigzag plot in the form of a flipped “S”. Along this path, the plots are placed in the form of an “S” which is rotated counterclockwise by 90 degrees.
- **single.zigzag**: zigzag plot in the form of a flipped “S”.
- **rectangular**: plots that fill the page from left to right and top to bottom. This is useful (and most compact) for plots that do not share an axis.

Note that `method` is ignored if `turns` are provided.

width1d
A graphical parameter > 0 giving the width of 1d plots.

width2d
A graphical parameter > 0 giving the height of 2d plots.

ospace
The outer space around the zenplot. A vector of length four (bottom, left, top, right), or one whose values are repeated to be of length four, which gives the outer space between the device region and the inner plot region around the zenplot.

Values should be in \([0, 1]\) when `pkg` is "graphics" or "grid", and as number of pixels when `pkg` is "loon".

ispace
The inner space in \([0, 1]\) between the each figure region and the region of the (1d/2d) plot it contains. Again, a vector of length four (bottom, left, top, right) or a shorter one whose values are repeated to produce a vector of length four.

draw
A **logical** indicating whether a the zenplot is immediately displayed (the default) or not.
... arguments passed to the drawing functions for both `plot1d` and `plot2d`. If you need to pass certain arguments only to one of them, say, `plot2d`, consider providing your own `plot2d`; see the examples below.

Value

(besides plotting) invisibly returns a list having additional classnames marking it as a zenplot and a zenPkg object (with Pkg being one of Graphics, Grid, or Loon, so as to identify the package used to construct the plot).

As a list it contains at least the path and layout (see `unfold` for details).

Depending on the graphics package `pkg` used, the returned list includes additional components. For `pkg = "grid"`, this will be the whole plot as a grob (grid object). For `pkg = "loon"`, this will be the whole plot as a loon plot object as well as the toplevel tk object in which the plot appears.

Author(s)

Marius Hofert and Wayne Oldford

See Also

All provided default `plot1d` and `plot2d` functions. `extract_1d()` and `extract_2d()` for how zargs can be split up into a list of columns and corresponding group and variable information. `burst()` for how `x` can be split up into all sorts of information useful for plotting (see our default `plot1d` and `plot2d`). `vport()` for how to construct a viewport for (our default) grid (plot1d and plot2d) functions. `extract_pairs()`, `connect_pairs()`, `group()` and `zenpath()` for (zen)path-related functions.

The various vignettes for additional examples.

Other creating zenplots: `unfold()`

Examples

### Basics #####################################################################

```r
## Generate some data
n <- 1000 # sample size
d <- 20 # dimension
set.seed(271) # set seed (for reproducibility)
x <- matrix(rnorm(n * d), ncol = d) # i.i.d. N(0,1) data

## A basic zenplot
res <- zenplot(x)
uf <- unfold(nfaces = d - 1)
## 'res' and 'uf' is not identical as 'res' has specific
## class attributes.
for(name in names(uf)) {
  stopifnot(identical(res[[name]], uf[[name]])
}
```
## The return value of zenplot() is the underlying unfold()

## Some missing data
z <- x
z[seq_len(n-10), 5] <- NA # all NA except 10 points
zenplot(z)

## Another column with fully missing data (use arrows)
## Note: This could be more 'compactified', but is technically
## more involved
z[, 6] <- NA # all NA
zenplot(z)

## Lists of vectors, matrices and data frames as arguments (=> groups of data)
## Only two vectors
z <- list(x[,1], x[,2])
zenplot(z)

## A matrix and a vector
z <- list(x[,1:2], x[,3])
zenplot(z)

## A matrix, NA column and a vector
z <- list(x[,1:2], NA, x[,3])
zenplot(z)

## Without labels or with different labels
z <- list(A = x[,1:2], B = cbind(NA, NA), C = x[,3])
zenplot(z, labs = NULL) # without any labels
zenplot(z, labs = list(group = NULL, group2d = TRUE)) # without group labels
zenplot(z, labs = list(group = NULL)) # without group labels unless groups change
zenplot(z, labs = list(var = NULL)) # without variable labels
zenplot(z, labs = list(var = "Variable ", sep = " - ")) # change default labels

## Example with a factor
zenplot(iris)
zenplot(iris, lim = "global") # global scaling of axis
zenplot(iris, lim = "groupwise") # acts as 'global' here (no groups in the data)

## More sophisticated examples
z <- list(x[,1:5], x[1:10, 6:7], NA,
          data.frame(x[seq_len(round(n/5)), 8:19]), cbind(NA, NA), x[1:10, 20])
zenplot(z, labs = list(group = "Group ") # change the group label (var and sep are defaults)
zenplot(z, labs = list(group = "Group ", data.frame(x[seq_len(round(n/5)), 8:19]), cbind(NA, NA), x[1:10, 20])

## Note: The third component (data.frame) naturally has default labels.
## zenplot() uses these labels and prepends a default group label.
z <- list(x[,1:5], x[1:10, 6:7], NA,
data.frame(x[seq_len(round(n/5)), 8:19]), cbind(NA, NA), x[1:10, 20])
zenplot(z, labs = list(group = "Group ", LETTERS[seq_len(length(z))]) # give group names
zenplot(z) # uses given group names
## Now let's change the variable labels
z. <- lapply(z, function(z.) {
  if(!is.matrix(z.)) z. <- as.matrix(z.)
  colnames(z.) <- paste("Var.", seq_len(ncol(z.)))
  z.
})
zenplot(z.)

### A dynamic plot based on 'loon' (if installed and R compiled with tcl support)
## Not run:
if(requireNamespace("loon", quietly = TRUE))
  zenplot(x, pkg = "loon")
## End(Not run)

### Providing your own turns
#### A basic example
turns <- c("l", "d", "d", "r", "r", "d", "d", "r", "r", "u", "u", "u", "l", "l",
  "d", "d", "d", "d", "d", "d")
zenplot(x, plot1d = "layout", plot2d = "layout", turns = turns) # layout of plot regions
## => The tiles stick together as ispace = 0.
zenplot(x, plot1d = "layout", plot2d = "layout", turns = turns,
  pkg = "grid") # layout of plot regions with grid
## => Here the tiles show the small (default) ispace

#### Another example (with own turns and groups)
zenplot(list(x[,1:3], x[,4:7]), plot1d = "arrow", plot2d = "rect",
  turns = c("d", "r", "r", "r", "r", "d",
    "d", "l", "l", "l", "l", "l"), last1d = FALSE)

### Providing your own plot1d() or plot2d()
myrect <- function(...) {
  plot(NA, type = "n", ann = FALSE, axes = FALSE, xlab = 0:1, ylab = 0:1)
  rect(xleft = 0, ybottom = 0, xright = 1, ytop = 1, ...)
}
zenplot(matrix(0, ncol = 15),
  n2dcol = "square", width1d = 10, width2d = 10,
  plot1d = function(...) myrect(col = "royalblue3"),
  plot2d = function(...) myrect(col = "maroon3"))

## Colorized rugs as plot1d()
basecol <- c("royalblue3", "darkorange2", "maroon3")
palette <- colorRampPalette(basecol, space = "Lab")
cols <- palette(d) # different color for each 1d plot
zenplot(x, plot1d = function(zargs) {
  rug_1d_graphics(zargs, col = cols[(zargs$num+1)/2])
}
)

## With grid
dev <- grid() # for gTree() and gList()
zenplot(x, pkg = "grid", # you are responsible for choosing the right pkg (cannot be tested!)
  plot1d = function(zargs) {
    rug_1d_grid(zargs, col = cols[(zargs$num+1)/2])
  }
)

## Rectangles with labels as plot2d() (shows how to overlay plots)
## With graphics
## Note: myplot2d() could be written directly in a simpler way, but is
## based on the two functions here to show how they can be combined.
zenplot(x, plot1d = "arrow", plot2d = function(zargs) {
  rect_2d_graphics(zargs)
  label_2d_graphics(zargs, add = TRUE)
})

## With grid
zenplot(x, pkg = "grid", plot1d = "arrow", plot2d = function(zargs) {
  gTree(children = gList(rect_2d_grid(zargs),
    label_2d_grid(zargs))))

## Rectangles with labels outside the 2d plotting region as plot2d()
## With graphics
zenplot(x, plot1d = "arrow", plot2d = function(zargs) {
  rect_2d_graphics(zargs)
  label_2d_graphics(zargs, add = TRUE, xpd = NA, srt = 90,
    loc = c(1.04, 0), adj = c(0,1), cex = 0.7)
})

## With grid
zenplot(x, pkg = "grid", plot1d = "arrow", plot2d = function(zargs)
```r
## 2d density with points, 1d arrows and labels
zenplot(x, plot1d = function(zargs) {
  rect_1d_graphics(zargs)
  arrow_1d_graphics(zargs, add = TRUE, loc = c(0.2, 0.5))
  label_1d_graphics(zargs, add = TRUE, loc = c(0.8, 0.5))
}, plot2d = function(zargs) {
  points_2d_graphics(zargs, col = adjustcolor("black", alpha.f = 0.4))
  density_2d_graphics(zargs, add = TRUE)
})

## 2d density with labels, 1d histogram with density and label
## Note: The 1d plots are *improper* overlays here as the density
## plot does not know the heights of the histogram. In other
## words, both histograms and densities use the whole 1d plot
## region but are not correct relative to each other in the
## sense of covering the same are. For a *proper* overlay
## see below.
zenplot(x,
  plot1d = function(zargs) {
    hist_1d_graphics(zargs)
    density_1d_graphics(zargs, add = TRUE, border = "royalblue3",
                        lwd = 1.4)
    label_1d_graphics(zargs, add = TRUE,
                       loc = c(0.2, 0.8),
                       cex = 0.6, font = 2,
                       col = "darkorange2")
  },
  plot2d = function(zargs) {
    density_2d_graphics(zargs)
    points_2d_graphics(zargs, add = TRUE, col = adjustcolor("black", alpha.f = 0.3))
  }
)

### More sophisticated examples ##################################################################

### Example: Overlaying histograms with densities (the *proper* way)

# Define proper 1d plot for overlaying histograms with densities
hist_with_density_1d <- function(zargs) {
  # Extract information and data
  num <- zargs$num # plot number (among all 1d and 2d plots)
  turn.out <- zargs$turns[num] # turn out of current position
  horizontal <- turn.out == "d" || turn.out == "u"

  # Example: Proper overlay
  hist_1d_graphics(zargs)
  density_1d_graphics(zargs, add = TRUE,
                      border = "darkblue",
                      lwd = 1.4)
  label_1d_graphics(zargs, add = TRUE,
                     loc = c(0.2, 0.8),
                     cex = 0.6, font = 2,
                     col = "darkorange2")
}
```

# the indices of the 'x' variable to be displayed in the current plot
ii <- plot_indices(zargs)
label <- paste0("V", ii[1]) # label
srt <- if(horizontal) 0 else if(turn.out == "r") -90 else 90 # label rotation
x <- zargs$x[,ii[1]] # data
lim <- range(x) # data limits
## Compute histogram information
breaks <- seq(from = lim[1], to = lim[2], length.out = 21)
binInfo <- hist(x, breaks = breaks, plot = FALSE)
binBoundaries <- binInfo$breaks
widths <- diff(binBoundaries)
heights <- binInfo$density
## Compute density information
dens <- density(x)
xvals <- dens$x
keepers <- (min(x) <= xvals) & (xvals <= max(x)) # keep those within the range of the data
x. <- xvals[keepers]
y. <- dens$y[keepers]
## Determine plot limits and data
if(turn.out == "d" || turn.out == "l") { # flip density/histogram
  heights <- -heights
  y. <- -y.
} else {
  xlim <- range(0, heights, y.)
  ylim <- range(0, lim[2] - lim[1]) # special for barplot(); need to shift the bars
  x <- c(xlim[1], x., xlim[2]) - xlim[1] # shift due to plot region set up by barplot()
  y <- c(0, y., 0)
}
## Determining label position relative to the zenpath
loc <- c(0.1, 0.6)
# when walking downwards, change both left/right and up/down
if(turn.out == "d") loc <- 1-loc
# when walking to the right, coordinates change and 2nd is flipped
if(turn.out == "r") {
  loc <- rev(loc)
}
# when walking to the left, coordinates change and 1st is flipped
if(turn.out == "l") {
  loc <- rev(loc)
loc[1] <- 1-loc[1]
}

## Plotting
barplot(heights, width = widths, xlim = xlim.bp, ylim = ylim.bp,
  space = 0, horiz = !horizontal, main = "", xlab = "", axes = FALSE) # histogram
polygon(x = x, y = y, border = "royalblue3", lwd = 1.4) # density
opar <- par(usr = c(0, 1, 0, 1)) # switch to relative coordinates for text
on.exit(par(opar))
text(x = loc[1], y = loc[2], labels = label, cex = 0.7, srt = srt, font = 2,
  col = "darkorange2") # label
}

## Zenplot
zenplot(x,
plot1d = "hist_with_density_1d",
plot2d = function(zargs) {
  density_2d_graphics(zargs)
  points_2d_graphics(zargs,
    add = TRUE,
    col = adjustcolor("black", alpha.f = 0.3))
}
)

### Example: A path through pairs of a grouped t copula sample

## 1) Build a random sample from a 17-dimensional grouped t copula

d. <- c(8, 5, 4) # sector dimensions
d <- sum(d.) # total dimension
nu <- rep(c(12, 1, 0.25), times = d.) # d.o.f. for each dimension
n <- 500 # sample size
set.seed(271)
Z <- matrix(rnorm(n * d), ncol = n) # (d,n)-matrix
P <- matrix(0.5, nrow = d, ncol = d)
  diag(P) <- 1
L <- t(chol(P)) # L: LL^T = P
Y <- t(L %*% Z) # (n,d)-matrix containing n d-vectors following N(0,P)
U. <- runif(n)
W <- sapply(nu, function(nu.) 1/qgamma(U., shape = nu./2, rate = nu./2)) # (n,d)-matrix
X <- sqrt(W) * Y # (n,d)-matrix
U <- sapply(1:d, function(j) pt(X[,j], df = nu[j])) # (n,d)-matrix

## 2) Plot the data with a pairs plot, colorizing the groups

cols <- matrix("black", nrow = d, ncol = d) # colors
start <- c(1, cumsum(head(d., n = -1))+1) # block start indices
end <- cumsum(d.) # block end indices
for(j in seq_along(d.)) cols[start[j]:end[j], start[j]:end[j]] <- basecol[j] # colors
diag(cols) <- NA # remove colors corresponding to diagonal entries
cols <- as.vector(cols) # convert to a vector
cols <- cols[!is.na(cols)] # remove NA entries corresponding to diagonal
count <- 0 # panel number
my_panel <- function(x, y, ...) # panel function for colorizing groups
{ count <<- count + 1; points(x, y, pch = ".", col = cols[count]) }
pairs(U, panel = my_panel, gap = 0,
labels = as.expression( sapply(1:d, function(j) bquote(italic(U[.(j)]))) ) )

## 3) Zenplot of a random path through all pairs, colorizing the respective group
## Define our own points_2d_grid() for colorizing the groups
my_points_2d_grid <- function(zargs, basecol, d.) {
  r <- extract_2d(zargs) # extract information from zargs
  x <- r$x
  y <- r$y
  xlim <- r$xlim
  ylim <- r$ylim
  num2d <- zargs$num/2
  vars <- as.numeric(r$v$vlabs[num2d:(num2d+1)]) # two variables to be plotted
  # Alternatively, we could have used ord[r$vars[num2d:(num2d+1)]] with
  # the order 'ord' (see below) being passed to my_points_2d_grid()
  col <- if(all(1 <= vars & vars <= d.[1])) { basecol[1] } else {
    if(all(d.[1]+1 <= vars & vars <= d.[1]+d.[2])) { basecol[2] } else {
      if(all(d.[1]+d.[2]+1 <= vars & vars <= d)) basecol[3] else "black"
    }
  }
  # determine the colors
  vp <- vport(zargs$isspace, xlim = xlim, ylim = ylim, x = x, y = y) # viewport
  pointsGrob(x = x[1], y = y[1], pch = 21, size = unit(0.02, units = "npc"),
             name = "points_2d", gp = gpar(col = col), vp = vp)
}

## Plot a random permutation of columns via a zenplot
## Note: We set column labels here, as otherwise the labels can only
## show *indices* of the variables to be plotted, i.e., the column
## number in U[,ord], and not the original column number in U (which
## is what we want to see in order to see how our 'path' through
## the pairs of variables looks like).
colnames(U) <- 1:d
set.seed(1)
(ord <- sample(1:d, size = d)) # path; 1:d would walk parallel to the secondary diagonal
zenplot(U[,ord], plot1d = "layout", plot2d = "layout", pkg = "grid") # layout
zenplot(U[,ord], # has correct variable names as column names
        pkg = "grid",
        plot1d = function(zargs) arrow_1d_grid(zargs, col = "grey50"),
        plot2d = function(zargs)
       gTree(children = gList(
          my_points_2d_grid(zargs, basecol = basecol, d. = d.),
          rect_2d_grid(zargs, width = 1.05, height = 1.05,
          col = "grey50", lty = 3),
          label_2d_grid(zargs, loc = c(1.06, -0.03),
          just = c("left", "top"), rot = 90, cex = 0.45,
          fontface = "bold") )))

## => The points are colorized correctly (compare with the pairs plot).

### Using ggplot2 ####################################################################

## Although not thoroughly tested, in principle ggplot2 can also be used via
## pkg = "grid" as follows.

```r
library(ggplot2)

## Define our own 2d plot
my_points_2d_ggplot <- function(zargs, extract2d = TRUE)
{
  if(extract2d) {
    r <- extract_2d(zargs) # extract results from zargs
    df <- data.frame(r$x, r$y) # data frame
    names(df) <- c("x", "y")
    cols <- zargs$x[, "Species"]
  } else {
    ii <- plot_indices(zargs) # the indices of the variables to be plotted
    irs <- zargs$x # iris data
    df <- data.frame(x = irs[, ii[1]], y = irs[, ii[2]]) # data frame
    cols <- irs[,"Species"]
  }
  num2d <- zargs$num/2 # plot number among all 2d plots
  p <- ggplot() + geom_point(data = df, aes(x = x, y = y, colour = cols),
    show.legend = num2d == 3) +
    labs(x = "", y = ") # 2d plot
  if(num2d == 3) p <- p + theme(legend.position = "bottom", # legend for last 2d plot
    legend.title = element_blank())
  ggplot_gtable(ggplot_build(p)) # 2d plot as grob
}

## Plotting
iris. <- iris
colnames(iris.) <- gsub("\", " ", x = colnames(iris)) # => nicer 1d labels
zenplot(iris., n2dplots = 3, plot2d = "my_points_2d_ggplot", pkg = "grid")
zenplot(iris., n2dplots = 3,
  plot2d = function(zargs) my_points_2d_ggplot(zargs, extract2d = FALSE),
  pkg = "grid")

### Providing your own data structure

## Danger zone: An example with a new data structure (here: a list of *lists*)
## Note: - In this case, we most likely need to provide both plot1d and plot2d
## (but not in this case here since arrow_1d_graphics() does not depend
## on the data structure)
## - Note that we still make use of zargs here.
## - Also note that the variables are not correctly aligned anymore:
## In the ggplot2 examples we guaranteed this by plot_indices(),
## but here we don’t. This then still produces our layout but the
## x/y axis of adjacent plots might not be the same anymore. This is
## fine if only a certain order of the plots is of interest, but
## not a comparison between adjacent plots.

z <- list(list(1:5, 2:1, 1:3), list(1:5, 1:2))
zenplot(z, n2dplots = 4, plot1d = "arrow", last1d = FALSE,
```
plot2d = function(zargs, ...) {
  r <- unlist(zargs$x, recursive = FALSE)
  num2d <- zargs$num/2 # plot number among 2d plots
  x <- r[[num2d]]
  y <- r[[num2d + 1]]
  if(length(x) < length(y)) x <- rep(x, length.out = length(y))
  else if(length(y) < length(x)) y <- rep(y, length.out = length(x))
  plot(x, y, type = "b", xlab = "", ylab = "")
}, ispace = c(0.2, 0.2, 0.1, 0.1))

### Zenplots based on 3d lattice plots

library(lattice)
library(grid)
library(gridExtra)

## Build a list of cloud() plots (trellis objects)

## Note:
## - 'grid' problem: Without print(), the below zenplot() may fail (e.g.,
##   in fresh R sessions) with: 'Error in UseMethod("depth")' :
##   no applicable method for 'depth' applied to an object of class "NULL"
## - col = "black" inside scales is needed to make the ticks show

mycloud <- function(x, num) {
  lim <- extendrange(0:1, f = 0.04)
  print(cloud(x[, 3] ~ x[, 1] * x[, 2], xlim = lim, ylim = lim, zlim = lim,
    xlab = substitute(U[i.], list(i. = num)),
    ylab = substitute(U[i.], list(i. = num + 1)),
    zlab = substitute(U[i.], list(i. = num + 2)),
    zoom = 1, scales = list(arrows = FALSE, col = "black"),
    col = "black",
    par.settings = list(standard.theme(color = FALSE),
      axis.line = list(col = "transparent"),
      clip = list(panel = "off")))
}

plst.3d <- lapply(1:4, function(i)
  mycloud(x[, i:(i+2)], num = i)) # list of trellis objects

## Preparing the zenplot

num <- length(plst.3d)
ncols <- 2
turns <- c(rep("r", 2*(ncols-1)), "d", "d",
  rep("l", 2*(ncols-1)), "d")

plot2d <- function(zargs) {
  num2d <- (zargs$num+1)/2
  vp <- vport(zargs$ispace, xlim = 0:1, ylim = 0:1)
  grob(p = zargs$x[[num2d]], vp = vp, cl = "lattice") # convert trellis to grid object
  # Note: For further plots, Work with
  # gTree(children = gList(grob(zargs$x[[num2d]], vp = vp,
  # cl = "lattice")))
}
## Zenplot

## Note: We use a list of *plots* here already (not data)

```
zenplot(plst.3d, turns = turns, n2dplots = num, pkg = "grid", first1d = FALSE,
        last1d = FALSE, plot1d = "arrow_1d_grid", plot2d = plot2d)
```

---

### zenplots

**zenplots**: Zigzag Expanded Navigation Plots

---

**Description**

Zenplots, like pairs plots (scatterplot matrices), lay out a large number of one- and two-dimensional plots in an organized way.

**Details**

Unlike pairs plots, zenplots can lay out a much larger number of plots by pursuing a zigzagging layout (following a zenpath) of alternating one- and two-dimensional plots.

The plots can be created by R’s base graphics package, by the grid graphics package, or even made interactive (brushing, etc.) by using using the loon package.
Index

* creating zenplots
  unfold, 102
  zenplot, 108

* data extraction functions to build plots
  extract_1d, 35
  extract_2d, 37

* datagen
  burst, 20
  plot_indices, 79

* datasets
  de_elect, 33
  happiness, 48
  olive, 78
  wine, 105

* default 1d plot functions using R's base graphics
  arrow_1d_graphics, 4
  boxplot_1d_graphics, 16
  density_1d_graphics, 25
  hist_1d_graphics, 50
  jitter_1d_graphics, 55
  label_1d_graphics, 59
  lines_1d_graphics, 70
  points_1d_graphics, 81
  rect_1d_graphics, 91
  rug_1d_graphics, 98

* default 1d plot functions using the grid package
  arrow_1d_grid, 5
  boxplot_1d_grid, 17
  density_1d_grid, 26
  hist_1d_grid, 51
  jitter_1d_grid, 56
  label_1d_grid, 60
  lines_1d_grid, 71
  points_1d_grid, 82
  rect_1d_grid, 92
  rug_1d_grid, 99

* default 1d plot functions using the interactive loon package
  arrow_1d_loon, 7
  boxplot_1d_loon, 18
  density_1d_loon, 27
  hist_1d_loon, 52
  jitter_1d_loon, 57
  label_1d_loon, 61
  lines_1d_loon, 72
  points_1d_loon, 83
  rect_1d_loon, 93
  rug_1d_loon, 100
INDEX

rect_1d_loon, 93
rug_1d_graphics, 98
rug_1d_grid, 99
rug_1d_loon, 100

* default 2d plot functions using R’s base graphics
  arrow_2d_graphics, 8
  axes_2d_graphics, 12
  density_2d_graphics, 29
  group_2d_graphics, 45
  label_2d_graphics, 63
  points_2d_graphics, 84
  qq_2d_graphics, 88
  rect_2d_graphics, 94

* default 2d plot functions using the grid package
  arrow_2d_grid, 9
  axes_2d_grid, 13
  density_2d_grid, 30
  group_2d_grid, 46
  label_2d_grid, 64
  points_2d_grid, 85
  qq_2d_grid, 89
  rect_2d_grid, 95

* default 2d plot functions using the interactive loon package
  arrow_2d_loon, 10
  axes_2d_loon, 14
  density_2d_loon, 31
  group_2d_loon, 47
  label_2d_loon, 65
  points_2d_loon, 87
  rect_2d_loon, 96

* default 2d plot functions
  arrow_2d_graphics, 8
  arrow_2d_grid, 9
  arrow_2d_loon, 10
  arrow_2d_graphics, 12
  axes_2d_graphics, 13
  axes_2d_grid, 14
  density_2d_graphics, 29
  density_2d_grid, 30
  density_2d_loon, 31
  extract_2d, 37
  group_2d_graphics, 45
  group_2d_grid, 46
  group_2d_loon, 47
  label_2d_graphics, 63
  label_2d_grid, 64
  label_2d_loon, 65
  points_2d_loon, 65
  points_2d_graphics, 84
  points_2d_grid, 85
  points_2d_loon, 87
  qq_2d_graphics, 88
  qq_2d_grid, 89
  qq_2d_loon, 94
  rect_2d_graphics, 94
  rect_2d_grid, 95
  rect_2d_loon, 96

* dplot
  plot_region, 80
  vport, 104

* graphical tools
  l_ispace_config, 74
  na_omit_loon, 76
  plot_region, 80
  vport, 104
  zenarrow, 106

* hplot
  zenplot, 108

* tools for constructing your own plot1d and plot2d functions
  burst, 20
  burst_aux, 21
  check_zargs, 22
  extract_1d, 35
  extract_2d, 37
  plot_indices, 79

* tools related to constructing zenpaths
  connect_pairs, 23
  extract_pairs, 39
  graph_pairs, 42
  groupData, 44
  indexData, 53
  zenpath, 107

* utilities
  convert_occupancy, 24

* zenplot technical tools
  convert_occupancy, 24
  is_standard, 54
  n2dcols_aux, 75
  num_cols, 77
  turn_checker, 101

adjust_bb, 4
arrow_1d_graphics, 4, 6, 8, 17–19, 26, 27, 29, 36, 50–53, 56–59, 61, 62, 71–73, 82–84, 91, 93, 94, 98–101
axes_2d_graphics, 8, 10, 11, 13, 14, 16, 30, 31, 33, 38, 46–48, 64–66, 85, 86, 88–90, 95–97
arrow_2d_grid, 9, 9, 11, 12, 14, 16, 30, 31, 33, 38, 46–48, 64–66, 85, 86, 88–90, 95–97
arrow_2d_loon, 9, 10, 10, 13, 14, 16, 30, 31, 33, 38, 46–48, 64–66, 85, 86, 88–90, 95–97
as.matrix, 44
as.numeric, 11
axes_2d_graphics, 9–11, 12, 14, 16, 30, 31, 33, 38, 46–48, 64–66, 85, 86, 88–90, 95–97
axes_2d_grid, 9–11, 13, 13, 16, 30, 31, 33, 38, 46–48, 64–66, 85, 86, 88–90, 95–97
axes_2d_loon, 9–11, 13, 14, 16, 30, 31, 33, 38, 46–48, 64–66, 85, 86, 88–90, 95–97
boxplot_2d_loon, 5, 6, 8, 17, 18, 18, 26–29, 36, 51–53, 56–59, 61, 62, 71–73, 82–84, 91, 93, 94, 99–101
burst, 20, 22, 23, 36, 38, 80, 110, 111
burst.aux, 21, 21, 23, 36, 38, 80
density_2d_graphics, 9–11, 13, 14, 16, 29, 31, 33, 38, 46–48, 64–66, 85, 86, 88–90, 95–97
density_2d_grid, 9–11, 13, 14, 16, 30, 31, 33, 38, 46–48, 64–66, 85, 86, 88–90, 95–97
density_2d_loon, 9–11, 13, 14, 16, 30, 31, 33, 38, 46–48, 64–66, 85, 86, 88–90, 95–97
extract_2d, 9–11, 13, 14, 16, 21–23, 30, 31, 33, 36, 37, 46–48, 64–66, 80, 85, 86, 88–90, 95–97, 111
extract_pairs, 24, 39, 43, 44, 54, 108, 111
function, 109
groupData, 111
grogroup, 111
group_2d_graphics, 9–11, 13, 14, 16, 30, 31, 33, 38, 45, 47, 48, 64–66, 85, 86, 88–90, 95–97
hist_2d_grid, 9–11, 13, 14, 16, 30, 31, 33, 38, 46, 47, 48, 64–66, 85, 86, 88–90, 95–97
group_2d_loon, 9–11, 13, 14, 16, 30, 31, 33, 38, 46, 47, 48, 64–66, 85, 86, 88–90, 95–97
happiness, 48
INDEX

indexData, 24, 40, 43, 44, 53, 108
integer, 107
invisible, 80
is.standard, 25, 54, 76, 78, 101
jitter_1d_graphics, 5, 6, 8, 17–19, 26, 27, 29, 36, 50–53, 55, 57–62, 71–73, 82–84, 91–94, 98–101
l_ispace_config, 74, 76, 81, 104, 107
label_1d_graphics, 5, 6, 8, 17–19, 26, 27, 29, 36, 50–53, 56–58, 59, 61, 62, 71–73, 82–84, 91–94, 98–101
label_1d_loon, 5, 6, 8, 17–19, 26–29, 36, 51–53, 56–58, 60, 61, 61, 71–73, 82–84, 92–94, 99–101
label_2d_graphics, 9–11, 13, 14, 16, 30, 31, 33, 38, 46–48, 63, 65, 66, 83, 86, 88–90, 95–97
label_2d_grid, 9–11, 13, 14, 16, 30, 31, 33, 38, 46–48, 64, 64, 66, 85, 86, 88–90, 95–97
label_2d_loon, 9–11, 13, 14, 16, 30, 31, 33, 38, 46–48, 64, 65, 65, 85, 86, 88–90, 95–97
layout_1d_graphics, 67
layout_1d_grid, 67
layout_1d_loon, 68
layout_2d_graphics, 68
layout_2d_grid, 69
layout_2d_loon, 70
lines_1d_graphics, 5, 6, 8, 17–19, 26, 27, 29, 36, 50–53, 56–62, 70, 72, 73, 82–84, 91–94, 98–101
list, 20, 23, 36, 38, 39, 43, 44, 103, 109
logical, 20, 23, 36, 38, 44, 42, 66, 102, 108–110

matrix, 20, 23–25, 43, 44, 54, 107, 109
move, 75

n2dcols_aux, 25, 55, 75, 78, 101
na.omit_loon, 74, 76, 81, 104, 107
next_move.tidy, 77
NULL, 20
num.cols, 25, 55, 76, 77, 101
numeric, 20, 107

olive, 78

plot, 42, 43, 80
plot.exists, 79
plot_indices, 21–23, 36, 38, 79
plot_region, 74, 76, 80, 104, 107
points_1d_graphics, 5, 6, 8, 17–19, 26, 27, 29, 36, 50–53, 56–62, 71–73, 81, 83, 84, 91–94, 98–101
points_2d_graphics, 9–11, 13, 14, 16, 30, 31, 33, 38, 46–48, 64, 64, 66, 85, 86, 88–90, 95–97
points_2d_grid, 9–11, 13, 14, 16, 30, 31, 33, 38, 46–48, 64–66, 84, 86, 88–90, 95–97
points_2d_loon, 9–11, 13, 14, 16, 30, 31, 33, 38, 46–48, 64–66, 84, 86, 88–90, 95–97

qq_2d_graphics, 9–11, 13, 14, 16, 30, 31, 33, 38, 46–48, 64–66, 85, 86, 88, 88, 90, 95–97
qq_2d_grid, 9–11, 13, 14, 16, 30, 31, 33, 38, 46–48, 64–66, 85, 86, 88, 89, 95–97
rect_1d_graphics, 5, 6, 8, 17–19, 26, 27, 29, 36, 50–53, 56–62, 71–73, 82–84, 91, 93, 94, 98–101
rect_1d_loon, 5, 6, 8, 17–19, 26–29, 36, 51–53, 56–58, 60–62, 71–73, 82–84, 92, 93, 93, 99–101
rect_2d_graphics, 9–11, 13, 14, 16, 30, 31, 33, 38, 46–48, 64–66, 85, 86, 88–90, 94, 96, 97
rect_2d_grid, 9–11, 13, 14, 16, 30, 31, 33, 38, 46–48, 64–66, 85, 86, 88–90, 95, 97
rect_2d_loon, 9–11, 13, 14, 16, 30, 31, 33, 38, 46–48, 64–66, 85, 86, 88–90, 95, 96, 96
rug_1d_graphics, 5, 6, 8, 17–19, 26, 27, 29, 36, 50–53, 56–62, 71–73, 82–84, 91–94, 98, 100, 101
turn_checker, 25, 55, 76, 78, 101
unfold, 102, 111
vector, 20, 24, 39, 107, 109, 110
viewport, 104
vport, 74, 76, 81, 104, 107, 111
wine, 105
zenarrow, 74, 76, 81, 104, 106
zenpath, 24, 40, 43, 44, 54, 107, 111
zenplots, 121