

Package ‘wrGraph’

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Title Graphics in the Context of Analyzing High-Throughput Data

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Description Additional options for making graphics in the context of analyzing high-throughput data are available here.
This includes automatic segmenting of the current device (eg window) to accommodate multiple new plots,
automatic checking for optimal location of legends in plots, small histograms to insert as legends,
histograms re-transforming axis labels to linear when plotting log2-transformed data,
a violin-plot <doi:10.1080/00031305.1998.10480559> function for a wide variety of input-formats,
principal components analysis (PCA) <doi:10.1080/14786440109462720> with bag-plots <doi:10.1080/00031305.1999.10474494>
to highlight and compare the center areas for groups of samples,
generic MA-plots (differential- versus average-value plots) <doi:10.1093/nar/30.4.e15>,
staggered count plots and generation of mouse-over interactive html pages.

Depends R (>= 3.5.0)

Imports graphics, grDevices, grid, lattice, RColorBrewer, stats,
wrMisc (> 2.0.1)

Suggests dplyr, factoextra, FactoMineR, ggpubr, knitr, limma,
rmarkdown, sm

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.addTextToPoints	<i>Add text to points on plot</i>
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Description

This function allows to add custom text as lables to points on standard xy-plot.

Usage

```
.addTextToPoints(  
  x,  
  paramLst = NULL,  
  labels = NULL,  
  cex = NULL,  
  col = NULL,  
  adj = "auto",  
  callFrom = NULL,  
  silent = TRUE,  
  debug = FALSE  
)
```

Arguments

<code>x</code>	(matrix, data.frame) coordinated of ponts on plot
<code>paramLst</code>	(list) additional parameters for plotting (priority over separate <code>cex</code> or <code>col</code>), otherwise names displayed will be taken from 'labels' or rownames of coordinates 'x'
<code>labels</code>	(character) the text to be displayed (has not priority over 'paramLst'), if nothing valid found numbers will be displayed
<code>cex</code>	(character) (numeric) size of text, as expansion factor (see also <code>cex</code> in par)
<code>col</code>	(character or integer) use custom colors
<code>adj</code>	(character) values other than 0,0.5 or 1 will lead to 'auto' where text is displayed only to left of sufficient space available
<code>callFrom</code>	(character) allow easier tracking of messages produced
<code>silent</code>	(logical) suppress messages
<code>debug</code>	(logical) display additional messages for debugging

Value

This function make a plot and may return an optional matrix of outlier-data (depending on argument `getOutL`)

See Also

[prcomp](#) (used here for the PCA underneath) , [princomp](#), see the package [FactoMineR](#) for multiple plotting options or ways of combining categorical and numeric data

Examples

```
set.seed(2019); dat1 <- matrix(round(runif(30),2), ncol=2)
plot(dat1)          # traditional plot
.addTextToPoints(dat1, labels=letters[1:nrow(dat1)])
```

<code>.bestLegendLoc</code>	<i>Search best corner of plot for placing for legend This function aims to find best corner for plotting a legend.</i>
-----------------------------	--

Description

Search best corner of plot for placing for legend

This function aims to find best corner for plotting a legend.

Usage

```
.bestLegendLoc(
  dat,
  txtLen,
  txtHi,
  displayPlotSearch = FALSE,
  silent = TRUE,
  debug = FALSE,
  callFrom = NULL
)
```

Arguments

<code>dat</code>	(matrix, list or data.frame) main data of plot
<code>txtLen</code>	(numeric, length=1)
<code>txtHi</code>	(numeric, length=1) text height from <code>graphics::strheight()</code> (including inter-line)
<code>displayPlotSearch</code>	(logical) decide if lines to mark area where data is searched for legend should be drawn
<code>silent</code>	(logical) suppress messages
<code>debug</code>	(logical) additional messages for debugging
<code>callFrom</code>	(character) allows easier tracking of messages produced

Value

numeric vector with counts of number of points expected to enter legend-location for each corner (ie legend-localization)

See Also

[checkForLegLoc](#), [legend](#)

Examples

```
dat1 <- matrix(c(1:5,1,1:5,5), ncol=2)
(legLoc <- .bestLegendLoc(dat1, txtLen=0.4, txtHi=28))
```

.determFigMargPix

Estimate size/distance of margin to edge of image (png) in pixels

Description

This function allows estimating size/distance of margin to edge of image (png) in pixel and return numeric vector.

Usage

```
.determFigMargPix(marg, res, callFrom = NULL, silent = FALSE, debug = FALSE)
```

Arguments

<code>marg</code>	(numeric) distance of margin in inch (as given in <code>par(mar=c())</code>)
<code>res</code>	(numeric, length=1) resolution of image (png)
<code>callFrom</code>	(character) allows easier tracking of messages produced
<code>silent</code>	(logical) suppress messages
<code>debug</code>	(logical) additional messages for debugging

Value

This function returns a numeric vector matrix with (estimated) distance to figure margins in pixels

See Also

[convertPlotCoordPix](#), [mouseOverHtmlFile](#)

Examples

```
.determFigMargPix(c(5,4,4,2),100)
```

`.predPointsPix`*Predict and return pixel location of points of current plot*

Description

This function allows predicting the pixel location of points of current plot. Note: may be imprecise in case of x or y with all same values.

Usage

```
.predPointsPix(  
  x,  
  y,  
  dimPng,  
  res,  
  marg,  
  fromTop = TRUE,  
  scExt = 0.04,  
  displ = FALSE,  
  callFrom = NULL,  
  silent = FALSE,  
  debug = FALSE  
)
```

Arguments

x	(numeric) initial coordinates for plot
y	(numeric) initial coordinates for plot
dimPng	(numeric, length=2) width and hight of png
res	(numeric, length=1) resolution of png
marg	(numeric, length=4) margins in inches (as given by <code>par(mar=c(...))</code>)
fromTop	(logical) default counting in html is from top
scExt	(numeric, length=1) extending scale (default at 0.04 ie 4 %)
displ	(logical) optional plot
callFrom	(character) allows easier tracking of messages produced
silent	(logical) suppress messages
debug	(logical) additonal messages for debugging

Value

This function returns a numeric matrix with 2 columns 'xPix' and 'yPix' (with `length(x)` rows); and optionally a plot (if argument `displ=TRUE`)

See Also

[convertPlotCoordPix](#), [mouseOverHtmlFile](#)

Examples

```
.predPointsPix(x=c(1,100), y=c(1,100), dimPng=c(700,600), res=200, marg=c(5,4,4,2))
```

.serachColName	<i>Search Column Name This function provides help when seraching column names</i>
----------------	---

Description

Search Column Name

This function provides help when seraching column names

Usage

```
.serachColName(
  x,
  searchColNa,
  plusLowerCaps = TRUE,
  returnList = TRUE,
  silent = FALSE,
  debug = FALSE,
  callFrom = NULL
)
```

Arguments

x (matrix or data.frame) main input
searchColNa (character)
plusLowerCaps (logical) add lower caps to search
returnList (logical)
silent (logical) suppress messages
debug (logical) additional messages for debugging
callFrom (character) allow easier tracking of messages produced

Value

integer vector with index of colnames found or list with \$foundNa and \$remainNa

See Also

[convertPlotCoordPix](#); use [htmlSpecCharConv](#) to convert special characters for proper html display

Examples

```
mat1 <- matrix(1:6, ncol=3, dimnames=list(NULL, LETTERS[1:3]))
.serachColName(mat1, c("C","F","A"))
```

addBagPlot

Add Bagplot To Existing Plot

Description

This function adds a bagplot on an existing (scatter-)plot allowing to highlight the central area of the data.

Usage

```
addBagPlot(
  x,
  lev1 = 0.5,
  outCoef = 2,
  bagCol = NULL,
  bagCont = bagCol,
  bagLwd = 1.5,
  nCore = 4,
  outlCol = NULL,
  outlPch = NULL,
  outlCex = 0.6,
  reCol = NULL,
```

```

rePch = NULL,
reCex = NULL,
ctrPch = NULL,
ctrCol = NULL,
ctrCex = NULL,
addSubTi = TRUE,
returnOutL = FALSE,
silent = TRUE,
callFrom = NULL,
debug = FALSE
)

```

Arguments

x	(matrix, list or data.frame) main numeric input of data/points to plot
lev1	(numeric) min content of data for central area (default 0.5 for 50 percent)
outCoef	(numeric) parameter for defining unexpected values ('outlier', equivalent to range in boxplot)
bagCol	(character or integer) color for filling center part of bagplot (default light transparent grey); Note: It is highly suggested to use transparency, otherwise points underneath will be covered
bagCont	(character) color for inner and outer contours of bagplot
bagLwd	(numeric) line width for outer contour, set to NULL for not displaying outer contour (see also par)
nCore	(integer) decide when center should be determined by median or mean: if number of points reach nCore the median will be used
outlCol	(character or integer) color for highlighting unexpected values ('outlier', for text and replottig unexpected values), set to NULL for not highlighting unexpected values ('outliers') at all
outlPch	(integer) symbol replottig highlighted unexpected values ('outlier', for text and replottig unexpected values), set to NULL for not replottig outlier-points (see also par)
outlCex	(numeric) cex type expansion factor for labels of highlighted unexpected values ('outlier'), set to NULL for not printing (row)names of unexpected values ('outliers') (see also par)
reCol	(character or integer) color for replottig unexpected points, default set to NULL for not replottig
rePch	(integer) symbol for replottig unexpected points, default set to NULL for not re-plotting (see also par)
reCex	(numeric) cex type expansion factor for replottig unexpected points ('outliers'), default set to NULL for not replottig
ctrPch	(integer) symbol for showing group center (see also par)
ctrCol	(character or integer) color for group center symbol and potential unexpected values ('outlier', names of such unexpected values will shown if returnOutL=TRUE)

ctrCex	(numeric) cex type expansion factor for size of group center (see also par)
addSubTi	(logical) decide if subtitle, ie names of points should be added in plot for points considered as potential unexpected values ('outlier')
returnOutL	(logical) decide if rownames of (potential) unexpected values should be returned when running the function
silent	(logical) suppress messages
callFrom	(character) allow easier tracking of messages produced
debug	(logical) display additional messages for debugging

Details

A bagplot is a bivariate boxplot, see [Bagplot](#), following the basic idea of a boxplot in two dimensions. Of course, multimodal distributions - if not separated first - may likely lead to misinterpretation, similarly as it is known for interpreting boxplots. If a group of data consists only of 2 data-points, they will be connected using a straight line. It is recommended using transparent colors to highlight the core part of a group (if only 2 points are available, they will be connected using a straight line), in addition, one could use the option to re-plot all (non-outlier) points (arguments `reCol`, `rePch` and `reCex` must be used).

The outlier detection works similar to the one used in `boxplot`: The distance of a given point is compared to the median distance of all points to their respective group-center plus the 25 - 75 quantile-distance (of all points) times the multiplicative factor of argument `outCoef`.

Value

This function adds graphical elements (ie a bagplot) on top of an already existing plot, optionally it may return of matrix with unexpected values ('outliers', if argument `returnOutL=TRUE`)

See Also

[plotPCAw](#), [princomp](#)

Examples

```
set.seed(2020); dat1 <- matrix(round(rnorm(2000),3),ncol=2); rownames(dat1) <- 1:nrow(dat1)
dat1 <- dat1 + 5*matrix(rep(c(0,1,1,0,0,0,1,1),nrow(dat1)/4), byrow=TRUE, ncol=2)
col1 <- rgb(red=c(153,90,203,255), green=c(143,195,211,125), blue=c(204,186,78,115),
  alpha=90, maxColorValue=255)
## suppose we know the repartition into 4 subgroups which we would like to highlight them
grp1 <- rep(1:4, nrow(dat1)/4)
plot(dat1, col=grey(0.8), xlab="x", ylab="y", las=1, pch=grp1)
for(i in 1:4) addBagPlot(dat1[which(grp1==i),], bagCol=col1[i])
## slightly improved
if(requireNamespace("wrMisc", quietly=TRUE)) {library(wrMisc);
  col2 <- convColorToTransp(col1, 255)} else col2 <- col1
plot(dat1, col=grey(0.8), xlab="x", ylab="y", las=1, pch=grp1)
for(i in 1:4) addBagPlot(dat1[which(grp1==i),], bagCol=col1[i], outlPch=i,
  outlCol=col2[i], bagLwd=3)
```

checkForLegLoc

Find best place on plot for placing legend

Description

This function tries to find the best location for placing a legend of a bivariate plot, ie scatter-plot. All 4 corners of the data to plot are inspected for the least occupation by data plotted while displaying the content of sampleGrp. Alternatively, by setting the argument showLegend the user-defined legend will be returned

Usage

```
checkForLegLoc(
  matr,
  sampleGrp = NULL,
  showLegend = TRUE,
  suplSpace = 4,
  testCorner = 1:4,
  silent = TRUE,
  debug = FALSE,
  callFrom = NULL
)
```

Arguments

matr	(matrix, list or data.frame) main data of plot
sampleGrp	(character or factor) with this option the text to be displayed in the legend may be taken into consideration for its length
showLegend	(logical or character) decide if matr should be checked for best location; if showLegend contains any of the standard legend-location designations (eg 'topleft') it will be used in the output
suplSpace	(numeric) allows to consider extra room taken in legend by symbol and surrounding space, interpreted as n additional characters
testCorner	(integer) which corners should be considered (1=left-top, 2=right-top, right-bottom, left-bottom)
silent	(logical) suppress messages
debug	(logical) additional messages for debugging
callFrom	(character) allows easier tracking of messages produced

Value

This function returns a list with \$showL indicating if legend is desired and \$loc for the proposition of the best location, \$nConflicts gives the counts of conflicts

See Also[legend](#)**Examples**

```

dat1 <- matrix(c(1:5,1,1:5,5), ncol=2)
grp <- c("abc","efghijk")
(legLoc <- checkForLegLoc(dat1, grp))
plot(dat1, cex=3)
legend(legLoc$loc, legend=grp, text.col=2:3, pch=1, cex=0.8)

```

convertPlotCoordPix	<i>Convert points of plot to coordinates in pixels</i>
---------------------	--

Description

This function allows conversion the plotting positions ('x' and 'y' coordinates) of points in a given plot into coordinates in pixels (of the entire plotting region). It was designed to be used as coordinates in an html file for mouse-over interactivity (display of names of points and links). Of course, the size of the plotting region is crucial and may not be changed afterwards (if the plot is not written to file using png etc). In turn the function [mouseOverHtmlFile](#) will use the pixel-coordinates, allowing to annotate given points of a plot for mouse-over interactive html.

Usage

```

convertPlotCoordPix(
  x,
  y,
  useMar = c(6.2, 4, 4, 2),
  plotDim = c(1400, 800),
  plotRes = 100,
  fromTop = TRUE,
  callFrom = NULL,
  silent = FALSE,
  debug = FALSE
)

```

Arguments

x	(numeric) initial plotting coordinates on x-axis, names of vector - if available - will be used as IDs
y	(numeric) initial plotting coordinates on y-axis
useMar	(numeric,length=4) margins defined with plot, see also par
plotDim	(integer, length=2) dimension of the plotting device in pixels, see also par
plotRes	(integer) resolution of plotting device, see also par
fromTop	(logical) toggle if poordinates should start from top

callFrom (character) allows easier tracking of messages produced

silent (logical) suppress messages

debug (logical) additional messages for debugging

Value

This function returns a matrix with x- and y-coordinates in pixels

See Also

[mouseOverHtmlFile](#)

Examples

```
df1 <- data.frame(id=letters[1:10], x=1:10, y=rep(5,10), mou=paste("point", letters[1:10]),
  link=file.path(tempdir(), paste0(LETTERS[1:10], ".html")), stringsAsFactors=FALSE)
## Typically one wants to get pixel-coordinates for plots written to file.
## Here we'll use R's tempdir, later you may want to choose other locations
pngFile <- file.path(tempdir(), "test01.png")
png(pngFile, width=800, height=600, res=72)
## here we'll just plot a set of horizontal points at default parameters ...
plot(df1[,2:3], las=1, main="test01")
dev.off()
## Note: Special characters should be converted for proper display in html during mouse-over
library(wrMisc)
df1$mou <- htmlSpecCharConv(df1$mou)
## Let's add the x- and y-coordinates of the points in pixels to the data.frame
df1 <- cbind(df1, convertPlotCoordPix(x=df1[,2], y=df1[,3], plotD=c(800,600), plotRes=72))
head(df1)
## using mouseOverHtmlFile() one could now make an html document with interactive
## display of names and clickable links to the coordinates we determined here ...
```

cumFrqPlot

Cumulative (or sorted) Frequency Plot (takes columns of 'dat' as separate series)

Description

Display data as sorted or cumulative frequency plot. This type of plot represents an alternative to plotting data as histograms. Histograms are very universal and which are very intuitive. However, fine-tuning the bandwidth (ie width of the bars) may be very delicate, fine resolution details may often remain hidden.

Usage

```

cumFrqPlot(
  dat,
  cumSum = FALSE,
  exclCol = NULL,
  colNames = NULL,
  displColNa = TRUE,
  tit = NULL,
  xLim = NULL,
  yLim = NULL,
  xLab = NULL,
  yLab = NULL,
  col = NULL,
  CVlimit = NULL,
  thisResol = NULL,
  supTxtAdj = 0,
  supTxtYOffs = 0,
  useLog = "",
  silent = FALSE,
  debug = FALSE,
  callFrom = NULL
)

```

Arguments

<code>dat</code>	(matrix or data.frame) data to plot/inspect
<code>cumSum</code>	(logical) for either plotting cumulates Sums (then <code>thisResol</code> for number of breaks) or (if <code>=FALSE</code>) simply sorted values -> max resolution
<code>exclCol</code>	(integer) columns to exclude
<code>colNames</code>	(character) for alternative column/series names in display, as long as <code>displColNa=TRUE</code>
<code>displColNa</code>	(logical) display column-names
<code>tit</code>	(character) custom title
<code>xLim</code>	(numeric) custom limit for x-axis (see also par)
<code>yLim</code>	(numeric) custom limit for y-axis (see also par)
<code>xLab</code>	(character) custom x-axis label
<code>yLab</code>	(character) custom y-axis label
<code>col</code>	(integer or character) custom colors
<code>CVlimit</code>	(numeric) for the tag 'outlier column' (uses exclExtrValues) identify & mark column with median row-CV > <code>CVlimit</code>
<code>thisResol</code>	(integer) resolution <code>res</code> for binning large data-sets
<code>supTxtAdj</code>	(numeric) parameter <code>adj</code> for supplemental text
<code>supTxtYOffs</code>	(numeric) supplemental offset for text on y axis
<code>useLog</code>	(character) default="", otherwise for setting axis in log-scale "x", "y" or "xy"

<code>silent</code>	(logical) suppress messages
<code>debug</code>	(logical) additional messages for debugging
<code>callFrom</code>	(character) allows easier tracking of messages produced

Details

One of the advantages of directly displaying all data-points is that subtle differences may be revealed easier, compared to classical histograms. Furthermore, the plot presented here offers more options to display multiple series of data simultaneously. Thus, this type of plot may be useful to compare eg results of data normalization. Of course, with very large data-sets (eg > 3000 values) this gain of 'details' will be less important (compared to histograms) and will penalize speed. In such cases the argument `thisResol` will get useful as it allows to reduce the resolution and introduce binning. Alternatively for very large data-sets one may look into density-plots or vioplots (eg [vioplotW](#)). The argument `CVlimit` allows optionally excluding extreme values.

If numeric (and > 2 columns), its value will be used [exclExtrValues](#) to identify series with column-median > 'CVlimit'. Of course, exclusion of extreme values should be done with great care, important features of the data may get lost.

Value

This function plots to the current graphical device

See Also

[layout](#), [exclExtrValues](#) for decision of potential outliers; [hist](#), [vioplotW](#)

Examples

```
set.seed(2017); dat0 <- matrix(rnorm(500), ncol=5, dimnames=list(NULL,1:5))
cumFrqPlot(dat0, tit="Sorted values")
cumFrqPlot(dat0, cumSum=TRUE, tit="Sum of sorted values")
```

`foldChangeArrow`

Add arrow for expected Fold-Change to VolcanoPlot or MA-plot

Description

This function allows adding an arrow indicating a fold-change to MA- or Volcano-plots. When comparing multiple concentrations of standards in benchmark-tests it may be useful to indicate the expected ratio in a pair-wise comparison. In case of main input as list or MArrayLM-object (as generated from limma), the column-names of multiple pairwise comparisons can be used for extracting a numeric content (supposed as concentrations in sample-names) which will be used to determine the expected ratio used for plotting. Optionally the ratio used for plotting can be returned as numeric value.

Usage

```
foldChangeArrow(
  FC,
  useComp = 1,
  isLin = TRUE,
  asX = TRUE,
  col = 2,
  arr = c(0.005, 0.15),
  lwd = NULL,
  addText = c(line = -0.9, cex = 0.7, txt = "expected", loc = "toright"),
  returnRatio = FALSE,
  silent = FALSE,
  debug = FALSE,
  callFrom = NULL
)
```

Arguments

FC	(numeric, list or MArrayLM-object) main information for drawing arrow : either numeric value for fold-change/log2-ratio of object to search for colnames of statistical testing for extracting numeric part
useComp	(integer) only used in case FC is list or MArrayLM-object an has multiple pairwise-comparisons
isLin	(logical) indicate if FC is log2 or not
asX	(logical) indicate if arrow should be on x-axis
col	(integer or character) custom color
arr	(numeric, length=2) start- and end-points of arrow (as relative to entire plot)
lwd	(numeric) line-width of arrow
addText	(logical or named vector) indicate if text explaining arrow should be displayed, use TRUE for default (on top right of plot), or any combination of 'loc', 'line', 'cex', 'side', 'adj', 'col', 'text' (or 'txt') for customizing specific elements
returnRatio	(logical) return ratio
silent	(logical) suppress messages
debug	(logical) additonal messages for debugging
callFrom	(character) allows easier tracking of messages produced

Details

The argument addText also allows specifying a fixed position when using addText=c(loc="bottomleft"), also bottomright, topleft, topright, toleft and toright may be used. In this case the elems side and adjust will be redefined to accomodate the text in the corner specified.

Value

This function plots only an arrow onto current plotting device (and some explicative text), if returnRatio=TRUE also returns numeric value for extracted ratio

See Also

[MAplotW](#), [VolcanoPlotW](#)

Examples

```
plot(rnorm(20,1.5,0.1), 1:20)
foldChangeArrow(FC=1.5)
```

histW

Histogram (version W)

Description

This function proposes a few special tweaks to the general [hist](#) function : In a number of settings data are treated and plotted as log-data. This function allows feeding directly log2-data and displaying the x-axis (re-translated) in linear scale (see argument `isLog`).

Usage

```
histW(
  dat,
  fileName = "histW",
  output = "screen",
  nBars = 8,
  breaks = NULL,
  tit = NULL,
  subTi = NULL,
  xLab = NULL,
  yLab = NULL,
  xLim = NULL,
  las = NULL,
  xcex = 0.7,
  imgxSize = 900,
  useCol = NULL,
  useBord = NULL,
  isLog = TRUE,
  cexSubTi = NULL,
  cropHist = TRUE,
  parDefault = TRUE,
  silent = FALSE,
  debug = FALSE,
  callFrom = NULL
)
```

Arguments

<code>dat</code>	(matrix, list or data.frame) data to plot
<code>fileName</code>	(character) name of file for saving graphics
<code>output</code>	(character, length=1) options for output on 'screen' or saving image in various formats (set to 'jpg', 'png' or 'tif')
<code>nBars</code>	(integer) number of bars in histogram (default for 'low resolution' plot to give rough overview)
<code>breaks</code>	(integer) for (partial) compatibility with <code>hist()</code> : use only for number of breaks (or 'FD'), gets priority over 'nBars'
<code>tit</code>	(character) custom title
<code>subTi</code>	(character) may be FALSE for NOT displaying, or any text, otherwise range
<code>xLab</code>	(character) custom x-axes label
<code>yLab</code>	(character) custom y-axes label
<code>xLim</code>	(numeric, length=2) custom x-axes limits
<code>las</code>	(integer) optional fixed text orientation of x-axis numbers : use 1 for horizontal and 2 for perpendicular, see also par
<code>xcex</code>	(numeric) cex-type expansion factor for x-axis numbers, see also par
<code>imgxSize</code>	(integer) width of image when saving to file, see also par
<code>useCol</code>	(character or integer) custom colors, see also par
<code>useBord</code>	(character) custom histogram elements border color, see also par
<code>isLog</code>	(logical) for lin scale signal intensity values where representation needs log, assume log2 if TRUE
<code>cexSubTi</code>	(numerical) subtitle size (expansion factor cex), see also par
<code>cropHist</code>	(logical) -not implemented yet- designed for cutting off bars with very low ('insignificant') values
<code>parDefault</code>	(logical) to automatic adjusting <code>par(marg=,cex.axis=0.8)</code> , see also par
<code>silent</code>	(logical) suppress messages
<code>debug</code>	(logical) additional messages for debugging
<code>callFrom</code>	(character) allow easier tracking of messages produced

Details

The default settings allow making (very) small histograms ('low resolution'), which may be used as a rough overview of bandwidth and distribution of values in `dat`.

Similar to [hist](#), by changing the parameters `nBars` and/or `breaks` very 'high resolution' histograms can be produced. By default it displays `n` (the number of values used underneath) per set of data (on the top of the figure). Note that the argument for (custom) title `main` is now called `tit`.

Value

This function produces a histogram type graphic (to the current graphical device), it may also plot to file if the arguments `fileName` designs a valid (path&) file for the output

See Also[hist](#)**Examples**

```

set.seed(2016); dat1 <- round(c(rnorm(200,6,0.5),rlnorm(300,2,0.5),rnorm(100,17)),2)
dat1 <- dat1[which(dat1 <50 & dat1 > 0.2)]
histW(dat1, br="FD", isLog=FALSE)
histW(log2(dat1), br="FD", isLog=TRUE)

## quick overview of distributions
layout(partitionPlot(4))
for(i in 1:4) histW(iris[,i], isLog=FALSE, tit=colnames(iris)[i])

```

imageW

*Display Numeric Content Of Matrix As Image***Description**

To get a quick overview of the spatial distribution of smaller data-sets it may be useful to display numeric values as colored boxes. Such an output may also be referred to as heatmap (note that the term 'heatmap' is frequently associated with graphical display of hierarchical clustering results). The function [image](#) provides the basic support to do so (ie heatmap without rearranging rows and columns by clustering). To do this more conveniently, the function `imageW` offers additional options for displaying row- and column-names or displaying NA-values as custom-color.

Usage

```

imageW(
  data,
  latticeVersion = FALSE,
  transp = TRUE,
  NAcol = "grey95",
  tit = NULL,
  rowNa = NULL,
  colNa = NULL,
  xLab = NULL,
  yLab = NULL,
  xLabVal = NA,
  yLabVal = NA,
  las = 2,
  col = NULL,
  nColor = 9,
  balanceCol = TRUE,
  gridCol = "grey75",
  gridLty = 1,
  centColShift = 0,

```

```

    cexDispl = NULL,
    panel.background.col = "white",
    supLat = list(),
    rotXlab = 0,
    rotYlab = 0,
    cexTit = 1.6,
    cexAxs = NULL,
    cexXlab = 0.7,
    cexYlab = 0.9,
    showValues = FALSE,
    Xtck = 0,
    Ytck = 0,
    silent = FALSE,
    debug = FALSE,
    callFrom = NULL
)

```

Arguments

<code>data</code>	(matrix or data.frame) main input
<code>latticeVersion</code>	(logical) use lattice for plotting (this will include a color-legend)
<code>transp</code>	(logical) decide if data should get transposed (if TRUE the data will be displayed exactly same order as when printing the values as table); set to FALSE to get behaviour prior to version 1.3.0.
<code>NAcol</code>	(character or integer) custom color for NA-values, default is light grey
<code>tit</code>	(character) custom figure title
<code>rowNa</code>	(character) optional custom rownames
<code>colNa</code>	(character) optional custom colnames
<code>xLab</code>	(character, length=1) optional custom text for x-axis label (so far fixed color & fontsize)
<code>yLab</code>	(character, length=1) optional custom text for y-axis label
<code>xLabVal</code>	(character) optional custom text for x-axis 'values' (replaces rownames of data)
<code>yLabVal</code>	(character) optional custom text for y-axis 'values' (replaces colnames of data)
<code>las</code>	(numeric) style of axis labels (see also par); in case of <code>latticeVersion=TRUE</code> this argument will override default <code>rotXlab=0</code> and/or <code>rotYlab=0</code>
<code>col</code>	(character or integer) colors; in lattice version 2 or 3 color-names to define central- and end-points of gradient (starting with color for lowest values, optional central color and color for highest values), default is 60 shades 'RdYlBu' RColorBrewer, if 'heat.colors' use heat.colors in min 15 shades
<code>nColor</code>	(integer, only used in lattice version) number of color-blocks in color gradient (made based on central- and end-points from <code>col</code>)
<code>balanceCol</code>	(logical, only used in lattice version) if TRUE the color-radiant aims to color the value closest to 0 with the center color (from <code>col</code> (default gray)
<code>gridCol</code>	(character, only used in lattice version) define color of grid

<code>gridLty</code>	(integer, only used in lattice version) define line-type of grid (see also <code>lty</code> par)
<code>centColShift</code>	(integer, only used in lattice version) shift central (default grey) color element for negative scale up or down (ie increase or reduce number of color-blocks for negative values), used for correcting automatic scaling rounding issues to ensure the central elements captures 0
<code>cexDispl</code>	(numeric, length=1, only used in lattice version) define cex size for displaying (rounded) values in plot, set to NULL for omitting
<code>panel.background.col</code>	(character, only used in lattice version)
<code>supLat</code>	(list, only used in lattice version) additional arguments/parameters passed to <code>levelplot</code> - currently not activated
<code>rotXlab</code>	(numeric, 0 - 360, lattice version only) control rotation of x-axis values
<code>rotYlab</code>	(numeric, 0 - 360, lattice version only) control rotation of y-axis values
<code>cexTit</code>	(numeric) cex-like expansion factor for title (see also par)
<code>cexAxs</code>	(numeric) cex-like expansion factor for x- and y-axis text/labels (see also par)
<code>cexXlab</code>	(numeric) cex-like expansion factor for x-axis labels (see also par)
<code>cexYlab</code>	(numeric) cex-like expansion factor for y-axis labels (see also par)
<code>showValues</code>	(logical or numeric) optional display of values from data, if contains eg <code>cex=0.5</code> this value will be used as expansion factor (otherwise default to 0.6); if contains eg <code>digits=3</code> this value displayed will be rounded to this number of significant digits (otherwise default to 4)
<code>Xtck</code>	(numeric or logical) expansion factor for length of tick-marks on x-axis (default=0 for no tick-marks)
<code>Ytck</code>	(numeric or logical) expansion factor for length of tick-marks on y-axis
<code>silent</code>	(logical) suppress messages
<code>debug</code>	(logical) additional messages for debugging
<code>callFrom</code>	(character) allow easier tracking of messages produced

Details

This function allows two modes of operation : 1) plotting using standard R -graphics or 2) using the framework of grid- and lattice-graphics (since version 1.2.6). The latter version allows integrating a legend for the color-scale and adding grid-lines, rotation of axis-labels or removing tick-marks. Please note that sometimes the center-color segment may not end up directly with the center of the scale, in this case you may adjust using the argument `centColShift=-1`

Value

This function plots in image (to the current graphical device) similar to as `image` does

See Also

[image](#), for the lattice version [levelplot](#), heatmaps including hierarchical clustering [heatmap](#) or [heatmap.2](#) from package [gplots](#)

Examples

```

imageW(iris[1:40,1:4], transp=FALSE, tit="Iris (head)")
imageW(iris[1:20,1:4], latticeVersion=TRUE, col=c("blue","red"),
       rotXlab=45, yLab="Observation no", tit="Iris (head)")

ma=matrix(round(runif(20),3) ,nrow=4, dimnames=list(letters[1:4],LETTERS[1:5]))
imageW(ma, cexYlab=2, transp=FALSE)
imageW(ma, cexYlab=2, transp=TRUE)
## lattice version
pl1 <- imageW(ma, latticeVersion=TRUE, trans=TRUE, yLab="my y label (Caps)")
plot(pl1)

```

legendHist

Add histogram to existing plot

Description

Add histogram at place of legend using colors from 'colorRamp'.

Usage

```

legendHist(
  x,
  colRamp = NULL,
  location = "bottomright",
  legTit = NULL,
  cex = 0.7,
  srt = 67,
  offS = NULL,
  border = TRUE,
  silent = FALSE,
  debug = FALSE,
  callFrom = NULL
)

```

Arguments

x	(numeric) main input/component of plot
colRamp	(character or integer) set of colors, default is rainbow-like
location	(character) for location of histogram inside existing plot (may be 'br','bl','tl','tr','bottomright', 'bottomleft','topleft','topright')
legTit	(character, length=1) optional title for histogram-insert
cex	(numeric) expansion factor (see also par)
srt	(numeric) angle for histogram text labels (90 will give vertical label) (see also par)

offs	(NULL or numeric, length=5) fine-tuning of where histogram-insert will be placed and how elements therein are distributed (default c(xOff=0.2,yOff=0.25,leftOffS=0.05,upperBarEnd=1.05,txtOff=0.02), 1st and 2nd determine proportion of insert relative to entire plotting region, 3rd defines space left on bottom for text, 4th if bars hit ceiling of insert or proportion to leave, 5th for shifting text towards top when turned other than 90 degrees)
border	(logical) decide if draw gray rectangle or not around legend
silent	(logical) suppress messages
debug	(logical) display additional messages for debugging
callFrom	(character) allow easier tracking of messages produced

Value

This function produces a histogram on the current plotting device

Examples

```
dat <- rnorm(90); plot(dat)
legendHist(dat, col=1:5)
```

MAplotW

MA-plot (Differential Intensity Versus Average Intensity)

Description

This type of plot for display of relative changes versus (mean) absolute abundance is very common in high-throughput biology, see [MA-plot](#).

Usage

```
MAplotW(
  Mvalue,
  Avalue = NULL,
  useComp = 1,
  filtFin = NULL,
  tit = NULL,
  ProjNa = NULL,
  FCthrs = NULL,
  subTxt = NULL,
  grayIncr = TRUE,
  col = NULL,
  pch = 16,
  compNa = NULL,
  batchFig = FALSE,
  cexMa = 1.8,
  cexLa = 1.1,
```

```

    limM = NULL,
    limp = NULL,
    annotColumn = c("SpecType", "GeneName", "EntryName", "Accession", "Species", "Contam"),
    annColor = NULL,
    expFCarrow = FALSE,
    cexPt = NULL,
    cexSub = NULL,
    cexTxLab = 0.7,
    namesNBest = NULL,
    NbestCol = 1,
    colBySpecType = FALSE,
    sortLeg = "descend",
    NaSpecTypeAsContam = TRUE,
    useMar = c(6.2, 4, 4, 2),
    returnData = FALSE,
    callFrom = NULL,
    silent = FALSE,
    debug = FALSE
)

```

Arguments

Mvalue	(numeric, list or MArrayLM-object) main data to plot; if numeric, the content will be used as M-values (and A-values must be provided separately); if list or MArrayLM-object, it must contain list-elements named Mvalue and means to extract all information needed for plotting
Avalue	(numeric, list or data.frame) if NULL it is assumed that A-values can be extracted from argument Mvalue
useComp	(integer) choice of one of multiple comparisons present in Mvalue (if generated using moderTestXgrp())
filtFin	(matrix or logical) The data may get filtered before plotting: If FALSE no filtering will get applied; if matrix of TRUE/FALSE it will be used as optional custom filter, otherwise (if Mvalue if an MArrayLM-object eg from limma) a default filtering based on the filtFin element will be applied
tit	(character) custom title
ProjNa	(character) add project-name to (automatic) title
FCthrs	(numeric) Fold-Change threshold (display as line) give as Fold-change and NOT log2(FC)
subTxt	(character) custom sub-title
grayIncr	(logical) if TRUE, display overlay of points (not exceeding thresholds) as increased shades of gray
col	(character) custom color(s) for points of plot (see also par)
pch	(integer) type of symbol(s) to plot (default=16) (see also par)
compNa	(character) names of groups compared
batchFig	(logical) if TRUE figure title and axes legends will be kept shorter for display on fewer space

cexMa	(numeric) font-size of title, as expansion factor (see also cex in par)
cexLa	(numeric) size of axis-labels, as expansion factor (see also cex in par)
limM	(numeric, length=2) range of axis M-values
limp	(numeric, length=2) range of axis FDR / p-values
annotColumn	(character) column names of annotation to be extracted (only if Mvalue is MArrayLM-object containing matrix \$annot). The first entry (typically 'SpecType') is used for different symbols in figure, the second (typically 'GeneName') is used as preferred text for annotating the best points (if namesNBest allows to do so.)
annColor	(character or integer) colors for specific groups of annotation (only if Mvalue is MArrayLM-object containing matrix \$annot)
expFCarrow	(logical, character or numeric) optional adding arrow for expected fold-change; if TRUE the expected ratio will be extracted from numeric concentration-indications from sample-names if numeric an arrow will be drawn (M-value as 1st position, color of 2nd position of vector).
cexPt	(numeric) size of points, as expansion factor (see also cex in par)
cexSub	(numeric) size of subtitle, as expansion factor (see also cex in par)
cexTxLab	(numeric) size of text-labels for points, as expansion factor (see also cex in par)
namesNBest	(integer or character) for display of labels to points in figure: if 'pass', 'passThr' or 'signif' all points passing thresholds; if numeric (length=1) this number of best points will get labels if the initial object Mvalue contains a list-element called 'annot' the second of the column specified in argument annotColumn will be used as text
NbestCol	(character or integer) colors for text-labels of best points, also used for arrow
colBySpecType	(logical) incase argument Mvalue is MArrayLM-object it is possible to use different color-codes for points passing thresholds based on Mvalue\$annot[, "SpecType"]; use this with multi-species benchmark tests
sortLeg	(character) sorting of 'SpecType' annotation either ascending ('ascend') or descending ('descend'), no sorting if NULL
NaSpecTypeAsContam	(logical) consider lines/proteins with NA in Mvalue\$annot[, "SpecType"] as contaminants (if a 'SpecType' for contaminants already exists)
useMar	(numeric, length=4) custom margins (see also par)
returnData	(logical) optional returning data.frame with (ID, Mvalue, pValue, FDRvalue, passFilt)
callFrom	(character) allow easier tracking of messages produced
silent	(logical) suppress messages
debug	(logical) additional messages for debugging

Details

Using an **MMA-plot** one compares two independent series of measures (ie gene transcript or protein abundance values) of 2 samples/data-sets or the means of 2 groups of replicates. Basically, the plot will display a log-transformed ratio (log-fold-change) of both measures ('Minus'=M) against the

mean value of both mesures ('Average'=A). As with omics-data it is habit to with with log2-data, the ratio/fold-change can be obatined by subtraction this axis is also called 'Minus'=M) Furthermore, output from statistical testing by [moderTest2grp](#) or [moderTestXgrp](#) can be directly read to produce MA-plots, which are mriomarily used for diagnostic purposes. Please note, that plotting a very high number of points in transparency (eg >10000) may take several seconds.

Value

This function plots an MA-plot (to the current graphical device); if returnData=TRUE, a data.frame with (\$ID, \$Mvalue, \$Avalue, \$passFilt) gets returned

See Also

(for PCA) [plotPCAw](#)

Examples

```
library(wrMisc)
set.seed(2005); mat <- matrix(round(runif(600),2), ncol=6)
rownames(mat) <- paste(rep(letters[1:25],each=4), letters[2:26])
MAplotW(mat[,2] -mat[,1], A=rowMeans(mat[,1:2]))

## assume 2 groups with 3 samples each
matMeans <- rowGrpMeans(mat, gr=gl(2,3,labels=LETTERS[3:4]))
MAplotW(M=matMeans[,2] -matMeans[,1], A=rowMeans(mat))

## assume 2 groups with 3 samples each and run moderated t-test (from package 'limma')
tRes <- moderTest2grp(mat, gl(2,3))
MAplotW(tRes$Mval, tRes$Amean)
MAplotW(M=tRes$Mval, A=rowMeans(tRes$means), FCth=1.3)
MAplotW(tRes)
MAplotW(tRes, limM=c(-2,2), FCth=1.3)
```

mouseOverHtmlFile

Create Pouse-Over Interactive Html-Pages (With Links)

Description

This function allows generating html pages with interactive mouse-over to display information for the points of the plot and www-links when clicking based on embedded png file. Basically, an html page will be generated which contains a call to display to an image file specified in pngFileNa and in the body below pixel-coordinated will be given for disply of information at mouse-over and embedded links.

Usage

```

mouseOverHtmlFile(
  myCoor,
  pngFileNa,
  HtmFileNa = NULL,
  mouseOverTxt = NULL,
  displSi = c(800, 600),
  colNa = NULL,
  tit = "",
  myHtmTit = "",
  myComment = NULL,
  textAtStart = NULL,
  textAtEnd = NULL,
  pxDiam = 5,
  addLinks = NULL,
  linkExt = NULL,
  htmlExt = "htm",
  callFrom = NULL,
  silent = FALSE,
  debug = FALSE
)

```

Arguments

<code>myCoor</code>	(matrix or data.frame) with initial x&y coordinates of points for plot; with IDs (1st column !!) & coordinates (2nd & 3rd col), data for mouse-over & link (4th & 5th); NOTE : if 'colNa' NOT given, colnames of 'myCoor' will be inspected & filtered (columns of non-conform names may get lost) !!! Associated with (already existing) figure file 'pngFileNa' and make html page where points may be indicated by mouse-over
<code>pngFileNa</code>	(character, length=1) filename for complementary png figure (must already exist)
<code>HtmFileNa</code>	(character, length=1) filename for html file produced
<code>mouseOverTxt</code>	(character, length=1) text for interactive mouse-over in html, if NULL, will use col specified by 1st 'colNa' or (if NULL) rownames of 'myCoor'
<code>displSi</code>	(integer, length=2) size of image ('pngFileNa') at display in html (width,height), see also par
<code>colNa</code>	(character) if not NULL min length of 3 to custom specify the column-names to be used : 1st for mouse-over and 2nd+3rd for coordinates associated (and optional 4th for links)
<code>tit</code>	(character) title to be displayed on top of figure
<code>myHtmTit</code>	(character) title of Html page; 'htmlExt' .. checking and correcting filename-extension (only main Html page)
<code>myComment</code>	(character) modify comment embedded in html-document
<code>textAtStart</code>	(character) text in html before figure

textAtEnd	(character) text in html after figure
pxDiam	(integer, length=1) diameter for mouse-over tip to appear (single val or vector), simpler version/solution than with 'Tooltip' package
addLinks	(character) for clickable links, either 1) vector of links or 2) single character-chain to be used for pasting to rownames (eg https://www.uniprot.org/uniprot/) or 3) TRUE to check presence of 4th name specified in 'colNa' to be used as columnname from 'myCoor' dominates over eventual presence of 4th name in 'colNa'
linkExt	(character) if specified : links will get specified ending, define as NULL or "" for taking 'addLinks' asIs
htmlExt	(character, length=1) extension used when making html files
callFrom	(character) allow easier tracking of messages produced
silent	(logical) suppress messages
debug	(logical) additional messages for debugging

Details

Basically there are two options for defining the path to the image embedded : 1) Absolute path : In turn you can move the html to different locations, as long as it still can see the png-file the image can be displayed. However, this may not be any more the case when the html file is sent to another person. If the png-file is accessible as url, it should be easily visible. 2) Relative path : The simplest case would be to give only the file-name with no path at all, thus the png-file is supposed to be in the same directory as the html-file. This option is very 'transportable'. Basically the same applies to the clickable links which may be provided. In high-throughput biology one typically points here to data-bases accessible over the internet where urls to specific pages. With UniProt such links can easily be constructed when using protein identifiers as rownames.

Value

This function returns an html-document pointing to a given png-file (pngFileName as relative path, thus the png MUST always remain in the same path/folder as the html file)

See Also

[convertPlotCoordPix](#); use [htmlSpecCharConv](#) to convert special characters for proper html display

Examples

```
## Note, this example writes files to R's tempdir,
## Otherwise, if you simply work in the current directory without specifying paths you'll
## get an html with relative paths, which simply needs the png file in the same path
df1 <- data.frame(id=letters[1:10], x=1:10, y=rep(5,10), mou=paste("point",letters[1:10]),
  link=file.path(tempdir(),paste0(LETTERS[1:10],".html")), stringsAsFactors=FALSE)
## here we'll use R's tempdir, later you may want to choose other locations
pngFile <- file.path(tempdir(),"test01.png")
png(pngFile, width=800, height=600, res=72)
## here we'll just plot a set of horizontal points ...
```

```

plot(df1[,2:3],las=1,main="test01")
dev.off()
## Note : Special characters should be converted for display in html pages during mouse-over
library(wrMisc)
df1$mou <- htmlSpecCharConv(df1$mou)
## Let's add the x- and y-coordinates of the points in pixels to the data.frame
df1 <- cbind(df1, convertPlotCoordPix(x=df1[,2],y=df1[,3],plotD=c(800,600),plotRes=72))
head(df1)
## Now make the html-page allowing to display mouse-over to the png made before
htmFile <- file.path(tempdir(),"test01.html")
mouseOverHtmlFile(df1, pngFile, HtmFileNa=htmFile, pxDiam=15,
  textAtStart="Points in the figure are interactive to mouse-over ...",
  textAtEnd="and/or may contain links")
## We still need to make some toy links
for(i in 1:nrow(df1)) cat(paste0("point no ",i," : ",df1[i,1]," x=",df1[i,2]," y=",
  df1[i,3]), file=df1$link[i])
## Now we are ready to open the html file using any browser
## Not run:
browseURL(htmFile)

## End(Not run)

```

partitionPlot

Make matrix for layout to partition plotting area

Description

This function proposes a matrix for use with [layout](#) to arrange given number of plots to be placed on a page/plotting area. In certain instances the proposed layout may accomodate slightly more plots, eg nFig=5 can not be arranged in 2 or 3 columns without an empty last spot. Portrait (vertical) or lanscape (horizontal) layout proportions can be chosen. The user can also impose a given number of columns.

Usage

```

partitionPlot(
  nFig,
  returnMatr = TRUE,
  horiz = TRUE,
  figNcol = NULL,
  byrow = TRUE,
  silent = TRUE,
  debug = FALSE,
  callFrom = NULL
)

```

Arguments

nFig	(integer) number of figures to be arrages on single plotting surface (ie window or plotting device)
returnMatr	(logical) will return matrix ready for use by layout ; returns vector with nRow and nCol if =FALSE
horiz	(logical) will priviledge horizontal layout if TRUE
figNcol	(integer) optional number of columns
byrow	(logical) toggle if output is in order of rows or columns (equivament to matrix
silent	(logical) suppress messages
debug	(logical) additonal messages for debugging
callFrom	(character) allows easier tracking of messages produced

Value

This function returns a matrix for use with [layout](#) or (if returnMatr=FALSE numeric vector with number of segements in x- an y-axis)

See Also

[layout](#)

Examples

```
partitionPlot(5); partitionPlot(14,horiz=TRUE)
```

plotBy2Groups

Separate and plot data by 2 groups

Description

Plot series of data as membership of 2 different grouping vectors (eg by grp=patient and grp2=age-group).

Usage

```
plotBy2Groups(
  dat,
  grp,
  grp2 = NULL,
  col = NULL,
  pch = NULL,
  tit = NULL,
  cex = 2,
  lwd = 0.5,
  lty = 2,
```

```

yLab = NULL,
cexLab = NULL,
sepLines = FALSE,
silent = FALSE,
debug = FALSE,
callFrom = NULL
)

```

Arguments

<code>dat</code>	(numeric) main data (may contain NA)
<code>grp</code>	(character or factor) grouping of columns of 'dat', eg replicate association
<code>grp2</code>	(character or factor) additional/secondary grouping of columns of 'dat'
<code>col</code>	(character or integer) use custom colors, see also par
<code>pch</code>	(integer) symbol to mark group-center (see also par)
<code>tit</code>	(character) custom title
<code>cex</code>	(numeric) expansion factor for text (see also par)
<code>lwd</code>	(integer) line-width (see also par)
<code>lty</code>	(integer) line-type (see also par)
<code>yLab</code>	(character) custom y-axis label
<code>cexLab</code>	(numeric) expansion factor for labels: 1st value for main groups (<code>grp</code> , eg genotypes), 2nd for detailed text (<code>grp2</code> , eg animal IDs) (see also par)
<code>sepLines</code>	(logical) optional drawing of horizontal lines aiming to separate groups (in analogy to support vectors)
<code>silent</code>	(logical) suppress messages
<code>debug</code>	(logical) additional messages for debugging
<code>callFrom</code>	(character) allow easier tracking of messages produced

Value

This function returns a list with `$annot`, `$abund` for initial/raw abundance values and `$quant` with final normalized quantitations, or returns `data.frame` with `annot` and `quant` if `separateAnnot=FALSE`

See Also

[read.table](#), [normalizeThis](#))

Examples

```

set.seed(2020); rand1 <- round(runif(12),2) +rep(1:3,each=4)
plotBy2Groups(rand1, gl(2,6,labels=LETTERS[5:6]), gl(4,3,labels=letters[1:4]))

```

plotLinReg

*Plot Linear Regression And Confidence Interval Of Regression***Description**

This function provides help to display a series of bivariate points given in 'dat' (multiple data formats possible), to model a linear regression and plot the results. Furthermore, a confidence interval to the regression may be added to the plot, regression parameters get be displayed.

Usage

```
plotLinReg(
  dat,
  indepVarLst = NULL,
  dependVar = NULL,
  cusTxt = NULL,
  regrLty = 1,
  regrLwd = 1,
  regrCol = 1,
  confInt = 0.95,
  confCol = NULL,
  xLab = NULL,
  yLab = NULL,
  xLim = NULL,
  yLim = NULL,
  tit = NULL,
  nSignif = 3,
  col = 1,
  pch = 1,
  silent = FALSE,
  debug = FALSE,
  callFrom = NULL
)
```

Arguments

dat	(numeric, data.frame or list) main data to plot/inspect. If numeric 'dat' will be used as dependent variable (y-data) together with numeric 'indepVarLst' (independent variable); if list, then list-elements indepVarLst and dependVar will be used; if matrix, the the 1st and 2nd colum will be used
indepVarLst	(character) if 'dat' is list, this designs the list element with the explanatory or independent variable (ie the variable used for explaining, typically x-data)
dependVar	(character) if 'dat' is list, this designs the list element with dependent variable (ie the variable to be explained, typically y-data) to test
cusTxt	(character) optional custom text to display in subtitle (instead of p-value to H0: slope.regression=0)

regrLty	(integer) line type for regression
regrLwd	(integer) line width for regression
regrCol	(integer) color of regression-line
confInt	(numeric, between 0 and 1) the probability alpha for the regression interval, if NULL no confidence interval will be plotted/calculated
confCol	(character) (background) color for confidence-interval
xLab	(character) optional custom x-label
yLab	(character) optional custom y-label
xLim	(numeric) custom limit for x-axis (see also par)
yLim	(numeric) custom limit for y-axis (see also par)
tit	(character) optional title
nSignif	(integer) number of significant digits for regression parameters in subtitle of plot
col	(integer or character) custom color for points (choose NULL for not plotting the actual data)
pch	(integer or character) type of symbol for points (see also par)
silent	(logical) suppress messages
debug	(logical) additional messages for debugging
callFrom	(character) allow easier tracking of messages produced

Value

This functions simply plots (to the current graphical device); an invisible list containing \$data, \$lin-Reg, \$confInterval (if calculated) may be returned, too

See Also

[exclExtrValues](#) for decision of potential outliers; [hist](#), [vioplotW](#)

Examples

```
set.seed(2020); dat1 <- rep(1:6,each=2) +runif(12,0,1)
plotLinReg(dat1, gl(6,2))
## extract elements out of list :
li2 <- list(aa=gl(5,2), bb=dat1[1:10])
plotLinReg(li2, indepVarLst="aa", dependVar="bb")
```

plotPCAw

*PCA Plot With Bag-plot To Highlight Centers Of Groups***Description**

This function allows to plot **principal components analysis (PCA)**, with options to show center and potential outliers for each of the groups (columns of data). The main points of this implementation consist in offering bagplots to highlight groups of columns/samples and support to (object-oriented) output from **limma** and **wrProteo**.

Usage

```
plotPCAw(
  dat,
  sampleGrp,
  tit = NULL,
  useSymb = c(21:25, 9:12, 3:4),
  center = TRUE,
  scale. = TRUE,
  useSymb2 = NULL,
  colBase = NULL,
  cexTxt = 1,
  cexSub = 0.6,
  cexAxis = NULL,
  cexNames = NULL,
  cexMain = NULL,
  displBagPl = TRUE,
  outCoef = 2,
  getOutL = FALSE,
  showLegend = TRUE,
  nGrpForMedian = 6,
  pointLabelPar = NULL,
  rowTyName = "genes",
  rotatePC = NULL,
  suplFig = TRUE,
  callFrom = NULL,
  silent = TRUE,
  debug = FALSE
)
```

Arguments

dat (matrix, data.frame, MArrayLM-object or list) data to plot. Note: NA-values cannot be processed - all lines with non-finite data (eg NA) will be omitted ! In case of MArrayLM-object or list dat must contain list-element named 'datImp', 'dat' or 'data'.

sampleGrp	(character or factor) should be factor describing groups of replicates, NAs are not supported
tit	(character) custom title
useSymb	(integer) symbols to use (see also par)
center	(logical or numeric) decide if variables should be shifted to be zero centered, argument passed to prcomp
scale.	(logical or numeric) decide if scaling to obtain unit variance, argument passed to prcomp Alternatively, a vector of length equal the number of columns of x can be supplied. The value is passed to scale.
useSymb2	(integer) symbol to mark group-center (no mark of group-center if default NULL) (equivalent to pch, see also par)
colBase	(character or integer) define custom colors (must be of length corresponding to number of columns from argument dat)
cexTxt	(numeric) expansion factor for text (see also par)
cexSub	(integer) expansion factor for subtitle line text (see also par)
cexAxis	(numeric) size of numeric y-axis labels as cex-expansion factor (see also par)
cexNames	(numeric) size of labels/values on axis as cex-expansion factor (see also par)
cexMain	(numeric) size of title as cex-expansion factor (see also par)x
displBagPl	(logical) if TRUE, show bagPlot (group-center) if >3 points per group otherwise the average-confidence-interval
outCoef	(numeric) parameter for defining outliers, see addBagPlot (equivalent to range in boxplot)
getOutL	(logical) return outlier samples/values
showLegend	(logical or character) toggle to display legend, if character it designates the location within the plot to display the legend ('bottomleft', 'topright', etc..)
nGrpForMedian	(integer) decide if group center should be displayed via its average or median value: If group has less than 'nGrpForMedian' values, the average will be used, otherwise the median; if NULL no group centers will be displayed
pointLabelPar	(character) define formatting for optional labels next to points in main figure (ie PC1 vs PC2); may be TRUE or list containing elements '\$textLabel', '\$textCol', '\$textCex', '\$textOffSet', '\$textAdj' for fine-tuning may also be '\$pointCex' and '\$pointCol' for custom size of points
rowTyName	(character) for subtitle : specify nature of rows (genes, proteins, probesets,...)
rotatePC	(integer) optional rotation (by -1) for figure of the principal components specified by index
suplFig	(logical) to include plots vs 3rd principal component (PC) and Screeplot
callFrom	(character) allow easier tracking of messages produced
silent	(logical) suppress messages
debug	(logical) display additional messages for debugging

Details

One motivation for this implementation of plotting PCA was to provide a convenient way for doing so with of MArrayLM-objects or lists as created by [limma](#) and [wrProteo](#).

Another motivation for this implementation comes from integrating the idea of bag-plots to better visualize different groups of points (if external knowledge allows organizing them as distinct groups) : The main body of data is shown as 'bag-plots' (a bivariate boxplot, see [Bagplot](#)) with different transparent colors to highlight the core part of different groups (if they contain more than 2 values per group). Furthermore, group centers are shown as average or median (see 'nGrpForMedian') with stars & index-number (if <25 groups).

If the data allow for at least 3 principal components, by default the plotting region will be divided in 3 parts: The 1st part for 1st and 2nd principal components, the 2nd part for 2nd and 3rd principal components and the 3rd part to display the variability captured in each principal component. Otherwise one may use `suplFig=FALSE` to restrict on only plotting the 1st and 2nd principal components.

Note : This function uses [prcomp](#) for calculating Eigenvectors and principal components, with default `center=TRUE` and `scale.=FALSE` (different to `princomp()`. which standardizes by default). This way the user has to option to intervene on arguments `center` and `scale.`. However, this should be done with care.

Note: NA-values cannot (by definition) be processed by (any) PCA - all lines with any non-finite values/content (eg NA) will be omitted !

Note : Package [RColorBrewer](#) may be used if available.

For more options with PCA (and related methods) you may also see also the package [FactoMineR](#) which provides a very wide spectrum of possiibiities, in particular for combined numeric and categorical data.

Value

This function make a plot and may return an optional matrix of outlier-data (depending on argument `getOutL`)

See Also

[prcomp](#) (used here for the PCA underneath) , [princomp](#), see the package [FactoMineR](#) for multiple plotting options or ways of combining categorical and numeric data

Examples

```
set.seed(2019); dat1 <- matrix(round(c(rnorm(1000), runif(1000,-0.9,0.9))),2),
  ncol=20, byrow=TRUE) + matrix(rep(rep(1:5,6:2), each=100), ncol=20)
biplot(prcomp(dat1))          # traditional plot
(grp = factor(rep(LETTERS[5:1], 6:2)))
plotPCAw(dat1, grp)
## with some custom settings
plotPCAw(dat1, grp, pointLabelPar=list(textCex=0.7, textCol=2, pointCex=2), suplFig=FALSE)
```

plotW2Leg

x-y plot with 2 legends

Description

This is a modified version of plot for 2-dimensional data, allowing to choose symbols and colors of points according to two additional columns of dat.

Usage

```
plotW2Leg(
  dat,
  useCol = c("logp", "slope", "medAbund", "startFr"),
  tit = NULL,
  subTi = NULL,
  subCex = 0.9,
  pch = 21:25,
  xlim = NULL,
  ylim = NULL,
  xlab = NULL,
  ylab = NULL,
  ablines = NULL,
  legendloc = "topright",
  txtLegend = NULL,
  histLoc = "bottomleft",
  legHiTi = NULL,
  silent = TRUE,
  debug = FALSE,
  callFrom = NULL
)
```

Arguments

dat	(matrix or data.frame) main input
useCol	(character or integer) columns form dat: The 1st and 2nd column are used as x- and y-axis
tit	(character) optional custom title
subTi	(character) optional custom subtitle
subCex	(numeric) cex-like expansion factor for subtitle (see also par)
pch	(integer) symbols to use for plotting (see also par), will be associated to 4th column of useCol
xlim	(numeric, length=2) x- axis limits (see also par)
ylim	(numeric, length=2) y- axis limits (see also par)
xlab	(character) custom x-axis label

ylab	(character) custom x-axis label
ablines	(list) optional horizontal and/or vertical gray dashed guide-lines
legendloc	(character) location of legend (of symbols)
txtLegend	(character) optional label for legend (of symbols)
histLoc	(character) location of histogram-legend (of 3rd column of useCol)
legHiTi	(character) optional title for histogram-legend
silent	(logical) suppress messages
debug	(logical) additional messages for debugging
callFrom	(character) allows easier tracking of messages produced

Value

This function returns graphical output only

See Also

(standard plots) plot from the package base

Examples

```
x1 <- cbind(x=c(2,1:7), y=8:1 +runif(8), grade=rep(1:4,2))
plotW2Leg(x1,useCol=c("x","y","y","grade"))
```

profileAsClu

Plot Profiles According To CLustering

Description

This function was made for visualizing the result of clustering of a numeric vector or clustering along multiple columns of a matrix.

Usage

```
profileAsClu(
  dat,
  clu,
  meanD = NULL,
  tit = NULL,
  col = NULL,
  pch = NULL,
  xlab = NULL,
  ylab = NULL,
  meCol = "grey",
  meLty = 1,
  meLwd = 1,
```

```

    cex = NULL,
    cexTit = NULL,
    legLoc = "bottomleft",
    silent = TRUE,
    debug = FALSE,
    callFrom = NULL
)

```

Arguments

<code>dat</code>	(matrix or data.frame) main input with data to plot as points
<code>clu</code>	(numeric or character) clustering results; if length=1 and character this term will be understood as column-name with cluster-numbers from <code>dat</code>
<code>meanD</code>	(numeric) mean/representative of multiple series for display as lines; if length=1 and character this term will be understood as columnname with cluster-numbers from <code>dat</code>
<code>tit</code>	(character) optional custom title
<code>col</code>	(character) custom colors
<code>pch</code>	(integer) custom plotting symbols (see also par)
<code>xlab</code>	(character) custom x-axis label
<code>ylab</code>	(character) custom y-axis label
<code>meCol</code>	(character) color for (dashed) line of mean/representative values
<code>meLty</code>	(integer) line-type line of mean/representative values (see also <code>lty</code> in par)
<code>meLwd</code>	(numeric) line-width line of mean/representative values (see also <code>lwd</code> in par)
<code>cex</code>	(numeric) cex-like expansion factor (see also par)
<code>cexTit</code>	(numeric) cex-like expansion factor for title (see also par)
<code>legLoc</code>	(character) legend location
<code>silent</code>	(logical) suppress messages
<code>debug</code>	(logical) additional messages for debugging
<code>callFrom</code>	(character) allows easier tracking of messages produced

Details

The data will be plotted like a regular scatter-plot, but some extra space is added to separate clusters and dashed lines highlight cluster-borders. If no mean/representative value is specified, a geometric mean will be calculated along all columns of `dat`. In case `dat` has multiple columns, a legend and a representative (default geometric mean) dashed grey line will be displayed.

Value

This function returns a plot only

Examples

```
set.seed(2020); dat1 <- runif(12)/2 + rep(6:8, each=4)
dat1Cl <- stats::kmeans(dat1, 3)$cluster
dat1Cl <- 5- dat1Cl # bring cluster-numbers in ascending form
dat1Cl[which(dat1Cl >3)] <- 1 # bring cluster-numbers in ascending form
profileAsClu(dat1, clu=dat1Cl)
```

staggerdCountsPlot	<i>Staggered Chart for Ploting Counts to Multiple Leveles of the Threshold used</i>
--------------------	---

Description

The basic idea of this plot is to show how counts data change while shifting a threshold-criterium. At each given threshold the counts are plotted like a staggered bar-chart (or staggered histogram) but without vertical lines to illustrated the almost continuous change from preceedig or following threshold-value.

Usage

```
staggerdCountsPlot(
  roc,
  threColumn = 1,
  countsCol = NULL,
  fixedCountPat = "n.pos.",
  varCountNa = NULL,
  sortAscending = TRUE,
  vertLine = NULL,
  col = NULL,
  tit = NULL,
  logScale = FALSE,
  las.alph = 2,
  displMaxSpec = TRUE,
  silent = FALSE,
  debug = FALSE,
  callFrom = NULL
)
```

Arguments

roc	(numeric matrix or data.frame) main input: one column with thresholds and multiple columns of assoicated count data
threColumn	(integer or character) to specify the column with threshold-data, in typica proteomics benchmark studies this would be 'alph' (for the statistical test threshold)
countsCol	(character of integer, min length=2) choice of column(s) with count-data in 'roc' to be used for display, if not NULL will override alternative search of columns using 'varCountNa' and 'fixedCountPat'

<code>fixedCountPat</code>	(character) optional pattern to help identifying counts-data: if not NULL it will be used as fixed part in column names to get pasted to <code>varCountNa</code> . In proteomics benchmark studies this would typically be 'n.pos.'
<code>varCountNa</code>	(character) alternative way to select the columns from 'roc': searched using grep using column-names containing the text given in argument <code>varCountNa</code> with may be combined with a fixed preceeding part given as argument <code>fixedCountPat</code> . In proteomics benchmark studies this would typically be the species-abbreviations (eg 'H','S','E')
<code>sortAscending</code>	(logical) decide if data should be sorted ascending or descending
<code>vertLine</code>	(numeric) for optional vertical line, typically used to highlight alpha 0.05
<code>col</code>	(character) custom colors, see also par
<code>tit</code>	(character) cutom title
<code>logScale</code>	(logical) display threshld values (x-axis) on log-scale
<code>las.alph</code>	(numeric) orientation of label of alpha-cutoff, see also par
<code>displMaxSpec</code>	(logical) display on right side of figure max count value of contributing group species
<code>silent</code>	(logical) suppress messages
<code>debug</code>	(logical) additonal messages for debugging
<code>callFrom</code>	(character) allows easier tracking of messages produced

Details

Initially this plot was designed for showing the absolute count-data used when constructing roc-curves (eg using the function `summarizeForROC` of package [wrProteo](#)). The main input should furnish the panel of threshold as one column and the coresponding counts data as min 2 columns. The threshold coumns gets specified using the argument `threColumn`, the counts-data may either be specified using argument `countsCol` or be searched using [grep](#) using column-names containing the text given in argument `varCountNa` with may be combined with a fixed preceeding part given as argument `fixedCountPat`.

Investigate count data prepared for plotting ROC curves : cumulative counts plot by species (along different statistical test thresholds). Note : Package [wrProteo](#) may be used to prepare input (matrix of ROC data).

Value

This function produces only a plot

See Also

[ecdf](#), for preparing input to ROC: function `summarizeForROC` in package [wrProteo](#)

Examples

```
set.seed(2019); test1 <- cbind(a=sample.int(n=7,size=50,repl=TRUE),
  b=sample.int(n=11,size=50,repl=TRUE),c=sample.int(n=18,size=50,repl=TRUE))
test1 <- cbind(alph=seq(0,1,length.out=50),a=cumsum(test1[,1]),b=cumsum(test1[,2]),
  c=cumsum(test1[,3]))
staggerdCountsPlot(test1,countsCol=c("a","b","c"))
## example below requires the package wrProteo
```

vioplotW

Violin-Plots Version W

Description

This function allows generating **Violin plots**) using a variety of input formats and offers additional options for colors. Main input may be multiple vectors, a matrix or list of multiple data-elements (entries may be of variable length), individual colors for different sets of data or color-gradients can be specified, and the display of n per set of data was integtated (based on an inspiration from the discussion 'Removing-NAs-from-dataframe-for-use-in-Vioplot' on the forum Nabble). It is also possible to plot pairwise half-violins for easier pairwise-comparisons (using halfViolin="pairwise"). Many arguments are kept similar to **vioplot** (here, the package vioplot is not required/used).

Usage

```
vioplotW(
  x,
  ...,
  finiteOnly = TRUE,
  removeEmpty = FALSE,
  halfViolin = FALSE,
  boxCol = "def",
  hh = NULL,
  xlim = NULL,
  ylim = NULL,
  nameSer = NULL,
  cexLaber = NULL,
  horizontal = FALSE,
  col = "rainbow",
  border = "black",
  xlab = NULL,
  ylab = NULL,
  cexLab = NULL,
  cexAxis = NULL,
  cexMain = NULL,
  lty = 1,
  pointCol = NULL,
  cexPt = NULL,
  dispNcex = 0.7,
```

```

    tit = NULL,
    las = 1,
    lwd = 1,
    rectCol = "black",
    at = 0,
    add = FALSE,
    wex = NULL,
    silent = FALSE,
    debug = FALSE,
    callFrom = NULL
  )

```

Arguments

<code>x</code>	(matrix, list or data.frame) data to plot, or first series of data
<code>...</code>	(numeric) additional sets of data to plot
<code>finiteOnly</code>	(logical) eliminate non-finite elements to avoid potential errors (eg when encountering NA)
<code>removeEmpty</code>	(logical) omit empty series (or less than 4 finite numeric entries) of data from plot
<code>halfViolin</code>	(logical or character) decide with TRUE or FALSE if full or only half of violins should be plotted, if "pairwise" always 2 data-sets will be plotted back-to-back
<code>boxCol</code>	(character) decide if boxplot should be added inside the violin, use "def" for default transparent grey
<code>hh</code>	(numeric, length <4) smoothing parameter (standard deviation to kernel function, if omitted an optimal smoothing parameter is used); equivalent to argument <code>h</code> in package vioplot ; see also sm.density
<code>xlim</code>	(NULL or numeric, length=2) custom limit on x-axis, see also par
<code>ylim</code>	(NULL or numeric, length=2) custom limit on y-axis, see also par
<code>nameSer</code>	(character) custom label for data-sets or columns (length must match number of data-sets)
<code>cexLabe</code>	(numeric) size of individual data-series labels as cex-expansion factor (see also par)
<code>horizontal</code>	(logical) orientation of plot
<code>col</code>	(character or integer) custom colors or gradients like 'rainbow', 'grayscale', 'heat.colors', 'topo.colors', 'Spectral' or 'Paired', or you may use colors made by the package colorRamps
<code>border</code>	(character) custom color for figure border
<code>xlab</code>	(character) custom x-axis label
<code>ylab</code>	(character) custom y-axis label
<code>cexLab</code>	(numeric) size of axis labels/values as cex-expansion factor (see also par)
<code>cexAxis</code>	(numeric) size of numeric y-axis labels as cex-expansion factor (see also par)
<code>cexMain</code>	(numeric) size of title as cex-expansion factor (see also par)

lty	(integer) line-type for linear regression line (see also par)
pointCol	(character or numeric) display of median: color (defaultly white)
cexPt	(numeric) display of median : size of point as cex-expansion factor (see also par)
dispNcex	(numeric or logical) size of text for display of n of numeric values per series of data; default dispN=0.7; if dispN=FALSE or dispN=0 n will not be displayed
tit	(character) custom title to figure
las	(integer) orientation of axis labels (see also par)
lwd	(integer) width of line(s) (see also par)
rectCol	(character) color of rectangle
at	(numeric) custom location of data-series names, ie the points at which tick-marks are to be drawn, will be passed to axis , it's length ust match the number of data-sets
add	(logical) add to existing plot if TRUE
wex	(integer) relative expansion factor of the violin
silent	(logical) suppress messages
debug	(logical) additional messages for debugging
callFrom	(character) allow easier tracking of messages produced

Details

The (relative) width of the density-profiles ('Violins') may be manually adjusted using the parameter `wex` which applies to all profiles drawn.

Note : Arguments have to be given with full names, lazy evaluation of arguments will not work properly with this function (since `'...'` is used to capture additional data-sets). Note : **vioplot** offers better options for plotting formulas

Value

This function plots a figure (to the current graphical device)

See Also

the package **vioplot**, [sm](#) is used for the density estimation

Examples

```
set.seed(2013)
dat6 <- matrix(round(rnorm(300) +3, 1), ncol=6,
  dimnames=list(paste0("li",1:50), letters[19:24]))
vioplotW(dat6)
## variable number of elements (each n is displayed)
dat6b <- apply(dat6, 2, function(x) x[which(x < 5)])
dat6b[[4]] <- dat6b[[4]][dat6b[[4]] < 4]
vioplotW(dat6b, col="Spectral")
vioplotW(dat6b, col="Spectral", halfViolin="pairwise", horizontal=TRUE)
vioplotW(dat6b, col="Spectral", halfViolin="pairwise", horizontal=FALSE)
```

VolcanoPlotW

*Volcano-Plot (Statistical Test Outcome Versus Relative Change)***Description**

This type of plot is very common in high-throughput biology, see [Volcano-plot](#). Basically, Volcano-Plots allows comparing the outcome of a statistical test to the relative change (ie log fold-change, M-value). This version of Volcano-plots supports conveniently results from packages [wrMisc](#) and [wrProteo](#).

Usage

```
VolcanoPlotW(
  Mvalue,
  pValue = NULL,
  useComp = 1,
  filtFin = NULL,
  tit = NULL,
  ProjNa = NULL,
  FCthrs = NULL,
  FdrList = NULL,
  FdrThrs = NULL,
  FdrType = NULL,
  plotAsFdr = FALSE,
  subTxt = NULL,
  grayIncr = TRUE,
  col = NULL,
  pch = 16,
  compNa = NULL,
  batchFig = FALSE,
  cexMa = 1.8,
  cexPt = NULL,
  cexLa = 1.1,
  cexSub = NULL,
  cexTxLab = 0.7,
  limM = NULL,
  limp = NULL,
  annotColumn = c("SpecType", "GeneName", "EntryName", "Accession", "Species", "Contam"),
  annColor = NULL,
  expFCarrow = FALSE,
  namesNBest = NULL,
  NbestCol = 1,
  colBySpecType = FALSE,
  sortLeg = "descend",
  NaSpecTypeAsContam = TRUE,
  useMar = c(6.2, 4, 4, 2),
  returnData = FALSE,
```

```

    callFrom = NULL,
    silent = FALSE,
    debug = FALSE
)

```

Arguments

Mvalue	(MArrayLM-object, numeric or matrix) data to plot; M-values are typically calculated as difference of log ₂ -abundance values and 'pValue' the mean of log ₂ -abundance values; M-values and p-values may be given as 2 columns of a matrix, in this case the argument pValue should remain NULL. One may also furnish MArrayLM-objects created by packages wrProteo (CRAN) or limma (Bioconductor).
pValue	(numeric, list or data.frame) if NULL it is assumed that 2nd column of 'Mvalue' contains the p-values to be used
useComp	(integer, length=1) choice of which of multiple comparisons to present in Mvalue (if generated using moderTestXgrp())
filtFin	(matrix or logical) The data may get filtered before plotting: If FALSE no filtering will get applied; if matrix of TRUE/FALSE it will be used as optional custom filter, otherwise (if Mvalue if an MArrayLM-object eg from limma) a default filtering based on the filtFin element will be applied
tit	(character) custom title (has priority over ProjNa)
ProjNa	(character) will be added to automatic title (if custom title tit was not specified)
FCthrs	(numeric) Fold-Change threshold (display as line) give as Fold-change and NOT log ₂ (FC), default at 1.5, set to NA for omitting
FdrList	(numeric) FDR data (only used when no Mvalue is not list or MArray-LMobject)
FdrThrs	(numeric) FDR threshold (display as line), default at 0.05, set to NA for omitting
FdrType	(character) FDR-type to extract if Mvalue is 'MArrayLM'-object (eg produced by from moderTest2grp etc); if NULL it will search for suitable fields/values in this order : 'FDR', 'BH', 'lfdr' and 'BY'
plotAsFdr	(logical) rather plot using FDR-values (if available) instead of p-Values
subTxt	(character) custom sub-title
grayIncr	(logical) if TRUE, display overlay of points (not exceeding thresholds) as increased shades of gray
col	(character) custom color(s) for points of plot (see also par)
pch	(integer) type of symbol(s) to plot (default=16) (see also par)
compNa	(character) names of groups compared
batchFig	(logical) if TRUE figure title and axes legends will be kept shorter for display on fewer space
cexMa	(numeric) font-size of title, as expansion factor (see also cex in par)
cexPt	(numeric) size of points, as expansion factor (see also cex in par)
cexLa	(numeric) size of axis-labels, as expansion factor (see also cex in par)
cexSub	(numeric) size of subtitle, as expansion factor (see also cex in par)

<code>cexTxLab</code>	(numeric) size of text-labels for points, as expansion factor (see also <code>cex</code> in par)
<code>limM</code>	(numeric, length=2) range of axis M-values
<code>limp</code>	(numeric, length=2) range of axis FDR / p-values
<code>annotColumn</code>	(character) column names of annotation to be extracted (only if <code>Mvalue</code> is <code>MArrayLM</code> -object containing matrix <code>\$annot</code>). The first entry (typically <code>'SpecType'</code>) is used for different symbols in figure, the second (typically <code>'GeneName'</code>) is used as preferred text for annotating the best points (if <code>namesNBest</code> allows to do so.)
<code>annColor</code>	(character or integer) colors for specific groups of annotation (only if <code>Mvalue</code> is <code>MArrayLM</code> -object containing matrix <code>\$annot</code>)
<code>expFCarrow</code>	(logical, character or numeric) optional adding arrow for expected fold-change; if TRUE the expected ratio will be extracted from numeric concentration-indications from sample-names if numeric an arrow will be drawn (M-value as 1st position, color of 2nd position of vector).
<code>namesNBest</code>	(integer or character) for display of labels to points in figure : if <code>namesNBest='pass'</code> , <code>'passThr'</code> or <code>'signif'</code> all points passing thresholds will get labels; if <code>namesNBest=5</code> this number of best points will get labels; if <code>namesNBest="5 each"</code> the best n of significant points on each side will get labels; if the initial object <code>Mvalue</code> contains a list-element called <code>'annot'</code> the second value of argument <code>annotColumn</code> will be used (of available in <code>'annot'</code>) as text
<code>NbestCol</code>	(character or integer) colors for text-labels of best points, also used for arrow
<code>colBySpecType</code>	(logical) incase argument <code>Mvalue</code> is <code>MArrayLM</code> -object it is possible to use different color-codes for points passing thresholds based on <code>Mvalue\$annot[, "SpecType"]</code> ; use this with multi-species benchmark tests
<code>sortLeg</code>	(character) sorting of <code>'SpecType'</code> annotation either ascending (<code>'ascend'</code>) or descending (<code>'descend'</code>), no sorting if NULL
<code>NaSpecTypeAsContam</code>	(logical) consider lines/proteins with NA in <code>Mvalue\$annot[, "SpecType"]</code> as contaminants (if a <code>'SpecType'</code> for contaminants already exists)
<code>useMar</code>	(numeric, length=4) custom margins (see also par)
<code>returnData</code>	(logical) optional returning data.frame with (ID, <code>Mvalue</code> , <code>pValue</code> , <code>FDRvalue</code> , <code>passFilt</code>)
<code>callFrom</code>	(character) allows easier tracking of messages produced
<code>silent</code>	(logical) suppress messages
<code>debug</code>	(logical) additional messages for debugging

Details

In high-throughput biology data are typically already transformed to log2 and thus, the 'M'-values (obtained by subtracting two group means, 'Minus') represent a relative change (ie fold-change). Output from statistical testing by [moderTestXgrp](#) or from package [wrProteo](#) can be directly read to produce Volcano plots. Please note, that plotting a very high number of points (eg >3000) in transparency may take several seconds.

Thresholds for the statistical testing can be set using `FdrThrs` which will be using FDR-values (or `lfdr`-values) from `MArrayLM`-objects or externaly provided `FdrList` Besides, typically thresholds

are set on the M-values, too. Here the threshold from argulent FCthrs will be used. Please note that M-value threshold should be given as `_linear scale_`, ie FCthrs=1.5 will be shown on the log2-axes at 0.58.

Using the argument `plotAsFdr` FDR value will be used for plotting instead of p-values. Since selection of 'significant' hits is usually done based on FDR-values, it makes sense to plot them directly instead of initial p-values. However, FDR values are not fully linear to initial p-values and plateau-phenomena may occur frequently. Thus, resulting plots may appear less spread, so finally drawing p-values (but cutting based on FDR-thresholds) many sometimes result in nicer plots.

The argument `returnData=TRUE` allows exporting directly all data shown on the plot, plus group-means (if available) filtering-status (if available) and symbol used on figure.

Value

This function simply plots an MA-plot (to the current graphical device), if `returnData=TRUE` an optional data.frame with (ID, Mvalue, pValue, FDRvalue, passFilt) can be returned

See Also

(for PCA) [plotPCAw](#)

Examples

```
library(wrMisc)
set.seed(2005); mat <- matrix(round(runif(900),2), ncol=9)
rownames(mat) <- paste0(rep(letters[1:25], each=4), rep(letters[2:26],4))
mat[1:50,4:6] <- mat[1:50,4:6] + rep(c(-1,1)*0.1,25)
mat[3:7,4:9] <- mat[3:7,4:9] + 0.9
mat[11:15,1:6] <- mat[11:15,1:6] - 0.7
## assume 2 groups with 3 samples each
gr3 <- gl(3, 3, labels=c("C","A","B"))
tRes2 <- moderTest2grp(mat[,1:6], gl(2,3), addResults = c("FDR","means"))
# Note: due to the small number of lines only FDR chosen to calculate
VolcanoPlotW(tRes2)
## Add names of points passing custom filters
VolcanoPlotW(tRes2, FCth=1.3, FdrThrs=0.2, namesNBest="passThr")
VolcanoPlotW(tRes2, FCth=1.3, FdrThrs=0.2, namesNBest=3)
VolcanoPlotW(tRes2, FCth=1.3, FdrThrs=0.2, namesNBest="2 each side")

## assume 3 groups with 3 samples each
tRes <- moderTestXgrp(mat, gr3, useComparison="all", addResults = c("FDR","means"))
# Note: due to the small number of lines only FDR chosen to calculate
VolcanoPlotW(tRes)
VolcanoPlotW(tRes, FCth=1.3, FdrThrs=0.2)
VolcanoPlotW(tRes, FCth=1.3, FdrThrs=0.2, useComp=2)
```

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