Package ‘genArise’

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Title Microarray Analysis tool
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Imports graphics, grDevices, methods, stats, tcltk, utils, xtable
Description genArise is an easy to use tool for dual color microarray
data. Its GUI-Tk based environment let any non-experienced
user performs a basic, but not simple, data analysis just
following a wizard. In addition it provides some tools for the
developer.
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Description

Extract **A values** from a Spot.
Usage

a.arise(mySpot)

Arguments

mySpot Spot object for one microarray.

Value

List of A-values. \( \frac{\log(cy3, 2) + \log(cy5, 2)}{2} \)

See Also

m.arise.

Examples

```r
## read the spot from a file and save it in spot
data(Simon)
## Extract A from spot and save in a
a <- a.arise(mySpot = Simon)
```

Description

This function allows to remove from the spot repeated Id’s. Before moving one of the repeated Id’s the function compute the log ratio of both values with the same Id and delete the least absolute value if both of them are positive or negative. In other case delete both observations.

Usage

alter.unique(mySpot)

Arguments

mySpot Spot object for one microarray.

Value

Spot object without duplicates.

Examples

```r
data(Simon)
## filter the spot and save it in f.spot
f.spot <- filter.spot(Simon)
## remove duplicates and save it in u.spot
u.spot <- alter.unique(f.spot)
```
Analysis.window

Description

Auxiliar function of genArise GUI, in this window you can apply operations to original data.

Usage

analysis.window(texto, follow.wizard = FALSE, envir, swap)

Arguments

texto  
follow.wizard  
envir  
swap

Historial project string

Boolean value, if this argument is TRUE, an data analysis are performed

Environment where are the project variables

Is this a swap analysis or an individual analysis

Value

tkwidget

Gene Annotations

Description

Performed an HTML file

Usage

annotations(specie.data, specie, column, symbol, output.file = "annotations.html")

Arguments

specie.data  
specie  
column  
symbol  
output.file

A data frame

Name of specie

Number of column where are the gene name in the data frame

An optional symbol besides GenBank ID

Name of output file

Value

HTML file with link for each spot in data frame
back.gui

Description
Auxiliar function of genArise GUI.

Usage
back.gui(envir)

Arguments
envir Environment where are the project variables

Value
tkwidget

bg.correct

Description
This function use the background data to eliminate unwanted effects in signal. The background correction establish the new Cy3 signal as Cy3 - BgCy3 and the new Cy5 as Cy5 - BgCy5.

Usage
bg.correct(mySpot)

Arguments
mySpot Spot object for one microarray.

Value
Spot object with the background correction done.

Examples
data(Simon)
## background correction and save it in c.spot
c.spot <- bg.correct(Simon)
Classes Defined by this Package

Description

This package defines the following data classes.

- **Spot**  A class used to store spot data with the following attributes: Cy3, Cy5, BgCy3, BgCy5, Ids as they are read by `read.spot` or obtained from a function that return a spot object.
- **DataSet**  A class used to store spot data with the following attributes: Cy3, Cy5, Ids, Z-score.

create.project

Create directorie for the project and its results and graphics

Description

Auxiliar function for genAriseGUI. Create the directory’s hierarchy of the project.

Usage

```r
create.project(project.name, results.file = "Results",
               graphics.file = "Graphics")
```

Arguments

- `project.name`  Project directory name.
- `results.file`  Filename of the project result.
- `graphics.file`  Filename of the project graphics.

Cys.plot

Data Visualization: log2(Cy3) vs log2(Cy5)

Description

This function shows the plot of the values from the log Cy3 against log Cy5 intensities that belongs to an object of the Spot class.

Usage

```r
cys.plot(mySpot, col = "green")
```

Arguments

- `mySpot`  An Spot object
- `col`  Color in which the points of the plot will be shown. This argument must be quoted and the possible values it can take are the same from the color funcion in the R base.
Examples

```r
data(Simon)
cys.plot(Simon)
```

---

**Description**

A simple list-based class for storing red and green channel foreground, z-scores and the Ids.

**Creating Objects from the Class**

Objects can be created by calls of the form `new("DataSet","sets","type")` where `sets` is a list containing Cy3, Cy5, Id and Zscore and `type` is "ri" or "ma". Objects are normally created by `read.spot`.

**Slots/List Components**

This class contains no slots (other than `.Data`), but objects should contain the following list components:

- **Cy5**: numeric matrix containing the red (cy5) foreground intensities. Rows correspond to spots and columns to arrays.
- **Cy3**: numeric matrix containing the green (cy3) foreground intensities.
- **Id**: Ids from all the observations.
- **Zscore**: The result of \((R - \text{mean}) / \text{sd}\) that define an intensity-dependent Z-score threshold to identify differential expression.

All of these matrices should have the same dimensions.

**Methods**

This class inherits directly from class `list` so any operation appropriate for lists will work on objects of this class.

---

**filter.spot**

*Intensity-based filtering of array elements*

**Description**

This function keep only array elements with intensities that are 2 standard deviation above background.

**Usage**

```r
filter.spot(mySpot)
```

**Arguments**

- `mySpot`: Spot object for one microarray.
Value

Array elements with intensities that are 2 standard deviation above background.

References


Examples

data(Simon)
## background correction and save it in c.spot
c.spot <- bg.correct(Simon)
## normalize spot
n.spot <- grid.norm(c.spot, nr = 23, nc = 24)
## filtering the spot
filter.spot(n.spot)

---

**genArise**

**GUI: Graphical User Interface**

Description

This is the main function and display the GUI of genArise.

Usage

genArise()

---

**genArise.init**

Description

Auxiliar function of genArise GUI, this function show a principal menu of genAriseGUI

Usage

genArise.init(envir)

Arguments

envir  Environment where are the project variables

Value

tkwidget
Description

After we finished our slice analysis we get a up-regulated and down-regulated set. This will be the set of study genes for genMege. Given this set, genMerge retrieves functional genomic data for each gene and provides statistical rank scores for over-representation of particular functions in the dataset.

Usage

genMerge(gene.association, description, population.genes, study.genes, output.file = "GenMerge.txt")

Arguments

gene.association
The gene-association file links gene names with a particular datum of information using a shorthand of gene-association IDS

description
The description file contains human-readable description of gene-association IDS

population.genes
Set of all genes detected on a array

study.genes
Set of genes may be those that are up-regulated or down-regulated or both of them.

output.file
The name of output file that includes all results obtained after this analysis.

Note

This function is completely based on GeneMerge from Cristian I. Castillo-Davis and Daniel L. Hartl

References

Cristian I. Castillo-Davis Department of Statistics Harvard University http://www.oeb.harvard.edu/hartl/lab/publications/GeneMerge

get.values

Auxiliary function for post-analysis

Description

This function get values from an DataSet object.

This is just a function for the GUI, and can not be used in the command line.

Usage

get.values(list.values, genes.values, up.down, min.val, max.val)
get.Zscore

Arguments

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>list.values</td>
<td>Zscore values from DataSet object</td>
</tr>
<tr>
<td>genes.values</td>
<td>Ids values from DataSet object</td>
</tr>
<tr>
<td>up.down</td>
<td>If the analysis will be done with &quot;up&quot; or &quot;down&quot; regulated</td>
</tr>
<tr>
<td>min.val</td>
<td>Minimal value of the range</td>
</tr>
<tr>
<td>max.val</td>
<td>Maximal value of the range</td>
</tr>
</tbody>
</table>

Value

An Ids list

Description

Read both files, but only extract the interested columns and create a Spot object.

Usage

```r
get.Zscore( spot, name, Zscore.min=NULL, Zscore.max=NULL, all=FALSE, envir)
```

Arguments

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>spot</td>
<td>a connection or a character string giving the name of the file to read where each column represent the spot components.</td>
</tr>
<tr>
<td>name</td>
<td>a connection or a character string giving the name of the file to read where each column represent the spot components.</td>
</tr>
<tr>
<td>Zscore.min</td>
<td>column that represent Cy3.</td>
</tr>
<tr>
<td>Zscore.max</td>
<td>column that represent Cy5.</td>
</tr>
<tr>
<td>all</td>
<td>column that represent BgCy3.</td>
</tr>
<tr>
<td>envir</td>
<td>Environment where are the genArise variables.</td>
</tr>
</tbody>
</table>

See Also

write.spot.
global.norm  

Global Normalization of Spot

Description
This function normalize R and I values and fit the value of Cy5 from his argument. In this function the normalize algorithm will be applied to all observations to get the lowess factor and then fit Cy5 with this factor. The observations. The observations with values R = 0 are deleted because they have no change in their expression levels.

Usage

```r
global.norm(mySpot)
```

Arguments

- **mySpot**: A spot object

Value

A new spot object but normalized, It means with a different Cy5 that is the result of the fit with the lowess factor.

Examples

```r
data(Simon)
# Background Correction
c.spot <- bg.correct(Simon)
#Normalized data
n.spot <- global.norm(c.spot)
```

graphic.choose  

Graphic choose

Description
This function show the plot of an spot object. This plot are identify with the graphic.type.value

Usage

```r
graphic.choose(spot.object, graphic.type)
```

Arguments

- **spot.object**: An object ob Spot class
- **graphic.type**: representative integer of type graphic will be plot

Value

Plot device
grid.norm  

Normalization by grid of Spot

Description
This function normalize R and I values and fit the value of Cy5 for each grid in the spot that it receives as argument. In this function the dimension of grid is \((\text{meta-row} \times \text{meta-column}).\)

Usage
grid.norm(mySpot, nr, nc)

Arguments

- mySpot  
  Spot object for one microarray.
- nr  
  Total of meta-row.
- nc  
  Total of meta-column.

Value
Spot object with the grid normalization done.

Examples
data(Simon)
## background correction and save it in c.spot
c.spot <- bg.correct(Simon)
## normalization and save it in n.spot
n.spot <- grid.norm(c.spot, 23, 24)

help  

Help of genArise

Description
Display the help of genArise in the GUI. This is just a function for the GUI, and can not be used in the command line.

Usage
help()
i.arise  

Description

Extract I from a Spot.

Usage

i.arise(mySpot)

Arguments

mySpot  
Spot object for one microarray.

Value

List of I-values

See Also

r.arise.

Examples

data(Simon)
## Extract I from spot and save in i
i.arise(Simon)

imageLimma  

Image Plot of Microarray

Description

Plot an image of colours representing the log intensity ratio for each spot on the array. This function can be used to explore whether there are any spatial effects in the data.

Usage

imageLimma(z, row, column, meta.row, meta.column, low = NULL, high = NULL)
Arguments

z numeric vector or array. This vector can contain any spot statistics, such as log intensity ratios, spot sizes or shapes, or t-statistics. Missing values are allowed and will result in blank spots on the image.

row rows in the microarray

column columns in the microarray

meta.row metarows in the microarray

meta.column metacolumns in the microarray

tlow color associated with low values of 'z'. May be specified as a character string such as 'green', 'white' etc, or as a rgb vector in which 'c(1,0,0)' is red, 'c(0,1,0)' is green and 'c(0,0,1)' is blue. The default value is 'green' if 'zerocenter=T' or 'white' if 'zerocenter=F'.

thigh color associated with high values of 'z'. The default value is 'red' if 'zerocenter=T' or 'blue' if 'zerocenter=F'.

Note

This function is based in the imageplot function from limma package.

References


Examples

data(Simon)
spot.data <- attr(Simon, "spotData")
M <- log(spot.data$Cy5, 2) - log(spot.data$Cy3, 2)
imageLimma(z = M, row = 23, column = 24, meta.row = 2, meta.column = 2, low = NULL, high = NULL)

Description

Extract M values from a Spot.

Usage

m.arise(mySpot)

Arguments

mySpot Spot object for one microarray.

Value

List of M-values
ma.plot

See Also

a.arise.

Examples

data(Simon)
## Extract M from spot and save in m
m <- m.arise(Simon)

ma.plot

Data Visualization: M vs. A plot

Description

This function allows to plot M -vs- A in spot.

Usage

ma.plot(mySpot, col = "green")

Arguments

mySpot Spot for one microarray.

col color of points in graphic

Examples

data(Simon)
## plot the signals for spot.
ma.plot(Simon)

make.swap

Swap analysis

Description

Read both files, but only extract the interested columns and create a Spot object.

Usage

make.swap(spot1, spot2, Cy3, Cy5, BgCy3, BgCy5, Id, Symdesc, header = FALSE, is.ifc = FALSE, envir, nr, nc, ...)


Arguments

- `spot1` a connection or a character string giving the name of the file to read where each column represent the spot components.
- `spot2` a connection or a character string giving the name of the file to read where each column represent the spot components.
- `Cy3` column that represent Cy3.
- `Cy5` column that represent Cy5.
- `BgCy3` column that represent BgCy3.
- `BgCy5` column that represent BgCy5.
- `Id` column that represent Id.
- `Symdesc` optional identifier besides the Id column.
- `header` the logical value of the header input file
- `is.ifc` If `is.ifc = TRUE` this experiment was done in the Unit of Microarray from Cellular Physiology Institute.
- `envir` Environment where are the genArise variables.
- `nr` Total of meta-row.
- `nc` Total of meta-column.

See Also

- `write.spot`

meanUnique

Remove Duplicates

Description

This function allows to remove from the spot repeated Id’s. Before moving one of the repeated Id’s the function compute the average of Cy3 intensity and Cy5 intensity.

Usage

meanUnique(mySpot)

Arguments

- `mySpot` Spot object for one microarray.

Value

Spot object without duplicates

Examples

data(Simon)
c.spot <- bg.correct(Simon)
n.spot <- global.norm(c.spot)
f.spot <- filter.spot(n.spot)
meanUnique(f.spot)
**Description**

Call a editor for note about actual experiment

**Usage**

```r
note(envir)
```

**Arguments**

- `envir` Environment where are the experiment variables

---

**old.project**

*Open previous project*

**Description**

Show the information that was obtained from the analysis of a previous project. This is just an auxiliary function for genAriseGUI, and can not be used in the command line.

**Usage**

```r
old.project(project.name, envir, parent)
```

**Arguments**

- `project.name` path of project file (PRJ)
- `envir` Environment where are the genArise variables
- `parent` The parent widget

**Value**

`tkwidget`
post.analysis  Set-combinatorial analysis

Description

This function allows you to perform a set combinatorial analysis between the results previously obtained in different projects. This function is called post.analysis and it is mandatory that you have done the Zscore operation in all the selected projects. It is important to clarify that this function receives a list of files with extension prj as argument and for this reason you can’t use it if the results to compare was not obtained by the genArise GUI.

Usage

post.analysis(values, min.val, max.val, up.down, output)

Arguments

values: A list of projects to compare
min.val: The minimal value of the range
max.val: The maximal value of the range
up.down: If the analysis will be done with "up" or "down" regulated
output: The directory that will contain all the output files

Value

Once obtained the ids list for each project a number of files with extension set are created in a directory. The name of this files consists in a sequence of 0 and 1. The number of digits in the file names is the same to the number of projects in the list passed as argument to the function. There is then, a relation between the number of digits in the file names and the projects. This relation is defined by the position specified in the file order.txt in the same directory you have passed as another argument in the function.

principal  Principal window of genAriseGUI

Description

This function show a window with the information of experiment like name and dimensions, too plot an image of colours representing the log intensity ratio for each spot on the array. This is just an auxiliar function for genAriseGUI, and can not be used in the command line.

Usage

principal(envir, swap)

Arguments

envir: Environment where are the genArise variables
swap: Is this a swap analysis or an individual analysis
**project.select**

**Value**

   tkwidget

---

**File selector**

**Description**

Previous window to post-analysis. In this window you can select one or several files (projects) and arguments to be used by post analysis function.

This is just an auxiliary function for genAriseGUI, and can not be used in the command line.

**Usage**

   projects.select(envir, nombre)

**Arguments**

   envir      Environment where are the genArise variables
   nombre     Name of directory where the post-analysis results will be placed.

**Value**

   tkwidget

---

**r.arise**

**Get R value**

**Description**

Get the R values from an object of the Spot class.

**Usage**

   r.arise(mySpot)

**Arguments**

   mySpot     An object of the Spot class

**Value**

   A vector containing the R value ( \( \log(Cy5/Cy3) \)) for each observation of the spot object.

**See Also**

   i.arise.
read.dataset

Examples

data(Simon)
# Get R-value from an object of the Spot class and save the result
R <- r.arise(Simon)
# Show the R-values

Description

Read all file and extract the interested columns to create a DataSet object (this file contain the zscore with all the genes after the duplicates filtering and makes not distinction between up-regulated and down-regulated. If you want to make this distinction you must write the data with the function write.dataSet, but there is no way to read this files with this function).

Usage

read.dataset(file.name, cy3 = 1, cy5 = 2, ids = 3, symdesc = NULL,
             zscore = 4, type = 6, header = FALSE, sep = "\t")

Arguments

file.name a connection or a character string giving the name of the file to read where each column represent the dataset components.
cy3 column that represent Cy3.
cy5 column that represent Cy5.
ids column that represent Id.
symdesc optional identifier besides Id column.
zscore column that represent the zscore value.
type column that represent if the experiment was performed as R vs I or M vs A.
header the logical value of the header input file
sep the separator in the inputfile

See Also

write.zscore.
read.spot

Read Spot from File

Description
Read all file, but only extract the interested columns and create a Spot object.

Usage
read.spot(file.name, cy3, cy5, bg.cy3, bg.cy5, ids, symdesc, header = FALSE, sep = \"\"\", is.ifc = FALSE, envir)

Arguments
- file.name: a connection or a character string giving the name of the file to read where each column represent the spot components.
- cy3: column that represent Cy3.
- cy5: column that represent Cy5.
- bg.cy3: column that represent BgCy3.
- bg.cy5: column that represent BgCy5.
- ids: column that represent Id.
- symdesc: (optional) identifier besides Id column.
- header: the logical value of the header input file
- sep: the separator in the input file
- is.ifc: If is.ifc = TRUE this experiment was done in the Unit of Microarray from Cellular Physiology Institute.
- envir: Environment where are the genArise variables. You don’t need to specify this argument.

See Also
write.spot.

reset.history
Reset the prj history file

Description
Clean all the operations saved in the prj history file.

Usage
reset.history(history.file, text)

Arguments
- history.file: The name of the prj history file.
- text: The new content of the prj history file.
Value
The history file without operations.

---

**ri.plot**  
*Data Visualization: R vs I*

**Description**
This function allows to plot **R-values** vs **I-values** from a Spot object.

**Usage**
```
ri.plot(mySpot, col = "green")
```

**Arguments**
- `mySpot`: Spot Object
- `col`: Color in which the points of the plot will be shown. This argument must be quoted and the possible values it can ake ares the same from the colors funcion in the R base package.

**See Also**
`colors()`

**Examples**
```
data(Simon)
ri.plot(Simon)
```

---

**set.grid.properties**

**Description**
Auxiliary function for genAriseGUI

**Usage**
```
set.grid.properties(envir, name, nr, nc, nmr, nmc)
```

**Arguments**
- `envir`: Environment where the variables are stored
- `name`: The name of the experiment
- `nr`: Total rows in the array (each row represent a spot)
- `nc`: Total columns in the array
- `nmr`: Total of meta-rows
- `nmc`: Total of meta-columns
**set.history.project**  
*Save the history of a project*

**Description**

Save in the history file each operation performed while the analysis. This is just to get the open this particular project in the future. This is just an auxiliary function for the GUI, and can not be used in the command line.

**Usage**

```r
generate.sheets(project, id.name, data.file)
```

**Arguments**

- `history.file`: The name of the prj history file.
- `id.name`: The name of the operation.
- `data.file`: The file with the results of the operation.

**Value**

The history file with the new performed operation.

---

**set.path.project**  
*set.path.project*

**Description**

Auxiliar function for genAriseGUI

**Usage**

```r
generate.sheets(path, results.file, graphics.file, envir)
```

**Arguments**

- `path`: Project path value
- `results.file`: Name of directory where results file will be
- `graphics.file`: Name of directory where pdf graphics will be
- `envir`: Environment where are the experiment variables
set.project.properties

Description
Auxiliar function for genAriseGUI

Usage
set.project.properties(envir)

Arguments
envir Environment where are the experiment variables

Simon

Dataset: Little fragment of a microarray from IFC UNAM

Description
This structure is a data fragment of a yeast microarray from the Microarrays Unit in IFC UNAM. The original microarray contains 6 meta-rows and 4 meta-columns, however this data just belongs to the first meta-row order in a way of 2 meta-rows and 2 meta-columns.

Usage
data(Simon)

Format
A list that contains 1104 observations, because the dimensions of this example are: 2 meta-rows, 2 meta-columns, 23 rows, 24 columns.

Examples
data(Simon)
#A preview from the chip
datos <- attr(Simon, "spotData")
M <- log(datos$Cy3, 2) - log(datos$Cy5, 2)
imageLimma(M, 23, 24, 2, 2)
Spot-class

single.norm Swap from Files

Description

Read both files, but only extract the interested columns and create a Spot object.

Usage

single.norm(envir)

Arguments

envir Environment where are the genArise variables.

See Also

write.spot.

Spot-class Spot-class

Description

A simple list-based class for storing red and green channel foreground and background intensities for a batch of spotted microarrays and the Ids.

Creating Objects from the Class

Objects can be created by calls of the form new("Spot", spot) where spot is a list. Objects are normally created by read.spot.

Slots/List Components

This class contains no slots (other than .Data), but objects should contain the following list components:

Cy5: numeric matrix containing the red (cy5) foreground intensities. Rows correspond to spots and columns to arrays.
Cy3: numeric matrix containing the green (cy3) foreground intensities.
BgCy5: numeric matrix containing the red (cy5) background intensities.
BgCy3: numeric matrix containing the green background intensities.
Id: Ids from all the observations.

All of these matrices should have the same dimensions.

Methods

This class inherits directly from class list so any operation appropriate for lists will work on objects of this class.
spotUnique  

Replicate filtering

Description

We consider replicate measures of two samples and adjust the log(ratio,2) measures for each gene so that the transformed values are equal. To do this we take the geometric mean. This procedure can be extended to averaging over n replicates.

Usage

spotUnique(mySpot)

Arguments

mySpot  Spot object for one microarray.

Value

Spot object without duplicates

Examples

data(Simon)
c.spot <- bg.correct(Simon)
f.spot <- filter.spot(c.spot)
spotUnique(mySpot = f.spot)

swap.select  

Dye swap files selector

Description

This is just an auxiliary function for genAriseGUI, and cannot be used in the command line.

Usage

swap.select(envir)

Arguments

envir  Environment where are the genArise variables

Value

tkwidget
**trim**

Description

Extract white spaces at the beginning or end of a word.

Usage

trim(word)

Arguments

word A string of characters possibly with white spaces at the beginning or end of the string.

Value

Returns a string of characters, with leading and trailing whitespace omitted.

Examples

```r
trim(" This is a String ")
## return [1] "This is a String"
```

**write.dataSet**

Write the values for observations of an object of DataSet class in an output file. These values are written in columns with the following order: Cy3, Cy5, Cy3 Background, Cy5 Background, Ids and finally the Zscore value. By default this output file has no header.

Usage

write.dataSet(dataSet.spot, fileName, quote = FALSE, col.names = FALSE, row.names = FALSE, Zscore.min = NULL, Zscore.max = NULL, sep = "\t")

Arguments

dataset.spot An object of DataSet class
fileName The name of the output file where the data will be written. This argument must be quoted.
quote If quote = TRUE, all values in the file will be quoted.
col.names If col.names = TRUE, an integer is written in every column as header. By default col.names = FALSE.
row.names If row.names = TRUE will be an extra column that numerates every rows in the file.

Zscore.min The lower value in a range, if Zscore.min = NULL then the file will contain all values bellow Zscore.max

Zscore.max The greater value in a range, if Zscore.max = NULL then file will be contain all values above Zscore.min. Both values, Zscore.min and Zscore.max can not be NULL

sep Character to separate the columns in file. By default sep = "\t".

Examples

data(WT.dataset)
write.dataSet(dataSet.spot = WT.dataset, fileName = "Example.csv", Zscore.min = 1, Zscore.max = 1.5, sep = "\t")

Description

Write the values for observations of an object of Spot class in an output file. This values are written in columns with the follow order: Cy3, Cy5, Cy3 Background, Cy5 Background and finally Ids. By default this file has no header.

Usage

write.spot(spot, fileName, quote = FALSE, sep = "\t", col.names = FALSE, row.names = FALSE)

Arguments

spot An object of Spot class

fileName The name of the output file where the data will be written. This argument must be quoted.

quote If quote = TRUE, all values in the file will be quoted.

sep Character to separate the columns in file. By default sep = "\t".

col.names If col.names = TRUE, an integer is written in every column as header. By default col.names = FALSE.

row.names If row.names = TRUE will be an extra column that numerates every rows in the file. read.spot.

Examples

data(Simon)
write.spot(spot = Simon, fileName = "Example.csv", quote = FALSE, sep = "\t", col.names = FALSE, row.names = FALSE)
write.zscore Write Z-score data

Description
Write the values for observations of an object of DataSet class in an output file. This values are written in columns tab separated with the follow order: Cy3, Cy5, Cy3 Background, Cy5 Background, Ids and finally the z-score value. The header of the output file is the selected type for the z-score (ri or ma).

Usage
write.zscore(dataSet.spot, fileName, sep = "\t")

Arguments
dataset.spot An object of DataSet class
fileName The name of the output file where the data will be written. This argument must be quoted.
sep Character to separate the columns in file. By default sep = "\t".

Examples
data(WT.dataset)
write.zscore(dataSet.spot = WT.dataset, fileName = "Zscore.csv", sep = "\t")

WT.dataset Microarray from the IFC

Description
This data set is a Microarray from the IFC.

Usage
data(WT.dataset)

Format
A vector containing 4036 observations.

Examples
data(WT.dataset)
Zscore.plot(WT.dataset)
Zscore

Z-scores for identifying differential expression

Description

This function identifies differentially expressed genes by calculating an intensity-dependent Z-score. This function uses a sliding window to calculate the mean and standard deviation within a window surrounding each data point, and defines a Z-score where Z measures the number of standard deviations a data point is from the mean.

Usage

Zscore(spot.object,type,window.size)

Arguments

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>spot.object</td>
<td>A spot object</td>
</tr>
<tr>
<td>type</td>
<td>Type of analysis: &quot;ri&quot; is for a R-I analysis and &quot;ma&quot; is for M-A analysis</td>
</tr>
<tr>
<td>window.size</td>
<td>Size of the sliding window</td>
</tr>
</tbody>
</table>

Value

A dataSet object with attributes Cy3, Cy5, Id, Z-score.

Examples

```r
data(Simon)
# Background Correction
c.spot <- bg.correct(Simon)
# Normalized data
n.spot <- grid.norm(c.spot,23,24)
# Filter spot
f.spot <- filter.spot(n.spot)
# Replicate filtering
u.spot <- spotUnique(f.spot)
# Zscore analysis
s.spot <- Zscore(u.spot)
```

Zscore.plot

Z-score Data Visualization: R vs I or M vs A

Description

This function allows to plot R-values vs I-values or M-values vs A-values for identifying differential expression.

Usage

Zscore.plot(dataSet.spot, Zscore.min, Zscore.max, all, col)
### Zscore.points

#### Arguments

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>dataSet.spot</td>
<td>Spot Object</td>
</tr>
<tr>
<td>Zscore.min</td>
<td>The lower value in a range, if Zscore.min = NULL then the file will contain all values below Zscore.max</td>
</tr>
<tr>
<td>Zscore.max</td>
<td>The greater value in a range, if Zscore.max = NULL then file will contain all values above Zscore.min. Both values, Zscore.min and Zscore.max cannot be NULL</td>
</tr>
<tr>
<td>all</td>
<td>Plot all the observations in four sets: $Z &lt; 1$, $1 &lt; Z &lt; 1.5$, $1.5 &lt; Z &lt; 2$, $Z &gt; 2$</td>
</tr>
<tr>
<td>col</td>
<td>Color in which the points of the plot will be shown where only the points from center are plotted. This argument must be quoted and the possible values it can take are the same from the colors function in the R base package.</td>
</tr>
</tbody>
</table>

#### See Also

colors()

#### Examples

```r
data(WT.dataset)
Zscore.plot(WT.dataset, Zscore.min = 1, Zscore.max = 2)
```

---

### Zscore.points

#### Description

This function display the window that show the results after the Z-score. This window allow:

1. Show the plots of the up and down generated with the function Zscore.plot regulated spots in: $Z < 1$ sd $1 < Z < 1.5$ sd $1.5 < Z < 2$ sd $Z > 2$ sd and All the points
2. Save the plots in pdf and save the results in an output file

This is just a function for the GUI, and can not be used in the command line.

#### Usage

```r
Zscore.points(type, text, envir, swap)
```

#### Arguments

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>type</td>
<td>Type of analysis done: &quot;ri&quot; is for a R-I analysis and &quot;ma&quot; is for M-A analysis</td>
</tr>
<tr>
<td>text</td>
<td>The text for the text area of the history of the project</td>
</tr>
<tr>
<td>envir</td>
<td>Environment where the variables are stored</td>
</tr>
<tr>
<td>swap</td>
<td>Is this a swap analysis or an individual analysis</td>
</tr>
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