EexprSet-class

Class "EexprSet" an extended version of the "exprSet" class from "Biobase"

Description

The "EexprSet" class extends the "exprSet" class from the package "Biobase", additional functionality that has been included in this type of object are a "weights" slot, that can be used to mark flagged genes, some generic methods like "drawMA" and "drawHistogram" as well the functions "getM" and "getA" that are quite usefull. The "EexprSet" class can be used for both two color micro arrays and Affymetrix GeneChips. Limma objects can be converted with the createEexprSetFromLimma function.

Warning

This object is deprecated and will be removed in the next version! Use MadbSet instead! MadbSet provides the same functionality and shares the same methods and functions with EexprSet.

Objects from the Class

Objects can be created by calls of the form new("EexprSet", ..., if to this call a "exprSet" is submitted, this is converted to a "EexprSet" object. All of the following arguments can be passed also through the constructor call.

Slots

**type**: Object of class "character" specifying if the data origins from a one color array ("Affymetrix") or from a two color array ("TwoColor"). This argument is optional.

**printer**: Object of class "Layout" same as in the limma package the printer attribute. Defines the number of rows and columns per subgrid as well as the rows and columns of subgrids on the array.

**samples**: Object of class "list" a list containing the sample names. Optional, the names of the chips/arrays are anyway stored in the rownames of the "exprSet".

**array.pairs**: Object of class "numeric" a vector that specifies what columns belong to each other. like the red and green intensities per array. In Affymetrix chips this is a optional parameter, for two color micro arrys this parameter should be defined. e.g with "array.pairs=c(1,-1,2,-2)" for a "EexprSet" that contains data from two arrays (and has therefore 4 expression columns), the number defines what columns belong to each other, the signs define the color.
EexprSet-class

(positive for Red, negative for Green, in the tradition of the M value that is \(\log_2(R) - \log_2(G)\).

By using the "createEexprSetFromLimma" one has not to care about all these arguments, as the function will read all this from the limma object.

weights: Object of class "matrix" a matrix with zeros (flagged features) and ones (not flagged ones). should always have the same number of columns and rows as the "exprMatrix". Optional argument.

exprs: Object of class "exprMatrix" the object that contains the expression information for each gene/feature. In Affymetrix GeneChip experiments it has the same number of columns as chips and the same number of rows as probe sets on each chip. For two color micro arrays it has 2xnumber of array columns (as the red and also the green channel are stored each into one column).

se.exprs: Object of class "exprMatrix" same as "exprs".

phenoData: Object of class "phenoData" look at the documentation of the "exprSet" object.

description: Object of class "characterORMIAME" look at the documentation of the "exprSet" object.

annotation: Object of class "character" look at the documentation of the "exprSet" class.

notes: Object of class "character" look at the documentation of the "exprSet" class.

genes: Object of class "matrix", holds information about the genes that belong to the rows in the exprs slot. This slot is automatically loaded with the genes slot of a limma object (MAList or RGList) when the function toEexprSet is used to transform those objects into a EexprSet object.

Extends

Class "exprSet", directly.

Methods

average See documentation average.

drawBioControls signature(object = "EexprSet"): Draws the expression intensities from the biotynilated control sequences that Affymetrix included in their GeneChips.

initialize internal function called when a new EexprSet is created.

drawHistogram (object, index=NULL, type=NULL, draw.pairs=FALSE, nr.breaks=250, draw.legend=FALSE, col=NULL)

Draws histograms of the intensities of the different chips. index: with index you can specify the channels (intensities) for which a histogram should be drawn. By default a histogram with all channels available will be drawn. type: not used yet... draw.pairs: not used yet... nr.breaks: the number of breaks for the histogram. draw.legend: if a legend should be drawn into the plot. col: the color in which the lines should be drawn. By default for each line an other color will be used.

drawMA (object, array.pairs=NULL, g=NULL, r=NULL, log.values=NULL, one.image=TRUE, draw.flagged=FALSE)

Draws an M versus A plot of the data. By submitting r and g one can specify what chips (or channel) should be used as the red intensities and which as the green channel. array.pairs: a vector with the indexes of the channels to compare. Red signal channels should be specified as positive numbers, green channels as negative ones. When the object was created with the createEexprSetFromLimmaClass this argument is already stored in the object itself. Usually it is better to specify the channels to draw with the r and g arguments. g: the index of the green intensity channel in the exprs matrix. r: the same for the red signal channel. log.values: if the values in the object are already in log2 scale. This argument is optional as the function checks for log scale values anyway. one.image: if all MA plots should be...
drawn into one image, only usefull when array.pairs are specified! draw.flagged: if the
flagged genes should also be drawn into the plot (as orange points). use.weights.from:
index of the channel from which the weights should be used; if for one MA plot only the
weights of one of the two signal channels should be used, otherwise only those genes will be
drawn, that are not flagged bad in both channels. main: the title for the plot. colramp: a
function that takes numbers as input and returns colors (just like the heat.colors or topo.colors).
If submitted the points are colored according to the density of spots in the place of the point.
Requires the "geneplotter" package. col: the color or vector of colors in which the points
should be drawn.

drawPolyAControls signature(object = "EexprSet") : Draws the expression intensi-
ties of the poly A control sequences from Affymetrix.

getA (object, r, g, remove.flagged=FALSE): returns the A values (average intensity, A
= 1/2 * log2(R*G)). To define which columns in the expression matrix represent the green
and which the red channel one can submit the r and g parameters with the index of the red
signals and green signals respectively. For example getA(Eset, r=2, g=1) uses the sec-
ond column of the exprs slot of the Eset object as red signal channel in the formula above
and the first column as green signal channel. It is also possible to submit a numerical vector
with the indizes of the red signal channels as r (for example r=c(2,4)) and the same for
the g parameter (g=c(1,3)). This returns an A values matrix with two
columns, the first with A values using the the 2nd column as red
and 1st column as green channel, the second column of A values was
calculated by using the 4th column as red and the 3rd as green channel.
By setting the parameter \code{remove.flagged} to \code{TRUE} will
give all genes that have a weight of 0 (in the \code{weights} slot
of the \code{EexprSet} object) in one of the signal channels a \code{NA}
value.)

getArrays (object,...): returns the names of the arrays of the EexprSet object submitted.

getM (object, r, g, remove.flagged=FALSE): Same as the getA function, but this func-
tion returns the regulation M (M = log2(R/G)).

getSignalChannels (object,...): returns the signal channel names of the EexprSet object
submitted.

getWeights object): Returns the weights for the single intensities. A weight of 0 means that
the feature was flagged, a weight of 1 means that the signal is ok.

toExprSet (object): Casts the EexprSet object in a expSet object.

loadFromDB (object, connection, name, pk, v=TRUE): loads a formerly saved (with the
function publishToDB) EexprSet object from the database. This method requires the tk-
fiDB package. Arguments: object: a instance of the EexprSet class, submit new("EexprSet")
to create a new one. connection: the database connection to a PostgreSQL database.
name: the experiment name (experiment title) that you want to load from the database. To get
a overview of the available experiments in the database you can call dbGetExperimentInfo(connection).
Pk: optional argument. Useful to load a subset of an experiment from the database. Simply
submit the primary keys from the signal channels (column signal_channels_pk in the
result from the dbGetExperimentInfo function). v: if TRUE additional informations
will be printed to the console.

publishToDB signature(object = "EexprSet") : stores the object into a PostgreSQL
database. Call help(publishToDB) to get more information of this method. This method
requires the tkfiDB package.

writeTable (object, file, mas5calls, include.annotation): writes the expression
values to a tab delimited table. Arguments: object: the object from the type EexprSet
that contains the normalized values. file: the file where the data should be written into.
mas5calls: optional, for MAS5 normalized chips. If submitted, the calls will be included in the output file.

Author(s)
Johannes Rainer

See Also
createEexprSetFromLimma, average

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**Layout-class**

*Microarray grid and print tip layout description object*

**Description**

This object can be used to describe the layout of a microarray (the number of sub grids or the number of spots per sub grid (print tip group)). The description of the array layout is essential for e.g. a print tip normalization method.

**Slots**

- **n.grid.row**: The number of sub grid rows onto the array.
- **n.grid.col**: The number of sub grid columns on the array.
- **n.spot.row**: The number of spot columns per sub grid.
- **n.spot.col**: The number of spot rows per sub grid.

**Methods**

No methods defined with class "Layout" in the signature.

**Author(s)**
Johannes Rainer

**See Also**
MadbSet-class
**MAtoG**

*Calculate the green intensity values from the M and A values given.*

**Description**

*MAtoG* This function calculates the green intensity values if one has only M and A values.

**Usage**

`MAtoG(M, A)`

**Arguments**

- **M**: A vector (or matrix) of M values
- **A**: A vector (or matrix) of A values

**Details**

M values are defined by the formula $M = \log_2(R/G)$ and the A values by $A = \frac{1}{2} \cdot \log_2(R \cdot G)$.

This function simply calculates from the M and A values back to the G (green) intensity values by performing the following calculation: $\sqrt{\left(2^{2A}\right)/2^M}$.

**Author(s)**

Johannes Rainer

**See Also**

*MAtoR*

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**MAtoR**

*Calculate the red intensity values from the M and A values given.*

**Description**

*MAtoR* This function calculates the red intensity values if one has only M and A values.

**Usage**

`MAtoR(M, A)`

**Arguments**

- **M**: A vector (or matrix) of M values
- **A**: A vector (or matrix) of A values

**Details**

M values are defined by the formula $M = \log_2(R/G)$ and the A values by $A = \frac{1}{2} \cdot \log_2(R \cdot G)$.

This function simply calculates from the M and A values back to the R (red) intensity values.
MadbSet-class

Author(s)
Johannes Rainer

See Also
MAtoG

MadbSet-class  
Class "MadbSet" an extended version of the "ExpressionSet" class from "Biobase"

Description
The "MadbSet" class directly extends the "ExpressionSet" class from the package "Biobase", additional functionality that has been included in this type of object are a "weights" slot, that can be used to mark flagged genes, some generic methods like "drawMA" and "drawHistogram" as well the functions "getM" and "getA" that are quite usefull. The "MadbSet" class can be used for both two color micro arrays and Affymetrix GeneChips. Limma objects (RGList or MAList) or ExpressionSet objects can be converted with the newMadbSet function

Objects from the Class
Objects can be created by calls of the form new("MadbSet", ...) or using the function newMadbSet. The use of the newMadbSet function is preferred, since it allows to convert other objects to a MadbSet object.

Slots
- **type**: Object of class "character" specifying if the data origins from a one color array ("Affymetrix") or from a two color array ("TwoColor"). This argument is optional.
- **printer**: Object of class "Layout" same as in the limma package the printer attribute. Defines the number of rows and columns per subgrid as well as the rows and columns of subgrids on the array.
- **samples**: Object of class "list" a list containing the sample names. Optional parameter.
- **array.pairs**: Object of class "numeric" a vector that specifies what columns belong to each other, like the red and green intensities per array. In Affymetrix chips this is a optional parameter, for two color micro arrys this parameter should be defined. e.g with "array.pairs=c(1,-1,2,-2)" for a "MadbSet" that contains data from two arrays (and has therefore 4 expression columns), the number defines what columns belong to each other, the signs define the color (positive for Red, negative for Green, in the tradition of the M value that is $\log_2(R) - \log_2(G)$).
- **weights**: Object of class "matrix" a matrix with zeros (flagged features) and ones (not flagged ones). should always have the same number of columns and rows as the "exprMatrix". Optional argument.
- **exprs**: Inherited from ExpressionSet, for more information refer to the ExpressionSet documentation.
- **se.exprs**: Inherited from ExpressionSet, for more information refer to the ExpressionSet documentation.
- **phenoData**: Inherited from ExpressionSet, for more information refer to the ExpressionSet documentation.
annotation: Inherited from ExpressionSet, for more information refer to the ExpressionSet documentation.

genes: Object of class "matrix", holds information about the genes that belong to the rows in the exprs slot. This slot is automatically loaded with the genes slot of a limma object (MAList or RGList) when the function newMadbSet is used to transform those objects into a MadbSet.

Extends

Class "ExpressionSet", directly.

Methods

average See documentation average.

drawHistogram (object,index=NULL,type=NULL,draw.pairs=FALSE,nr.breaks=250,draw.legend=FALSE,col=NULL)

Draws histograms of the intensities of the different chips. index: with index you can specify the channels (intensities) for which a histogram should be drawn. By default a histogram with all channels available will be drawn. type: not used yet... draw.pairs: not used yet... nr.breaks: the number of breaks for the histogram. draw.legend: if a legend should be drawn into the plot. col: the color in which the lines should be drawn. By default for each line an other color will be used.

drawMA (object,array.pairs=NULL,g=NULL,r=NULL,log.values=NULL,one.image=TRUE,draw.flagged=FALSE,use.weights.from=NULL,main=NULL,colramp=NULL,col=NULL,...)

Draws an M versus A plot of the data. By submitting r and g one can specify what chips (or channel) should be used as the red intensities and which as the green channel. r and g can either be the index of the respective sample in the ExpressionMatrix (exprs slot), or the name of the sample (i.e. the Affymetrix cel file name). array.pairs: a vector with the indizes of the channels to compare. Red signal channels should be specified as positive numbers, green channels as negative ones. When the object was created with the newMadbSet this argument is already stored in the object itself. Usually it is better to specify the channels to draw with the r and g arguments. g: the index of the green intensity channel in the exprs matrix (or the name of the sample/array). r: the same for the red signal channel. log.values: if the values in the object are already in log2 scale. This argument is optional as the function checks for log scale values anyway. one.image: if all MA plots should be drawn into one image, only usefull when array.pairs are specified! draw.flagged: if the flagged genes should also be drawn into the plot (as orange points). use.weights.from: index of the channel from which the weights should be used; if for one MA plot only the weights of one of the two signal channels should be used, otherwise only those genes will be drawn, that are not flagged bad in both channels. main: the title for the plot. colramp: a function that takes numbers as input and returns colors (just like the heat.colors or topo.colors). If submitted, the points are colored according to the density of spots in the place of the point. Requires the geneplotter package. col: the color or vector of colors in which the points should be drawn.

getA (object,r,g,remove.flagged=FALSE): returns the A values (average intensity, A = 1/2 * log2(R*G)). To define which columns in the expression matrix represent the green and which the red channel one can submit the r and g parameters with the index of the red signals and green signals respectively (or the names of the columns of the samples in the exprs slot). For example getA(Eset,r=2,g=1) uses the second column of the exprs slot of the Eset object as red signal channel in the formula above and the first column as green signal channel. It is also possible to submit a numerical vector with the indizes of the red signal channels as r (for example r=c(2,4)) and the same for the g parameter (g=c(1,3). This returns an A values matrix with two columns, the first with A values using the the 2nd column as red and 1st column as green channel, the second column of A values was calculated by using the 4th column
as red and the 3rd as green channel. By setting the parameter \code{remove.flagged} to \code{TRUE} will give all genes that have a weight of 0 (in the \code{weights} slot of the \code{MdbSet} object) in one of the signal channels a \code{NA} value.)

\itemize

\item \code{getArrays \(\text{object, \ldots}\)}: returns the names of the arrays of the MdbSet object submitted.

\item \code{getM \(\text{object, r, g, remove.flagged=FALSE}\)}: Same as the getA function, but this function returns the regulation (log2 ratio) values (\(M = \log2(R/G)\)).

\item \code{getSignalChannels \(\text{object, \ldots}\)}: returns the signal channel names of the MdbSet object submitted.

\item \code{getWeights \(\text{object}\)}: Returns the weights for the single intensities. A weight of 0 means that the feature was flagged, a weight of 1 means that the signal is ok.

\item \code{loadFromDB \(\text{object, connection, name, pk, v=TRUE}\)}: loads a previously saved (with the function \code{publishToDB}) MdbSet object from the database. This method requires the \pkg{pgUtils} package. Arguments: \code{object}: a instance of the MdbSet class, submit \code{newMdbSet()} to create a new one. \code{connection}: the database connection to a PostgreSQL database. \code{name}: the experiment name (experiment title) that you want to load from the database. To get a overview of the available experiments in the database you can call \code{dbGetExperimentInfo\(\text{connection}\)}. \code{pk}: optional argument. Useful to load a subset of an experiment from the database. Simply submit the primary keys from the signal channels (column \code{signal_channels_pk} in the result from the \code{dbGetExperimentInfo} function). \code{v}: if \code{TRUE} additional informations will be printed to the console.

\item \code{publishToDB \(\text{signature(object = "MdbSet"}\)}: stores the object into a PostgreSQL database. Call \code{help\(\text{publishToDB}\)} to get more information of this method. This method requires the \pkg{pgUtils} package.

\item \code{writeTable \(\text{object, file, mas5calls, include.annotation}\)}: writes the expression values to a tab delimited table. Arguments: \code{object}: the object from the type MdbSet that contains the normalized values. \code{file}: the file where the data should be written into. \code{mas5calls}: optional, for MAS5 normalized chips. If submitted, the calls will be included in the output file.

\item \textbf{Note}  
For further informations and examples refer to the package vignette (documentation), which can be opened using \code{openMdbVignette}.

\item \textbf{Author(s)}  
Johannes Rainer

\item \textbf{See Also}  
\code{average}
Sample-class

Class "Sample"

Description

In this object information about the sample that was hybridized onto a micro array can be stored into.

Slots

name: The name of the sample.
genus: The genus of the sample.
species: The species.
line: The cell line from which the sample origins.
individual: The patient ID if the sample was extracted from a patient.
sample.provider: The sample provider.
sex: Sample sex.
age: Age (of the individual).
developmental.state: The developmental state.
tissue: The tissue the sample comes from.
celltype: Sample celltype.
genetic.modifications: Genetic modifications of the sample.
disease.state: Disease state.
ref.to.clinical.data: References to clinical data.
growth.conditions: Sample growth conditions.
in.vivo.treatments: Sample in vivo treatments.
tissue.harvesting.method: Tissue harvesting method.
extract.method: Sample extraction method.
molecule.type: Molecule type.
amplification: Sample amplification.
amount: Sample amount.
treatment: Sample treatment.
exposure.time: Sample treatment exposure time.
description: Sample description.

Methods

createNewDBTable signature(object = "Sample"): creates a new database table in which objects of the type sample can be stored into.

getContentMatrix signature(object = "Sample"): returns the content of the individual slots of the sample object as a character matrix.

getPK signature(object = "Sample"): checks if a sample with the same attributes exists already in the database and returns its primary key or it inserts the sample in the database and returns the primary key of the newly inserted sample.

loadFromDB signature(object = "Sample"): loads the slots of the sample object with the attributes stored in the database.
SignalChannel-class

Author(s)

Johannes Rainer

See Also

MadbSet-class loadFromDB publishToDB

SignalChannel-class

Microarray signal channel description

Description

With this object it is possible to describe the signal channels of a microarray experiment. This object establishes the linkage between the sample that was hybridized onto a specific signal channel of a microarray (signal channels correspond to the columns of the `exprs` slot of a MadbSet (or ExpressionSet)). For further informations and examples refer to the package vignette (which can be opened using the `openMadbVignette`).

Slots

- **hyb.date**: The date when the sample was hybridized onto the array.
- **label.date**: The date when the sample was labeled.
- **label.incorporation**: The method that was used to label the RNA.
- **color**: A description of the color that was used.
- **description**: A description.
- **array.index**: The index of the corresponding array in the MadbSet object.
- **sample.index**: The index of the corresponding sample in the `samples` slot of the MadbSet object.
- **array.name**: The micro array name or ID.

Methods

- **createNewDBTable** signature(object = "SignalChannel"): creates a new database table that can be used to store objects from the type SignalChannel into.
- **getContentMatrix** signature(object = "SignalChannel"): returns the content of the slots of the SignalChannel object as a character matrix.
- **show** signature(object = "SignalChannel"): Displays the objects content.

Author(s)

Johannes Rainer

See Also

MadbSet-class, Sample-class, loadFromDB, publishToDB, getSignalChannels, getArrays
**Description**

This class holds information about the similarity between a vector and another one (or the rows or columns of a numerical matrix). An instance of this class will be returned as the result of the `dbSearchSimilarPattern` function. This object holds then information about the similarity (calculated with one of the different distance measurement functions (pearson, euclidian, spearman)) between a template gene pattern and a set of other gene expression or regulation patterns.

**Objects from the Class**

The function `dbSearchSimilarPattern` returns an instance of this class.

**Slots**

- **distances**: Object of class "numeric", this vector represents the distance (similarity) between numerical vectors.
- **distance.metric**: Object of class "character", the distance metric used to calculate the similarity.
- **data**: Object of class "matrix", the data matrix containing the values with which the template was compared.
- **template**: Object of class "numeric", the template vector.
- **template.id**: Object of class "character", the id of the template (if no custom template was used).

**Methods**

- `getData` signature(object = "Similarity") returns the data matrix.
- `getDistances` signature(object = "Similarity") returns the distances.
- `plot` signature(x = "Similarity") plots the template and the 5 top matching vectors (see `plotSimilarity` for more options).
- `print` signature(x = "Similarity") generic print function for the class Similarity.
- `sort` signature(x = "Similarity") sorts the data ascending or descending according to the distance.

**Author(s)**

Johannes Rainer

**See Also**

`dbSearchSimilarPattern` `plotSimilarity`
**arrowProgress**  
*Progress bar with an arrow*

**Description**

`arrowProgress` displays a simple progress bar with an arrow.

**Usage**

```r
arrowProgress(percent, steps=20, label=TRUE)
```

**Arguments**

- `percent`  
The progress of an action in percent.

- `steps`  
The number of steps of the progress bar. Setting the steps to 20 means that each 5 percent to progress bar increases.

- `label`  
if the actual percentage should be written as a number too.

**Details**

This function can be used to display the progress of functions that may take long time.

**Author(s)**

Johannes Rainer

**See Also**

`progress`

**Examples**

```r
arrowProgress(percent=70, steps=40)
```

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**average**  
*Average signal channels of a microarray experiment*

**Description**

`average` allows to average replicated signal channels (or replicated features within a signal channel) of a MadbSet object.

**Usage**

```r
average(object, average.which, log.scale=TRUE, method, array.names=NULL, v=TRUE, average.genes=TRUE, exclude.flagged=TRUE, only.good.spots=FALSE, ...)
```
Arguments

object
The MadbSet that contains the signal channels that should be averaged.

average.which
A numerical vector defining which columns of the exprs (which signal channels) slot of the object should be averaged. e.g. if the exprs slot contains 4 column and the columns 1 and 3 respectively 2 and 4 contain the expression values of replicated samples, c(1,2,1,2) has to be submitted to average the replicated samples.

log.scale
If the expression values should be log2 transformed before averaging.

method
The averaging method (one of c("mean","median","tukey.biweight")).

array.names
The names for the averaged signal channels (the colnames of the exprs slot in the returned EexprSet object).

v
Display some verbose messages during the execution of the function.

average.genes
If replicated spots / genes per signal channel should also be averaged (must have the same ID!).

exclude.flagged
If features with a weight of 0 (in the weights slot, means feature was flagged bad by the scanning software) should not be used to calculate the average across replicates. Could be problematic when doing a dye swap normalization with only two arrays with this function and some features are flagged bad on one and not flagged bad on the other array (function will use only the value from the not flagged feature in this case). In this case it could be better submitting exclude.flagged=FALSE.

only.good.spots
If only those features should be averaged across replicated arrays, that are not flagged bad in all arrays (Only for averaging across arrays, not averaging within arrays!).

Details

This function allows to average measured intensities of replicated microarrays (technical replicates). If the weights slot of the MadbSet object is not NULL and the exclude.flagged parameter is set TRUE, all genes that have weight of 0 (e.g. were flagged as bad spots by the scanning software) are excluded from the calculation of the average expression values (see description of the attribute exclude.flagged for more information).

Value

A MadbSet object that contains the averaged expression values for replicated microarrays.

Author(s)

Johannes Rainer

See Also

MadbSet-class
calculateSimilarity

Calculate similarities (distances) between a vector and the rows (columns) of a matrix

Description

calculateSimilarity calculates the similarity (distance) between the submitted numeric vector and all rows respectively columns of a numerical matrix using the specified similarity (distance) measurement method.

Usage

```r
calculateSimilarity(vector, matrix, orientation = "h", distance.fun = distance.euclidian, include.values = FALSE)
```

Arguments

- **vector**: The numerical vector for which the similarities should be calculated.
- **matrix**: Numerical matrix. Similarities are calculated for the input vector (vector parameter) with all rows (or columns, depending on the orientation parameter) of this matrix.
- **orientation**: If the vector should be compared with the rows ("h") or columns ("v") of the matrix.
- **distance.fun**: Function to calculate the similarity.
- **include.values**: Include input values in the result. If FALSE only a vector with the distances will be returned.

Details

This function is a simple and quick way to calculate similarities of a numerical vector and the columns (or rows) of a numerical matrix. `calculateSimilarity` can be used for example to search for genes with a common (similar) expression or regulation pattern than a input gene.

Author(s)

Johannes Rainer

See Also

distance.pearson, distance.euclidian, distance.spearman, dbSearchSimilarPattern

Examples

```r
In <- runif(5)
Testset <- rbind(a=runif(5, min=-1, max=2), b=runif(5, min=0, max=2), c=runif(5))
In
Testset
calculateSimilarity(vector=In, matrix=Testset, orientation="h")
```
**checkForDifferentAnnotation**

*Detect gene annotation differences*

**Description**

`checkForDifferentAnnotation` compares the gene annotation in the `annotation` database table with the gene annotation provided by the specified R annotation package. The IDs which differ in the annotation are returned as result.

**Usage**

```
checkForDifferentAnnotation(con, chip, check.columns=c("GenBank","UniGene","LocusLink"), v=TRUE)
```

**Arguments**

- `con`: The connection object to the database (Connections can be opened with the `dbConnect` function from the `RdbiPgSQL` package).
- `chip`: The chip for which the annotation should be checked. At the moment only Affymetrix chips are supported (e.g., `hgu133plus2`).
- `check.columns`: The identifiers that should be compared for the genes (Affymetrix probe sets).
- `v`: if some additional informations should be written to the console.

**Details**

This function compares the annotation for the genes (or Affymetrix probe set IDs) that are available in a database table called `annotation` and the corresponding R annotation package (like the `hgu133plus2` package). The annotation IDs specified by the `check.columns` attribute from the two different sources are compared for each gene and if they differ the gene and the different annotations are returned.

**Author(s)**

Johannes Rainer

**See Also**

`dbUpdateAnnotation dbGetAnnotation`
createDirs  

Create directories

Description
createDirs This function creates directories.

Usage
createDirs(dir)

Arguments

dir  The directories. As file delimiter, also in Windows, the Unix file delimiter “/” should be used!

Details
This function creates directories and subdirectories. If for example as dir the string “doc/tables/” is submited, the function creates the directory “doc”, then the directory “tables” into the “doc” directory.

Author(s)
Johannes Rainer

See Also
createFile

createEexprSetFromLimma

Changing a RGList or MAList into a object of the type EexprSet

Description
createEexprSetFromLimma This function creates a new object of the type EexprSet from a data object of the limma package. So the standard methods that are available for the EexprSet object are also available to this type of data.

Usage
createEexprSetFromLimma(object)

Arguments

object  The object (of the type RGList or MAList object from limma) to be converted.
createFile

Details

For two color micro array data, like the data objects in limma represent, the array.pairs attribute in the EexprSet object will contain information about what column corresponds to the red intensities and green intensities respectively of which array. So by calling for example the drawMA method the right intensities will be used to create the MA plot. Weights will also be set in the EexprSet object, as well as the printer layout if set in the limma object. The only thing that will be missing by now is the annotation (the $genes) object. This should be fixed soon...

warning

The EexprSet-class is deprecated! Use MadbSet instead! This function is replaced by the newMadbSet function.

Author(s)

Johannes Rainer

See Also

EexprSet-class, drawMA MadbSet newMadbSet

createFile

Create a file and all needed directories

Description

createFile This function creates a new file just like the file.create function from R, but if needed it creates also directories.

Usage

createFile(file)

Arguments

file The file name.

Details

This function creates a file also in a subdirectory, and creates this directory also if needed. If for example as file the string “doc/tables/testtable.txt” is submitted, the function creates the directory “doc”, then the directory “tables” into the “doc” directory and finally the file “testtable.txt” in this last sub directory. As file delimiter the “/” has always to be used, also in Windows!

Author(s)

Johannes Rainer

See Also

createDirs
createJOINQuery  

Create a SQL query that joins two or more tables

Description

This function creates SQL query strings that allow to join all available tables from the maDB database.

Usage

createJOINQuery(join, with, select = "*", r = TRUE)

Arguments

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>join</td>
<td>One of the two database tables that should be joined.</td>
</tr>
<tr>
<td>with</td>
<td>The database table with which the first one should be joined.</td>
</tr>
<tr>
<td>select</td>
<td>The attributes (column names) of the tables that should be returned. By default every column will be returned.</td>
</tr>
<tr>
<td>r</td>
<td>Attribute for joining the comparisons table with any other table. If r=TRUE the entries of the comparisons table will be joined with the other table using the information for the red signal channel, if r=FALSE the informtion for the green signal channel will be used.</td>
</tr>
</tbody>
</table>

Details

This function eases the usage of the various database tables of a maDB database. The list of tables that can be joined are: comparisons, signal_channels, arrays, samples and experiments.

Value

A string that can be used in the dbSendQuery (package RdbiPgSQL) function to retrieve the data.

Author(s)

Johannes Rainer

See Also

dbGetComparisons

Examples

```r
## join the comparison table with the samples table
createJOINQuery(join="comparisons", with="samples")
```
**createSampleFromTable**

_create a new Sample object using data from a matrix_

**Description**

createSampleFromTable This function creates a new instance from the class Sample using the data in the matrix submitted as attribute. The column names of the matrix should correspond to the attribute names (slot names) of the Sample class. All "_" in the column names are replaced by a dot (for example for the slot exposure.time of the Sample class the table should have a column named “exposure_time”).

**Usage**

createSampleFromTable(table)

**Arguments**

- **table**
  
The data frame/matrix that contains the values with which the new Sample object should be filled.

**Details**

This function a new Sample object filling its slots with the values of the data table submitted.

**Author(s)**

Johannes Rainer

**See Also**

Sample-class

**dbCalculateRegulations**

_Calculate regulation values from expression values in the database_

**Description**

dbCalculateRegulations calculates regulation values (M values, log2 fold change values) from expression values retrieved from the database and inserts these regulation values in the according database table (database tables comparisons and regulation_values, see the vignette for more information (openMadbVignette)).

**Usage**

dbCalculateRegulations(Con, exp.title, comparisons, v=TRUE)
Arguments

Con                  The connection to the database (see dbConnect from the RdbiPgSQL package).

exp.title            The tile of the microarray experiment (data set) for which the regulation values should be calculated. Note that it is only possible to calculate regulation values for comparisons of arrays within a microarray experiment, which means that this regulation values can only be calculated for two color arrays or Affymetrix GeneChips which were normalized together.

comparisons          A list of comparisons for which M and A values should be calculated. To calculate regulation values for the first three chips of an experiment (comparing the expression values of the features/probe sets of the second signal channel (array) with those of the first (control) and of the third chip to those of the first) submit list(c(2,1),c(3,1)). Use the function dbGetExperimentInfo to get information of the arrays/signal channels of a experiment and the according index of the signal channels in this experiment.

v                    If TRUE the progress of the calculation is shown using a progress bar.

Details

This function allows to calculate regulation values comparing expression values from two signal channels of a microarray experiment (dataset) in the maDB database. The according comparisons will be inserted into a database table called comparisons whichs attribute r_signal_channel links to the signal channel that was used as sample and whichs attribute g_signal_channel links to the signal channel that was used as control sample. The regulation values are calculated using the formula \( M = r - g \) and \( A = 0.5 \times (r + g) \) where \( r \) and \( g \) are the expression values in log2 scale. The regulation values (M and A values) are inserted into a database table called regulation_values. Regulation values can be fetched from the database using the getMDB function. The function dbGetComparisons can be used to get informations which samples were compared in the comparisons in the database.

Author(s)

Johannes Rainer

See Also

dbGetExperimentInfo dbGetComparisons

dbGetComparisons  Get a list of all comparisons from the database

Description

This function can be used to get all available information about comparisons that are stored in the database (i.e. which samples/signal channels are compared in which comparison).

Usage

dbGetComparisons(con, exp.title = NULL, join.tables = c("signal_channels", "samples", "arrays", "experiments"))
**dbGetGeneRegulationRanking**

**Arguments**

- **con**: The connection to the database.
- **exp.title**: Get the comparisons that were created within a specific micro array experiment that was saved in the database. If not submitted all comparisons will be returned. To get the information about the experiments stored in the database, call `dbGetExperimentInfo`.
- **join.tables**: The tables with which the comparisons will be joined. In the default case (which means join to all tables) all information concerning the comparisons (which experiment, sample, array ... was used) will be returned.

**Value**

The function returns a table with rows corresponding to the comparisons and columns to the attributes of the different tables (column names ending in “red” belong to the red signal channel and column names ending in “green” to the green respectively).

**Note**

For further information and examples refer to the package vignette (which can be opened using `openMadbVignette`).

**Author(s)**

Johannes Rainer

**See Also**

- `dbGetExperimentInfo`, `createJOINQuery`

---

**dbGetGeneRegulationRanking**

*Rank genes according to the number of comparisons they are regulated.*

**Description**

This function can be used to generate a ranking list for genes that contains the number of comparisons (from a selected set of comparisons in the database) the gene was regulated (where regulation can be for example be defined as an M value bigger than 1 or smaller -1). The ranking can be restricted to a subset of genes and comparisons. Note that the comparisons have to be created in the database (from expression values using the `dbCalculateRegulations` method). By default the function maps first the submitted ids to UniGene IDs and calculates therefore the ranking for genes (not for, in the case of Affymetrix, probe sets), nevertheless by setting `no.mapping.to.ug=TRUE` this mapping to UniGene IDs will be skipped and the ranking will be performed id per id.

**Usage**

```r
dbGetGeneRegulationRanking(con, ug = NULL, id = NULL, include.by.name = NULL, exclude.by.name = NULL, include.by.pk = ..., search.column = "exposure_time", no.mapping.to.ug = FALSE, m.up = 1, m.down = -1, v = TRUE, chip = NULL)
```
Arguments

con  The connection to the (maDB) database.

ug  A set of UniGene identifiers. The annotation table has to be created if this option is used!

id  A set of ids (eg Affymetrix probe set IDs or the IDs that were used as rownames in the EexprSet@exprs tables that were inserted into the database).

include.by.name  The comparisons are joined to the samples table. So comparisons can be selected or using the include.by.pk attribute, or using the sample names of the samples that were used as red signal channels in the calculation of the regulation value (\(M = \log_2 (R / G)\)).

exclude.by.name  Samples that should be excluded.

include.by.pk  The primary keys of the comparisons that should be included to create the ranking.

exclude.by.pk  The primary keys of the comparisons that should be excluded (makes only sense when the include.by.name was used, and not all of the comparisons that share the same sample names should be included).

count.cols  The entries (of the samples table) that should be used to count the regulation. For example if you have in your database samples with 6 hours, 8 hours and 24 hours exposure time and you want to count for each gene the number of comparisons with 6 and 8 hours where they were regulated and additionally the number of comparisons with 24 hours exposure time samples, submit count.cols=list(c("6h","8h"),c("24h")) and for the attribute search.col search.col="exposure_time".

write.info.file  If true a file called “HL” with the current date and “Info.txt” will be saved in the current working directory which contains the information which comparisons were used to generate the ranking.

search.column  The column of the samples table that should be used to distinguish between different comparisons (see attribute count.cols).

no.mapping.to.ug  If TRUE the ranking will be computed for each submitted id, if FALSE each id will be mapped to UniGene IDs, and those will then be used to count the regulations. Because of this mapping it is important, that the annotation table in the database holds the correct information (see dbUpdateAnnotation for more information).

m.up  Genes that have an M value bigger than this value will be counted as regulated (up-regulated!), the default is 1.

m.down  Genes that have an M value smaller than this value will be counted as down-regulated.

v  If additional information (progress bar...) should be written to the console.

chip  The chip or array type (eg hgu133plus2).

Details

coming soon...
Value
A table with the information about how many times a gene was regulated.

Author(s)
Johannes Rainer

See Also
dbUpdateAnnotation, publishToDB, dbCalculateRegulations

dbSearchSimilarPattern
Search for similar gene expression or regulation patterns in the database

Description
dbSearchSimilarPattern calculates the similarity of a template gene expression or regulation pattern to all gene expression (regulation) patterns in the maDB database.

Usage
dbSearchSimilarPattern(con, template=NULL, id=NULL, compare.ids=NULL, include.by.pk=NULL, include.by.name=NULL, exclude.by.pk=NULL, exclude.by.name=NULL, what=FALSE, include.values=FALSE, v=TRUE, distance.fun=distance.euclidian, orientation="h", column.names=c("name","tissue","exposure_time"), order=TRUE)

Arguments

con The database connection.
template A expression (regulation) pattern template (if NULL the id of the gene which expression (regulation) pattern should be used as template must be submitted with the id attribute).
id The ID of the gene that should be used as template (for Affymetrix data the probe set id).
compare.ids A set of genes with which the template should be compared. If not submitted all genes in the database will be used.
include.by.pk The primary keys of the signal channels (or comparisons) that should be used to build the pattern.
include.by.name The name of the samples that should be used to build the pattern.
exclude.by.pk The primary keys of the signal channels (or comparisons) that should be excluded.
exclude.by.name The name of the samples that should be excluded.
what If similar expression pattern ("E") or regulation pattern ("M") should be searched.
included.values See calculateSimilarity. If TRUE the returned Similarity class will contain also the data and makes it therefore possible to draw the data.
chip

deleteExperimentFromDB

The chip (array).

v

If additional informations should be plotted to the console.

distance.fun

The function to calculate similarities between vectors.

orientation

If genes should be compared ("h") or samples ("v").

column.names

The columns from the sample that should be used to build the column names of the data table. By default the column names of the result consist of the sample name, the sample tissue and the sample exposure time.

order

If the data columns should be ordered in the order of the primary keys (or names) submitted.

Details

This function calculates similarities between a template gene expression (regulation) pattern and all available patterns in the database. The function loads the values to compare from the database and calculates the similarity between the template and the matrix using the calculateSimilarity function. The user can specify the columns of the matrix by the include.by and exclude.by attributes and the rows by the compare.ids attribute (if not specified all genes will be used). If the user wants to compare a specific gene expression pattern (a custom pattern or a pattern of a gene in the database) with the expression pattern of all genes in the database, he has to specify the samples (signal channels) from which the expression values should be taken using the primary keys of the corresponding signal channels in the \code{signal_channels} database table, or by submitting the names of the samples that are hybridized onto the signal channels. For regulation values the primary keys of the comparisons in the \code{comparisons} table have to be used. As result an instance of the \code{Similarity} class will be returned (see \code{calculateSimilarity} for more information). An example is shown in the package vignette (use 
\code{openMadbVignette} to open the documentation).

Value

A object from the type \code{Similarity}.

Author(s)

Johannes Rainer

See Also

distance.pearson distance.euclidian distance.spearman calculateSimilarity
Similarity-class

deleteExperimentFromDB

Deleting a experiment from a database.

Description

deleteExperimentFromDB deletes an experiment (dataset) from the maDB database.
**distance.euclidian**  

**Usage**  
```r  
deleteExperimentFromDB(con, exp.title, v = TRUE)  
```

**Arguments**  
- **con**: The connection to the database (returned by the `dbConnect` function of the `RdbiPgSQL` package).  
- **exp.title**: The name (title) from the experiment in the database that should be deleted (to get a list of available experiments in the database use `dbGetExperimentInfo`).  
- **v**: If TRUE additional information will be printed to the console.

**Details**  
Like every function from the `pgUtils` and `maDB` packages that writes or updates values in a PostgreSQL database, this function uses transactions. The advantage of transactions is, that the database status before running the function is automatically recreated if an error occurs during the function execution, or if the user aborts the execution.

**Author(s)**  
Johannes Rainer

**See Also**  
`publishToDB dbGetExperimentInfo`

---

**distance.euclidian**  

*Calculate vector similarity (distance) using euclidian distance metrics*

**Description**  
`distance.euclidian` calculates the euclidian distance between two n-dimensional vectors.

**Usage**  
```r  
distance.euclidian(x, y, na.rm = FALSE, ...)  
```

**Arguments**  
- **x**: The first vector.  
- **y**: The second vector.  
- **na.rm**: If NA values should be removed before any calculations take place.  
- **...**: Additional parameters. Not yet used.

**Details**  
This simple function calculates the euclidian distance between two vectors using pythagoras theorem.
distance.pearson

Author(s)

Johannes Rainer

See Also

distance.pearson distance.spearman dbSearchSimilarPattern

distance.pearson  Calculate vector similarity (distance) using pearsons correlation method

Description

distance.pearson calculates the pearson correlation coefficient between two n-dimensional vectors.

Usage

distance.pearson(x,y,na.rm=FALSE,...)

Arguments

x  The first vector.
y  The second vector.
na.rm  If NA values should be removed before any calculations take place.
...  Additional parameters. Not yet used.

Details

This simple function calculates the correlation coefficient between two vectors.

Author(s)

Johannes Rainer

See Also

distance.euclidian distance.spearman dbSearchSimilarPattern
distance.pearson.uncentered

Calculate vector similarity (distance) using (uncentered) pearson's correlation method

Description

distance.pearson.uncentered calculates the uncentered pearson correlation coefficient between two n–dimensional vectors.

Usage

distance.pearson.uncentered(x, y, na.rm=FALSE, ...)

Arguments

- x: The first vector.
- y: The second vector.
- na.rm: If NA values should be removed before any calculations take place.
- ...: Additional parameters. Not yet used.

Details

This simple function calculates the uncentered correlation coefficient between two vectors.

Author(s)

Johannes Rainer

See Also

distance.euclidian distance.spearman dbSearchSimilarPattern

distance.spearman

Calculate spearman's rank correlation between two vectors

Description

distance.spearman calculates spearman's rank correlation coefficient between two n–dimensional vectors.

Usage

distance.spearman(x, y, na.rm=FALSE, ...)

Arguments

- **x**: The first vector.
- **y**: The second vector.
- **na.rm**: If NA values should be removed before any calculations take place.
- **...**: Additional parameters. Not yet used.

Details

This simple function calculates Spearman's rank correlation coefficient between two vectors.

Author(s)

Johannes Rainer

See Also

distance.euclidian distance.pearson dbSearchSimilarPattern
drawMAPlot

---

drawMAPlot

**Draw a standard MA plot**

Description

This function draws a simple M versus A plot with a lowess curve, a line for the mean A value, mean M value (drawn as red lines) and median M and A value (drawn as green line).

Usage

drawMAPlot(M, A, lwd = 1, ...)

Arguments

- **M**: A vector with M values.
- **A**: A vector with A values.
- **lwd**: The line width.
- **...**: Additional attributes for the plot call.

Value

An MA plot.

Author(s)

Johannes Rainer

See Also

drawMA
drawVolcanoPlot

**Description**

drawVolcanoPlot plots a volcano plot scattering the M values (log2 ratio) on the x axis against the p value (-log10 the p value).

**Usage**

drawVolcanoPlot(M,p,m=1,p.cut=0.05,p.transform=log10,ylab=NULL,colramp=NULL,na.rm=TRUE,...)

**Arguments**

- **M**
  - The M values.

- **p**
  - The test statistics (usually p values).

- **m**
  - Where vertical lines should be drawn. By default two horizontal lines (at M=1 and M=-1) are added to the plot. Submit m=NA if none should be drawn.

- **p.cut**
  - For what p value a horizontal line should be added to the plot (by default for a p value of p=0.05). Specify p.cut=NA if no line should be drawn.

- **p.transform**
  - The function that should be applied to the p values. By default \(-\log_{10} \). Note a \(-\) is added to each function submitted here.

- **ylab**
  - The label for the y axis. By default \(-\log_{10}(p)\)

- **colramp**
  - A color ramp (set of colors) that should be used to code the local point density. This attribute requires the package geneplotter as the densCols function is used to calculate the local point density.

- **na.rm**
  - If NA values should be removed.

- **...**
  - Additional parameters for the plot function.

**Details**

This function plots M values against test statistics. A horizontal line for a specific p value (by default 0.05) is added as well as vertical lines for a specific M value (by default 1 and -1). The data points can be colored according to the local point density by specifying a specific color ramp (e.g. colramp=topo.colors).

**Author(s)**

Johannes Rainer
format.latex

Description

format.latex Substitutes special characters in strings.

Usage

format.latex(x,...)

Arguments

x The string that should be formatted.
... not used yet.

Details

The function replaces all "$" and "%" and all other special characters, thus formatting the string properly for LaTeX.

Author(s)

Johannes Rainer

getAnnotation

Description

This function retrieves annotation for a gene (or a list of genes) to different public repository IDs.

Usage

getAnnotation(id = NULL, con = NULL, method = "local", chip = NULL, v = TRUE, ...)

Arguments

id The gene ID (or IDs), for example Affymetrix probe set IDs, GenBank IDs...
con The database connection to the "maDB" database, if method is "db". If the annotation should be done using the ensembl mart database using the bioMaRt package the mart connection object should be submitted with con. If local annotation (for example using Bioconductors Annotation packages) should be used this attribute can be omitted.
method The annotation method, one of c("local", "db", "mart").
chip An identifier for the chip or package that should be used to annotate the id. e.g. "hgu133plus2" should be submitted for the Affymetrix HG-U133plus2 chip.
v If additional output should be written to the console.
... additional parameters.
Value

A matrix where the rows correspond to the ids (genes) and the columns to the available annotations for the genes.

Warning

The local annotation using annotation packages is not implemented yet!

Author(s)

Johannes Rainer

See Also

dbGetAnnotation

Description

dbGetAnnotation returns the annotation of the submitted IDs to available annotations in the maDB annotation database table. For an example refer to the package vignette (which can be opened using the openMadbVignette function).

Usage

dbGetAnnotation(Con, id, columns=c("gen_bank","description","uni_gene","locuslink"), chip=NULL, search.col="id", v=TRUE, quickload=FALSE)

Arguments

Con The connection to the maDB database (created using the dbConnect function from the RdbiPgSQL package).

id The IDs of the genes that should be annotated.

columns the identifier to which the submitted ids should be annotated.

chip the chip (or for two color arrays a oligo set identifier) from which the ids were taken from (e.g. hgu133plus2 for the Affymetrix GeneChip 133Plus2).

search.col In wich of the columns the ids submitted with the id parameter should be searched for.

v If TRUE additional information will be printed to the console.

quickload Only valid if id="id", the annotation data will be fetched much quicker from the database.

Details

The annotation database table can be easily created in a PostgreSQL database using the dbUpdateAnnotation function.
getEDB

Author(s)
Johannes Rainer

See Also
dbUpdateAnnotation dbGetExperimentInfo loadFromDB

Description
getEDB retrieves expression values from the specified signal channels from a maDB database. For further informations and examples refer to the package vignette (which can be opened using the openMadbVignette).

Usage
getEDB(con, ids, signal.channels.pk, column.names = c("array_name", "color"), v = TRUE)

Arguments
con The connection to the database (created with the dbConnect function from the RdbiPgSQL package).
ids The IDs of the genes from which the expression values should be retrieved. In the case of Affymetrix GeneChips the Affymetrix IDs should be used (as they are used as rownames in the exprs matrix in the ExpressionSet objects).
signal.channels.pk the primary keys of the signal channels in the database from which the expression values should be retrieved. To get information about primary keys, arrays... from the database use the dbGetExperimentInfo function.
column.names The information that should be used as column names of the expression values matrix. Allowed are all column names of the sample database table.
v If TRUE additional information will be printed to the console.

Details
This function is useful, to retrieve only a subset of genes from a subset of signal channels of a microarray experiment (dataset) from a maDB database.

Author(s)
Johannes Rainer

See Also
publishToDB dbGetExperimentInfo loadFromDB getMDB
**dbGetExperimentInfo**

List information about an experiment from the database.

**Description**

`dbGetExperimentInfo` lists all experiments that are stored in the maDB database, or returns information from a particular experiment. Refer to the package vignette for further information or examples (vignette can be opened using the `openMadbVignette` function).

**Usage**

```r
dbGetExperimentInfo(Con, exp.title)
```

**Arguments**

- **Con**
  The connection to the maDB database (created using the `dbConnect` function from the `RdbiPgSQL` function).

- **exp.title**
  The experiment title (name) from the experiment which properties should be listed. If nothing is submitted a list with all experiments that are stored in the database is displayed.

**Details**

This function collects information about the specified experiment (database) by joining several database tables. A table is returned, that contains all primary keys or foreign keys with which all data can be accessed for the particular experiment from the various tables. This tables are:

- **experiments** Primary information about the experiment
- **arrays** the arrays of GeneChips which were used in the experiment
- **signal_channels** in two color micro arrays two signal channels exist and therefore two entries in the `signal_channels` table reference to one entry in the `arrays` table. For Affymetrix GeneChips the reference is one to one.
- **exp_values** this table contains all the expression values from the corresponding signal channels of the experiment. The reference to the `signal_channels` table is established by the `signal_channels_fk` column in the `exp_values` table.
- **samples** Each entry in this table references to one or more entries in the `signal_channels` table. This table contains information about the samples that were hybridized onto the arrays.

**Author(s)**

Johannes Rainer

**See Also**

`dbGetAnnotation` `publishToDB` `dbGetComparisons` `MadbSet-class`
getPK

Getting the primary key of the appropriate object from the database

Description

Returns the primary key of an object from the database. If in the corresponding database table no entry with the same attribute values (of the submitted object) exists, the values will be inserted into the database and the primary key of the new entry will be returned.

getMDB

Retrieve regulation values from a database.

Description

getMDB this function reads the regulation (M) values from the selected comparisons out of a maDB database. For further informations and examples refer to the package vignette (which can be opened using the openMadbVignette).

Usage

getMDB(con, ids=NULL, comparisons.pk=NULL, v=TRUE, column.names="description")

Arguments

con The connection to the database (returned by the dbConnect function of the RdbiPgSQL package).
ids The IDs of the genes from which the expression values should be retrieved. In the case of Affymetrix GeneChips the Affymetrix IDs should be used (as they are used as rownames in the exprs matrix in the exprSet objects).
comparisons.pk the primary keys of the comparisons in the database for which the regulation values should be exported. A list of available comparisons and informations which sampes are compared in the various comparisons the dbGetComparisons function can be used.
column.names The information that should be used as column names of the returned regulation values matrix. Allowed are all column names of the sample and comparisons database tables.
v If TRUE additional information will be printed to the console.

Author(s)

Johannes Rainer

See Also

publishToDB dbGetExperimentInfo dbGetComparisons loadFromDB getEDB
**getPathFromFile**

**Usage**

```r
getPK(object, Con, table.name = NULL, all.fields = FALSE, ...)```

**Arguments**

- `object`: The data object.
- `Con`: The connection to the database.
- `table.name`: The database table name where objects from the type of the submitted objects are stored into.
- `all.fields`: If all attributes have to match between the database entry and the object submitted.
- `...`: some additional things.

**Value**

The primary key of the database entry.

**Author(s)**

Johannes Rainer

---

**getPathFromFile**  
*Get the path to a file*

**Description**

`getPathFromFile` returns the path to the file.

**Usage**

```r
getPathFromFile(file)
```

**Arguments**

- `file`: The file name (should include also the path to the file). As file delimiter (also in Windows!) the Unix file delimiter "/" should be used!

**Author(s)**

Johannes Rainer

**See Also**

`createFile`

**Examples**

```r
getPathFromFile("/home/jo/tmp/somefile.txt")
```
**getSamplesFromDB**  
Lists all or only specified samples from the database.

### Description

getSamplesFromDB  This function lists all samples that are stored into a database with the publishToDB function, or lists all samples that match the pattern submitted.

### Usage

getSamplesFromDB(Con, table.name="samples", pattern)

### Arguments

- **Con**  
The connection to the database (returned by the dbConnect function of the RdbiPgSQL package).

- **table.name**  
The name of the table that contains the information about the samples.

- **pattern**  
A pattern that can be used to search for in all columns of the table.

### Details

This function returns a table (data.frame/matrix) with all samples stored in the database, or searches for those entries, that correspond to the submitted pattern.

### Author(s)

Johannes Rainer

### See Also

- publishToDB  
- MadbSet-class

---

**isDecimal**  
Is the number a cardinal or a decimal number?

### Description

isDecimal  This function determines if a number is decimal, or if it has no decimal places.

### Usage

isDecimal(x)

### Arguments

- **x**  
the number or a list of numbers.

### Details

Sometimes it is useful to know if a number has decimal places, or if it is cardinal. This function can be used on single numbers or on a vector of numbers to solve this problem.
loadFromDB-methods

Author(s)

Johannes Rainer

Examples

isDecimal(2)
isDecimal(2.1)
isDecimal(c(1,2.3,2,3.4))

loadFromDB-methods  Load a dataset from the database

Description

loadFromDB in package maDBi This method allows to load data sets, stored previously into the database using the publishToDB method, back into the R workspace. A list of available data sets in a database created by the maDB package is returned by the dbGetExperimentInfo function (by submitting the connection to the database as parameter, a connection to a PostgreSQL database can be established by the dbConnect function from the RdbiPgSQL). For further informations and examples refer to the package vignette (which can be opened using the openMadbVignette).

Usage

loadFromDB(object=NULL,connection=NULL,name=NULL,pk=NULL,v=TRUE,...)

Arguments

object An empty MadbSet or Sample object, generated either by link{newMadbSet} or new("MadbSet") for MadbSet objects, or by new("Sample") for Sample objects.
connection The connection object to the database.
name Only used if a MadbSet should be loaded from the database. Name should be equal to the experiment name that was stored into the database (use dbGetExperimentInfo to get a list of all available experiments in the database).
pk For MadbSet: if a subset of arrays should be loaded from one experiment. As pk the primary keys of the corresponding signal channels should be submitted (to get a list of all signal channels, arrays, samples of a specific experiment in the maDB database use the dbGetExperimentInfo function by submitting also the name of the experiment along with the connection to the database as a parameter).
v If TRUE additional informations will be printed to the console.
... Additional parameters. Not used yet.

Methods

object = "MadbSet" Loads a MadbSet object from the database.
object = "Sample" Loads a Sample object from the database, (submit new("Sample"))

Warning

The usage of this method for EexprSet objects is deprecated! Use the MadbSet objects instead!
**Description**

The maDB package allows to store microarray experiments (preprocessed expression values of one-color (Affymetrix) or two-color microarrays along with sample information and annotation) into a database. As database backend a PostgreSQL database is used, where all needed tables are created automatically once the first experiment is stored into a newly created database using the `publishToDB` method. The database itself consists of a variety of tables, where the microarray data is stored in a relational way, thus allowing to store two-color microarray data and data from one-color (Affymetrix) microarray experiments in the same database. Use `openMadbVignette` to open the documentation (vignette) of the package.

**Details**

<table>
<thead>
<tr>
<th>Package:</th>
<th>maDB</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type:</td>
<td>Package</td>
</tr>
<tr>
<td>Version:</td>
<td>1.9.4</td>
</tr>
<tr>
<td>Date:</td>
<td>2007-05-23</td>
</tr>
<tr>
<td>License:</td>
<td>LGPL</td>
</tr>
</tbody>
</table>

The main function to create the database tables and to insert an experiment into the database is `publishToDB`. Preprocessed expression values and sample informations of the submitted `MadbSet` object are stored into the database. The function `loadFromDB` can be used to fetch a whole microarray experiment, or a subset of an experiment from the database. Other functions to access just subsets of expression values are `getEDB`. The web interface `madbWeb` (written in PHP) to a microarray database generated with the maDB package is accessible at http://madb.i-med.ac.at/madbWeb. Additionally the maDB package provides also functions to create graphical visualizations of microarray data like the `drawMA` function to generate MA (differential expression against average expression) plots, or `drawVolcanoPlot` to generate volcano plots. In both plots the local point density can be color coded.

**Author(s)**

Johannes Rainer
Maintainer: johannes.rainer@tcni.at

**References**

http://madb.i-med.ac.at/madbWeb

---

**multiapply**

*Apply a function to two arrays*

**Description**

`multiapply` allows to apply functions row wise or column wise to two arrays.
multiapply

Usage

multiapply(a, b, MARGIN, FUN, ...)

Arguments

a An array which rows or columns should be submitted to the function.
b An array which rows or columns should be submitted to the function. The argument a will be passed as first argument to the function while the argument b will be passed as the second one.
MARGIN Like the MARGIN argument in the apply function, 1 means submit the rows to the function, 2 the columns.
FUN The function that should be applied. Any function that needs two input parameters.
... Additional parameters for the function FUN.

Details

Like the apply function this function can be used to apply functions to the rows or columns of a matrix, without having to write for loops. If the result of the function FUN is numeric or a character the function returns an array containing the results, otherwise a list with the output of the function FUN.

Author(s)

Johannes Rainer

See Also

apply

Examples

## creating two arrays
a <- matrix(ncol=3, nrow=3)
a[1,] <- c(1, 2, 2)
a[2,] <- c(3, 2, 3)
a[3,] <- c(2, 2, 2)
b <- matrix(ncol=5, nrow=3)
b[1,] <- c(8, 8, 6, 8, 10)
b[2,] <- c(2, 3, 3, 2, 3)
b[3,] <- c(1, 1, 1, 1, 2)

## now we perform a wilcox unpaired test for each row.
multiapply(a=a, b=b, MARGIN=1, FUN=wilcox.test, paired=FALSE)
mean.center  Mean center a numerical vector

Description

mean.center mean centers a numerical vector.

Usage

mean.center(x, log.scale=TRUE, sd.scale=FALSE, ...)

Arguments

x

The numerical vector that should be mean centered.

log.scale

If the values are in log2 scale. (in this case the mean of the vector will be
subtracted from each value, otherwise divided).

sd.scale

if TRUE the mean centered values will be divided with the standard deviation.

... Additional parameters. Not yet used.

Details

This function can be used to mean center for example gene expression data.

Author(s)

Johannes Rainer

Examples

mean.center(c(1,2,3,2,1,3,5,3,5))

meanWithoutNA  Calculating the mean by excluding all NA and NULL values

Description

meanWithoutNA This function calculates the mean from the data submitted by excluding all NA
and NULL values.

Usage

meanWithoutNA(Data)

Arguments

Data A vector containing the values from which the mean should be calculated. NA
and NULL values are removed before the calculation.
**medianWithoutNA**

**Details**

Simple function to calculate the mean from a values vector.

**Author(s)**

Johannes Rainer

**Examples**

```r
data <- c(2, 3, 5, 1, NA, NULL, 3, NA)
data
meanWithoutNA(data)
```

---

**medianWithoutNA**  
_Calculating the median by excluding all NA and NULL values_

**Description**

_medianWithoutNA_ This function calculates the median from the data submitted by excluding all NA and NULL values.

**Usage**

```r
medianWithoutNA(Data)
```

**Arguments**

- **Data**  
  A vector containing the values from which the median should be calculated. NA and NULL values are removed before the calculation.

**Details**

Simple function to calculate the median from a values vector.

**Author(s)**

Johannes Rainer

**Examples**

```r
data <- c(2, 3, 5, 1, NA, NULL, 3, NA)
data
medianWithoutNA(data)
```
multiGrep

Perform a pattern search with a list of patterns

Description

multiGrep: search for a list of patterns.

Usage

multiGrep(pattern, x, ...)

Arguments

pattern The string, or a vector of strings, that should be searched in the submitted data.
x The data, any kind of string or vector.
... Some additional parameters for the myGrep and grep commands that are executed inside the function.

Details

The functions performs a myGrep call for each of the patterns submitted and returns a vector with the indices where the patterns were found inside the data vector.

Author(s)

Johannes Rainer

See Also
grep, myGrep

Examples

test <- c("where", "is", "the", "pattern", "in", "this", "vector", "?")
multiGrep(pattern = "patt", test)
test[multiGrep(pattern = "patt", test)]

multiGrep(pattern = c("the", "tor", "is", "where"), test)
test[multiGrep(pattern = c("the", "tor", "is", "where"), test)]
myGrep  

Perform a pattern search

Description

myGrep This function is a wrapper function for the grep function from R, that converts the data into a character vector before calling grep on the data. The function returns the index or a list of indexes, where (at what position) the pattern can be found in the submitted data.

Usage

myGrep(pattern, x, exact.match=FALSE, ...)

Arguments

pattern The string that should be searched in the submitted data.

x The data, any kind of string or vector.

exact.match If the string to search has to be exactly the same as the pattern or not (if TRUE, it is equal to a simple ==).

... Some additional parameters for the grep command.

Details

This function is not really different from the grep call from R (as it uses also the grep call ;-)).

Author(s)

Johannes Rainer

See Also

grep, multiGrep

newMadbSet  

Create a new MadbSet object

Description

Function to create a new MadbSet object. Returns either an empty MadbSet object, or, if an ExpressionSet, RGList or MARList is submitted, a MadbSet containing all data from the submitted object.

Usage

newMadbSet(x = NULL, ...)

Description

Function to create a new MadbSet object. Returns either an empty MadbSet object, or, if an ExpressionSet, RGList or MARList is submitted, a MadbSet containing all data from the submitted object.
Arguments

- `x` A optional ExpressionSet (`Biobase`), RGList (`limma`) or MAList (`limma`) object.
- ... some additional parameters.

Details

This function facilitates the creation of MadbSet objects. It takes either an ExpressionSet, RGList or MAList as input and returns a MadbSet containing all data from the submitted object.

Value

Returns a MadbSet (eventually filled with all the data from the submitted `x`, if `x` is an ExpressionSet, RGList or MAList)

Note

For further informations and examples refer to the package vignette (which can be opened using the `openMadbVignette`).

Author(s)

Johannes Rainer

See Also

`MadbSet-class`
**plotSimilarity**

**Draw a plot for the Similarity-class**

**Description**

This function draws a similarity plot for the `Similarity-class` objects. For further informations and examples refer to the package vignette (which can be opened using the `openMadbVignette`).

**Usage**

```r
plotSimilarity(ids, distances, data, template, restrict.to = min(5, length(data[, 1])), template.id = "custom", legend = TRUE, ...)
```

**Arguments**

- `ids` A list with the ids (rownames of the data matrix).
- `distances` The vector with the distances (each row of the data matrix to the template vector).
- `data` The data matrix (the expression or regulation patterns of a set of genes over a set of samples).
- `template` The template vector (the expression or regulation pattern of a gene over a set of samples).
- `restrict.to` How many patterns should be drawn. By default the 5 patterns with the smallest distance to the template pattern will be drawn.
- `template.id` The template gene id.
- `legend` If a legend should be drawn.
- `...` additional parameters.

**Value**

A plot of best matching gene expression or regulation patterns.

**Author(s)**

Johannes Rainer

**See Also**

`Similarity-class`
**progress**

*Progress bar*

**Description**

`progress` displays a simple progress bar.

**Usage**

```r
progress(percent=0, steps=20, type="default", label=TRUE)
```

**Arguments**

- `percent`  The progress of an action in percent.
- `steps`  The number of steps of the progress bar. Setting the steps to 20 means that each 5 percent to progress bar increases.
- `type`  The type of the progress bar. Allowed types are “default” and “arrow”.
- `label` if the actual percentage should be written as a number too.

**Details**

This function can be used to display the progress of functions.

**Author(s)**

Johannes Rainer

**See Also**

`arrowProgress`

**Examples**

```r
progress(percent=70, steps=40)
```

---

**publishToDB**

*Writing the expression values from normalized micro arrays into a database*

**Description**

`publishToDB` allows to store a microarray experiment (dataset) into a database. For further informations and examples refer to the package vignette (which can be opened using the `openMadbVignette`).

**Usage**

```r
publishToDB(object=NULL, connection=NULL, exp.name=NULL, exp.date=NULL, samples=NULL)
```
**Arguments**

**object**
The object from which the expression values (preprocessed intensity values) should be stored in the database (an object from the type `MdbSet`).

**connection**
The database connection, with the `dbConnect` function from the `RdbiPgSQL` package.

**exp.name**
The experiment name (project name or dataset name). This name has to be unique in the database!

**exp.date**
The date of the experiment. Optional; as additional information the publishing date will automatically be inserted in the database.

**samples**
A list of, or a single representation of a `Sample` object, that contains information about the samples hybridized on the chips. If the sample already exists in the database, it will not be added again. This parameter can also be omitted (but then no sample information will be available for this array!)

**signal.channels**
The linking element between the signal channels (columns in the `exprs` slot of the `MdbSet` object), and the corresponding samples hybridized on the specific signal channel. A list of `SignalChannels` of a `MdbSet` is returned by calling the function `getSignalChannels` on the object. If a list of `Samples` are submitted, the linkage between the signal channels and the samples has to be generated by setting the `sample.index` slot of the `SignalChannels` appropriately.

**preprocessing**
A string giving information about the preprocessing of the microarray experiment (e.g. RMA).

**pubmed.id**
Optional pubmed id of the microarray experiment (if it has already been published).

**global.transaction**
If a global transaction should be used for the whole function call. The benefit of this is, that if any errors occur during the function call, no data will be written into the database. It is always a good idea to send a transaction rollback call to the database (e.g. `dbSendQuery(Con,"ROLLBACK TRANSACTION;")`) if any exceptions occurred, to be sure that the database will not get inconsistent.

**v**
If TRUE additional informations will be printed to the console.

**Author(s)**

Johannes Rainer

**See Also**

`getSignalChannels` `MdbSet-class` `SignalChannel-class` `Sample-class` `getPK` `loadFromDB`
replaceAll

Replace all occurrences of a specified character in a string by a new character

Description
replaceAll This function helps to replace characters in a string or vector of strings.

Usage
replaceAll(x,old,new)

Arguments
x The string or vector of strings where the replacements should occur.
old The character or vector of characters that should be replaced.
new The character or vector of characters with whom the old characters should be replaced.

Details
This function replaces single characters with others.

Author(s)
Johannes Rainer

See Also
replaces

Examples

test <- c("zes","i have","an american","keezboard lazout")
replaceAll(test,old="z","y")
replaceAll(test,old=c("z","h"),new=c("y","d"))

replaces

Replace all occurrences of a specified character in a string by a new character

Description
replaces This function helps to replace characters in a string.

Usage
replaces(x,old,new,...)
Arguments

- `x` The strings where the replacements should occur.
- `old` The character or vector of characters that should be replaced.
- `new` The character or vector of characters with whom the old characters should be replaced.
- `...` Additional parameters. Not used yet.

Details

This function replaces character strings with the one submitted. This function can only be applied to single strings. Use the `replaceAll` to apply it to vectors of strings.

Author(s)

Johannes Rainer

See Also

`replaceAll`

Examples

```r
replaces("there are to much white spaces",old=" ","+")
```

Description

This data set is a small excerpt from an Affymetrix hgu133plus2 microarray experiment. It contains 8 chips from 4 patients, 2 B-cell-ALL (acute lymphoblastic leukemia) and 2 T-cell-ALL patients. Two samples per patient were hybridized onto the chips, one before treatment and one after 6 hours GC (glucocorticoid) treatment. From every Affymetrix GeneChip only 1000 probe sets are included in this small dataset. For further informations and examples refer to the package vignette (which can be opened using the `openMadbVignette`).

Format

An `ExpressionSet` containing the expression values from 1000 genes on 8 different Affymetrix GeneChips.
**toEexprSet**  
*Transform objects to objects of the type EexprSet*

**Description**

This function should transform data objects like limmas RGList or MAList objects into an instance of the class "EexprSet".

**Usage**

```
toEexprSet(object)
```

**Arguments**

- `object`  
The data object to transform.

**Value**

An instance of the type "EexprSet" that holds the information from the object submitted.

**warning**

This method as well as the EexprSet are deprecated! Use MadbSet and newM adbSet instead!

**Author(s)**

Johannes Rainer

**See Also**

- `EexprSet-class`
- `createEexprSetFromLimma`

---

**dbUpdateAnnotation**  
*Create and update an annotation table in a PostgreSQL database.*

**Description**

`dbUpdateAnnotation` creates and updates the annotation database table in a maDB database. For further informations and examples refer to the package vignette (which can be opened using the `openMadbVignette`).

**Usage**

```
dbUpdateAnnotation(Con, data, chip, date, do.backup=TRUE, v=TRUE)
```
**writeFigure**

**Arguments**

- **Con**
  The connection to the maDB database (returned by the function `dbConnect` of the `RdbiPgSQL` package).

- **data**
  The annotation table. Supported column names are "id", "gen_bank", "description", "uni" (also additional columns containing some additional annotations are allowed, any ordering of columns is allowed).

- **chip**
  An identifier for the chip or array (oligo set) respectively.

- **date**
  The date when the annotation was created.

- **do.backup**
  If a backup of the annotation table should be done. This is useful when the annotation of an already existing table is going to be updated. By default the annotations of the chip that will be updated will be saved as a tab delimited txt file. The backup file will be saved in the current workspace.

- **v**
  If TRUE additional information will be printed to the console.

**Details**

When creating or updating the database not all columns have to be submitted in the `data` argument, when submitting a table with only some of the columns the other columns in the database will remain empty.

**Author(s)**

Johannes Rainer

**See Also**

dbGetAnnotation

---

**writeFigure**  
*Includes a figure in a LaTeX document*

**Description**

`writeFigure` This function writes all the needed lines into a tex document to include an image into a LaTeX document (the image has to be created before.).

**Usage**

`writeFigure(file=NULL, image=NULL, label=NULL, caption=NULL, option="[!ht]", image.width=1)`

**Arguments**

- **file**
  The file where the lines should be included. If the file does not exist it will be created, if the file should be in some subdirectories, these will also be created if needed. As file a file handle or a character string giving the file name (and or directories) can be submitted.

- **image**
  The path to the image (relative from the directory where the `file` lies into).

- **label**
  The label that should be used to link to this figure.

- **caption**
  The caption that should be written below the figure.

- **option**
  Some LaTeX specific options for the figure.

- **image.width**
  The image width relative to the text width.
writeLatexTable

Details
The lines that are needed to include an image into a LaTeX document are inserted with this function into a file, if the file does already exist, the lines will be appended. As file parameter also a file handle can be submitted.

Author(s)
Johannes Rainer

See Also
writeLatexTable

writeLatexTable

Writes a matrix or data frame in latex format to a file.

Description
writeLatexTable This function writes a matrix or a data frame formatted as a LaTeX table to a text file. The text size as well as the number of digits and the desired caption and label can be specified.

Usage
writeLatexTable(data=NULL,file=NULL,append=TRUE,textsize="normalsize",caption=NULL,label=NULL,digits=NULL)

Arguments
data The data that should be written. A matrix or a data frame, the column names will be used as column headers, the row names as row headers.
file The file where the table should be written into. If directories are specified, these directories (if not already existant) will be created. As file parameter also a file handle can be submitted.
append If the table should be appended to the text in the file.
textsize The size of the text, possible alternatives for "normalsize" are "small", "scriptsize" and all other LaTeX text sizes.
caption The text that should be written into the table caption.
label The label text that can be used to link to this table.
digits The number of digits that should be used for all numeric values in the table.

Details
One important feature of this function is, that the table can be written into a file that has not to be in the working directory. So one can for example by submitting as file="doc/tabletest.tex" writing the table into the file “tabletest.tex”, that is in the subdirectory “doc” in the working directory. If this directory does not already exist, the function will create it. But remember that you have to use always the unix file separator “/”, also in Windows!
writeLatexTable

Author(s)
  Johannes Rainer

See Also
  writeFigure
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