Package ‘MotIV’

November 20, 2016

Type Package
Title Motif Identification and Validation
Version 1.30.0
Date 2014-04-09
Author Eloi Mercier, Raphael Gottardo
Maintainer Eloi Mercier <emerrier@bcgsc.ca>, Raphael Gottardo
<rgottard@fhcrc.org>
Depends R (>= 2.10), BiocGenerics (>= 0.1.0)
Imports graphics, grid, methods, S4Vectors, IRanges (>= 1.13.5),
Biostrings (>= 1.24.0), lattice, rGADEM, utils
Suggests rtracklayer
SystemRequirements GNU Scientific Library >= 1.6
(http://www.gnu.org/software/gsl/)
Description This package makes use of STAMP for comparing a set of
motifs to a given database (e.g. JASPAR). It can also be used
to visualize motifs, motif distributions, modules and filter
motifs.
License GPL-2
biocViews Microarray, ChIPchip, ChIPSeq, GenomicSequence,
MotifAnnotation
NeedsCompilation yes

R topics documented:

alignments-class ......................................................... 2
as.data.frame .......................................................... 3
combineMotifs ........................................................... 4
exportAsRangedData .................................................... 5
exportAsTransfacFile .................................................. 6
filter ................................................................. 7
filter-class ............................................................ 8
filters-methods .......................................................... 9
FOXA1_rGADEM ......................................................... 10
generateDBScores ..................................................... 10
getGademPWM .......................................................... 12
alignments-class

Class "alignments"

Description

This object contains the alignments found by a MotIV analysis.

Objects from the Class

Objects can be created by calls of the form new("alignments", TF, evalue, sequence, match, strand ).

Slots

TF Object of class "TF"

evalue The e-value of the alignment.

sequence The input sequence aligned.

match The TF sequence which has been matched.

strand The strand of the alignment.

Author(s)

Eloi Mercier <emercier@chibi.ubc.ca>

See Also

motiv.matches, transcriptionFactor
as.data.frame  

Coerce to a Data Frame

Description

This function coerces a MotIV object into a data frame.

Usage

## S4 method for signature 'motiv'
as.data.frame(x)

Arguments

x  
An object of class motiv.

Details

'as.data.frame' returns a data frame.

This object regroups all the TF identified by MotIV with the corresponding evalue and alignments.

Value

A data.frame object.

Author(s)

Eloi Mercier <emercier@chibi.ubc.ca>

See Also

data.frame, viewAlignments

Examples

#####Database and Scores#####
path <- system.file(package="MotIV")
jaspar <- readPWMfile(paste(path,"/extdata/jaspar2010.txt",sep=""))
jaspar.scores <- readDBScores(paste(path,"/extdata/jaspar2010_PCC_SWU.scores",sep=""))

#####Input#####
data(FOXA1_rGDEM)
motifs <- getPWM(gadem)
motifs.trimed <- lapply(motifs,trimPWMedge, threshold=1)

#####Analysis#####
foxa1.analysis.jaspar <- motifMatch(inputPWM=motifs,align="SWU",cc="PCC",database=jaspar,DBscores=jaspar.scores)
foxa1.analysis.jaspar.df = as.data.frame(foxa1.analysis.jaspar)
head(foxa1.analysis.jaspar.df)
combineMotifs

Combine Motifs

Description
This function combines motifs according to a set of filters.

Usage
## S4 method for signature 'motiv, filters'
combineMotifs(x, y, name=NULL, exact=TRUE, verbose=TRUE)

Arguments
- **x**: An object of class `motiv`.
- **y**: A filter or a set of filter.
- **name**: Name(s) to be given for similar motifs.
- **verbose**: If FALSE, no output will be print.
- **exact**: If TRUE, search only for perfect name match.

Details
This function is used to consider some motifs as a unique motif or similar motifs.
Many filters could be pass in argument separated by coma. They will be considered independently (coma is considered as OR).
If a name or a vector of name is provided, it will be used to assign new name for similar motif to the corresponding filter. Else, a generic name is used.

Value
A motiv object.

Author(s)
Eloi Mercier <emercier@chibi.ubc.ca>

See Also
- setFilter, filter, split

Examples
#####Database and Scores#####
path <- system.file(package="MotIV")
jasper <- readPWMfile(paste(path,"/extdata/jaspar2010.txt",sep=""))
jasper.scores <- readDBScores(paste(path,"/extdata/jaspar2010_PCC_SMU.scores",sep=""))

#####Input#####
data(FOXA1_rGADEM)
motifs <- getPWM(gadem)
motifs.trimed <- lapply(motifs,trimPWMedge, threshold=1)
exportAsRangedData

Description

Export your

Usage

exportAsRangedData(x, y, correction=TRUE)

Arguments

x An object of class `motiv`.

y The rGADEM type object associated with the `motiv` object.

correction If TRUE, corrects the position according to the alignment.

Details

Use this function to export the results into a RangedData object.

Value

An object of type RangedData.

Author(s)

Eloi Mercier <<emerrier@chibi.ubc.ca>>

Examples

```
#####Database and Scores#####
path <- system.file(package="MotIV")
jaspar <- readPWMfile(paste(path,"/extdata/jaspar2010.txt",sep=""))
jaspar.scores <- readDBScores(paste(path,"/extdata/jaspar2010_PCC_SWU.scores",sep=""))

#####Input#####
data(FOXA1_rGADEM)
motifs <- getPWM(gadem)
motifs.trimed <- lapply(motifs,trimPWMedge, threshold=1)
```
exportAsTransfacFile

### Analysis ###
```r
foxa1.analysis.jaspar <- motifMatch(inputPWM=motifs, align="SWU", cc="PCC", database=jaspar, DBscores=jaspar.scores, top=5)
summary(foxa1.analysis.jaspar)
```

### Filters ###
```r
f.foxa1<-setFilter(name="", tfname="FOXA1", top=3, evalueMax=10^-5)
f.ap1 <- setFilter (tfname="AP1", top=3)
f.foxa1.ap1 <- f.foxa1 | f.ap1
foxa1.filter <- filter(foxa1.analysis.jaspar, f.foxa1.ap1, exact=FALSE, verbose=TRUE)
```

### Plots ###
```r
#plot(foxa1.filter.combine, ncol=2, top=5, rev=FALSE, main="FOXA1", bysim=TRUE)
#plot(foxa1.filter.combine, gadem, ncol=2, type="distribution", correction=TRUE, group=FALSE, bysim=TRUE, strand=FALSE, sort=TRUE, main="FOXA1")
#plot(foxa1.filter.combine, gadem, type="distance", correction=TRUE, group=TRUE, bysim=TRUE, main="FOXA1", strand=FALSE, method=3, xlim=c(-100,100), darg=list(bw=8))
```

### RangedData ###
```r
foxa1.rd <- exportAsRangedData(foxa1.filter.combine["FOXA1"], gadem)
ap1.rd <- exportAsRangedData(foxa1.filter.combine["AP1"], gadem)
```

---

**exportAsTransfacFile**  
*Write Transfac Files*

**Description**
Export an object of class `motiv` as a Transfac file type.

**Usage**
```r
## S4 method for signature 'motiv'
exportAsTransfacFile(x, file)
## S4 method for signature 'list'
exportAsTransfacFile(x, file)
```

**Arguments**
- `x`: An object of class `motiv` to be exported.
- `file`: A character string naming a file.

**Details**
This function is made to provide standard output file used by STAMP. It takes an object of class `motiv` and writes two files named `_matched.txt` and `_match_pairs.txt` containing alignments and identified PWMs.

For more information about the Transfac file format, please refer to http://www.benoslab.pitt.edu/stamp/help.html.

**Author(s)**
Eloi Mercier <emercier@chibi.ubc.ca>
Examples

#####Database and Scores#####
path <- system.file(package="MotIV")
jaspar <- readPWMfile(paste(path,"/extdata/jaspar2010.txt",sep=""))
jaspar.scores <- readDBScores(paste(path,"/extdata/jaspar2010_PCC_SWU.scores",sep=""))

#####Input#####
data(FOXA1_rGADEM)
motifs <- getPWM(gadem)
motifs.trimed <- lapply(motifs,trimPWMedge, threshold=1)

#####Analysis#####
foxa1.analysis.jaspar <- motifMatch(inputPWM=motifs,align="SWU",cc="PCC",database=jaspar,DBscores=jaspar.scores,top=5)
summary(foxa1.analysis.jaspar)

#####Filters#####
f.foxa1<-setFilter(name="", tfname="FOXA1", top=3, evalueMax=10^-5)
f.ap1 <- setFilter(tfname="AP1", top=3)
f.foxa1.ap1 <- f.foxa1 | f.ap1
foxa1.filter <- filter(foxa1.analysis.jaspar, f.foxa1.ap1, exact=FALSE, verbose=TRUE)
foxa1.split <- split(foxa1.analysis.jaspar, c(f.foxa1, f.ap1), drop=FALSE, exact=FALSE, verbose=TRUE)
foxa1.filter.combine <- combineMotifs(foxa1.filter, c(f.foxa1, f.ap1), exact=FALSE, name=c(""FOXA1", "AP1"),

#####Export#####
#exportAsTransfacFile(foxa1.filter.combine, file="foxa1_analysis")

---

filter

<table>
<thead>
<tr>
<th>Filter Motifs</th>
</tr>
</thead>
</table>

Description

This function selects motifs according to a set of filters.

Usage

```r
## S4 method for signature 'motiv,filters'
filter(x, f, exact=FALSE, verbose=TRUE)
```

Arguments

- **x**: An object of class motiv.
- **f**: A filter or a set of filter for motiv object.
- **verbose**: If FALSE, no output will be print.
- **exact**: If TRUE, search only for perfect name match.

Details

This function is used to select motifs that correspond to the filters.

Many filter could be pass in argument separated by coma. They will be considered independently.

Value

A motiv object.
Author(s)

Eloi Mercier <emercier@chibi.ubc.ca>

See Also

setFilter, split, combine

Examples

#####Database and Scores#####
path <- system.file(package="MotIV")
jaspar <- readPWMfile(paste(path,"/extdata/jaspar2010.txt",sep=""))
jaspar.scores <- readDBScores(paste(path,"/extdata/jaspar2010_PCC_SWU.scores",sep=""))

#####Input#####
data(FOXA1_rGADEM)
motifs <- getPWM(gadem)
motifs.trimed <- lapply(motifs,trimPWMedge, threshold=1)

#####Analysis#####
foxa1.analysis.jaspar <- motifMatch(inputPWM=motifs,align="SWU",cc="PCC",database=jaspar,DBscores=jaspar.scores,top=5)
summary(foxa1.analysis.jaspar )

#####Filters#####
f.foxa1<-setFilter(name="", tfname="FOXA1", top=3, evalueMax=10^-5)
f.ap1 <- setFilter (tfname="API", top=3)
f.foxa1.ap1 <- f.foxa1 | f.ap1
foxa1.filter <- filter(foxa1.analysis.jaspar, f.foxa1.ap1, exact=FALSE, verbose=TRUE)
foxa1.split <- split(foxa1.analysis.jaspar, c(f.foxa1, f.ap1) , drop=FALSE, exact=FALSE, verbose=TRUE)
foxa1.filter.combine <- combineMotifs(foxa1.filter, c(f.foxa1, f.ap1), exact=FALSE, name=c("FOXA1", "API"),

filter-class

Class “filter”

Description

This object information to be apply as filter.

Details

This class filter is used to selected motiv objects according the filter’s arguments.

Objects from the Class

Objects can be created by calls of the form new("filter", name, tfname, top, evalueMax, lengthMax, valid).

Slots

name A name or a list of names.
tfname A transcription factor name or a list of TF names.
evalueMax An e-value between 0 and 1.
top Defined the depth of the filter.
lengthMax The maximum motif length.
valid The alignment that should be considered as valid.
Author(s)

Eloi Mercier <emercier@chibi.ubc.ca>

See Also

setFilter, filter, split, combine

Examples

showClass("filter")

Description

Methods for filters object

Usage

## S4 method for signature 'filter'
summary(object)
## S4 method for signature 'filters'
summary(object)
## S4 method for signature 'filter'
names(x)
## S4 method for signature 'filters'
names(x)

Arguments

object An object of class filter.
x An object of class filter.

Author(s)

Eloi Mercier <emercier@chibi.ubc.ca>

See Also

setFilter, filter, split, combine

Examples

showClass("filter")
FOXA1_rGADEM Dataset for FOXA1

Description

This dataset contains results obtained by rGADEM for the FOXA1 transcription factor.

Usage
gadem

References

http://genomebiology.com/2008/9/9/R137

Examples

```r
#####Database and Scores#####
path <- system.file(package="MotIV")
data(jaspar2010)
data(jaspar2010.scores)

#####Input#####
data(FOXA1_rGADEM)
motifs <- getPWM(gadem)
motifs.trimed <- lapply(motifs,trimPWMedge, threshold=1)

#####Analysis#####
foxa1.analysis.jaspar <- motifMatch(inputPWM=motifs,align="SWU",cc="PCC",database=jaspar,DBscores=jaspar.scores,top=5)
summary(foxa1.analysis.jaspar )
```

generateDBScores Database Scores Functions

Description

This functions are used to generate scores of a PWM database.

Usage
generateDBScores(inputDB, cc="PCC", align="SWU", nRand=1000, go=1, ge=0.5)
readDBScores(file)
writeDBScores(x, file)
**Arguments**

- **inputDB**: A list of PWM corresponding to the database.
- **cc**: The metric name to be used:
  - **align**: The Alignment method to be used.
  - **go**: Gap open penalty.
  - **ge**: Gap extension penalty.
  - **nRand**: The number of random PWM to be generated. The more higher it is, the more accurate score will be.
- **file**: A character string naming a file.
- **x**: A numeric matrix corresponding to a score.

**Details**

The score reflects the bias of the database. It is used to compute more precisely e-value alignments.

`generateDBScores` : Based on database properties (suchs as length, zero rate, invariant columns), nRand matrix are generated. A score is calculated for each matrix length with the specified alignment method and metric.

The score is associated to a database and a alignment method and metric so you don’t have to generate it each time you use the same database. Use the `writeDBScores` and `readDBScores` instead.

`readDBScores` : Read a score file.

`writeDBScores` : Write a score file.

**Value**

A numeric matrix. Columns correspond respectively to the first matrix length, second matrix length, variance, mean, matrix number, distance min and max.

**Warning**

Because of each matrix is compare to each other, computing time is exponential. You should be aware of this fact before provided a high nRand. 5000 is a good time/accuracy rate choice.

**Author(s)**

Shaun Mahony, modified by Eloi Mercier <<emercier@chibi.ubc.ca>>

**References**


**See Also**

`readDBScores`, `writeDBScores`

**Examples**

```r
###Database and Scores###
path <- system.file(package="MotIV")
jasper <- readPWMfile(paste(path,"/extdata/jaspar2010.txt",sep=""))
#jaspar.scores <- generateDBScores(inputDB=jaspar,cc="PCC",align="SWU",nRand=1000)
#writeDBScores(jasper.scores,paste(path,"/extdata/jaspar_PCC_SWU.scores",sep=""))
jasper.scores <- readDBScores(paste(path,"/extdata/jaspar2010_PCC_SWU.scores",sep=""))
```
getGademPWM

Recover PWM

Description

This function selects the PWMs contained in an object of type gadem.

Usage

getGademPWM(y)

Arguments

y A gadem object.

Value

A list of PWM.

Author(s)

Eloi Mercier <emercier@chibi.ubc.ca>

Examples

###Database and Scores###
path <- system.file(package="MotIV")
jaspar <- readPWMfile(paste(path,"/extdata/jaspar2010.txt",sep=""))
jaspar.scores <- readDBScores(paste(path,"/extdata/jaspar2010_PCC_SWU.scores",sep=""))

###Input###
data(FOXA1_rGADEM)
# motifs <- getGademPWM(gadem) #deprecated
motifs <- getPWM(gadem)
motifs.trimed <- lapply(motifs,trimPWMedge, threshold=1)

getPWM

Get PWMs from a motiv object

Description

Get PWMs from a motiv object.

Usage

## S4 method for signature 'motiv'
getPWM(x)

Arguments

x An object of class motiv.
jaspar2010

Description
Jaspar database and Jaspar score.

Usage
jaspar
jaspar.scores

Details
Jaspar is a well-known transcription factor database. Version 2010 contents 130 non-redundant matrix of TF binding sites.

The jaspar scores have been computed with Pearson Correlation Coefficient and Smith-Waterman Ungapped alignments.

Source
http://jaspar.genereg.net/

References

See Also
generateDBscores, motifMatch

Examples
#####Database and Scores#####
path <- system.file(package="MotIV")
data(jaspar2010)
data(jaspar2010.scores)

#####Input#####
data(FOXA1_rGADEM)
motifs <- getPWM(gadem)
motifs.trimed <- lapply(motifs,trimPWMedge, threshold=1)

#####Analysis#####
foxa1.analysis.jaspar <- motifMatch(inputPWM=motifs,align="SWU",cc="PCC",database=jaspar,DBscores=jaspar.scores)
summary(Foxa1.analysis.jaspar )
makePWM  

Constructing a pwm object

Description

This function constructs an object of class pwm from a matrix. It checks that the matrix has correct dimensions and that columns add up to 1.0.

Usage

makePWM(pwm, alphabet="DNA")

Arguments

pwm  
Matrix representing the positon weight matrix

alphabet  
Character the alphabet making up the sequence. Currently, only "DNA" is supported.

Value

An object of class pwm.

Author(s)

Oliver Bembom, <bembom@berkeley.edu>

Examples

#mFile <- system.file("Exfiles/pwm1", package="seqLogo")
#m <- read.table(mFile)
#pwm <- makePWM(m)

matches-class  
Class "matches"

Description

This object contains the name of the input motif and all the matches found.

Objects from the Class

Objects can be created by calls of the form new("matches", name, aligns, similarity, valid).

Slots

name  Motif name.

aligns  Alignments found by motifMatch.

similarity  The optional name given to the motif.

valid  The alignment that should be considered as valid.
motifDistances

Author(s)
Eloi Mercier <<emercier@chibi.ubc.ca>>

See Also
motiv.alignments, tf

Examples

    showClass("matches")

motifDistances  Clustering PWMs Computation

Description
Set of functions to perform clustering of PWMs.

Usage

motifDistances(inputPWM, DBscores=jaspar.scores, cc="PCC", align="SWU", top=5, go=1, ge=0.5)
motifHclust(x,...)
motifCutree(tree,k=NULL, h=NULL)

Arguments

inputPWM, DBscores, cc, align, top, go, ge
    Option for the PWMs distances computation. Refer to motifMatch.

x,...
    Arguments to pass to the hclust function. See hclust.

tree, k, h
    Arguments to pass to the cutree function. See cutree.

Details

This function are made to perform motifs clustering.

The ‘motifDistances’ function computes the distances between each pair of motifs using the specified alignment.

The ‘motifHclust’ and ‘motifCutree’ functions are simple redefinition of ‘hclust’ and ‘cutree’.

Author(s)
Eloi Mercier <<emercier@chibi.ubc.ca>>
motifMatch

Examples

```r
#####Database and Scores#####
path <- system.file(package="MotIV")
jaspar <- readPWMfile(paste(path,"/extdata/jaspar2010.txt",sep=""))
jaspar.scores <- readDBScores(paste(path,"/extdata/jaspar2010_PCC_SWU.scores",sep=""))

#####Input#####
data(FOXA1_rGADEM)
motifs <- getPWM(gadem)
motifs.trimed <- lapply(motifs,trimPWMedge, threshold=1)

#####Analysis#####
foxa1.analysis.jaspar <- motifMatch(inputPWM=motifs,align="SWU",cc="PCC",database=jaspar,DBscores=jaspar.scores,top=5)

#####Clustering#####
d <- motifDistances(getPWM(foxa1.analysis.jaspar))
hc <- motifHclust(d)
plot(hc)
f <- motifCutree(hc, k=2)
foxa1.combine <- combineMotifs(foxa1.analysis.jaspar, f, exact=FALSE, name=c("Group1", "Group2"), verbose=TRUE)
```

motifMatch  

Motifs Matches Analysis

### Description ###

Search for motifs matches corresponding to PWM.

### Usage ###

```
motifMatch(inputPWM, database=jaspar, DBscores=jaspar.scores, cc="PCC", align="SWU", top=5, go=1, ge=0.5)
```

### Arguments ###

- **inputPWM**: A list of PWM.
- **database**: A list of PWM corresponding to the database.
- **DBscores**: A matrix object containing the scores associated to the database.
- **cc**: The metric name to be used.
- **align**: The Alignment method to be used.
- **top**: The number of identified transcription factors per motif.
- **go**: Gap open penalty.
- **ge**: Gap extension penalty.

### Details ###

For a set of PWMs given by `inputPWM`, this function realizes alignments with each motif of the database and returns the top best motifs. If no database is provided, the function will use jaspar by loading data(jaspar2010). If no DBscores is given, jaspar.scores from data(jaspar2010_scores) will be used.

The e-value is computed according the metric name cc and is corrected by the DBscores.
motiv-class

Value
A motiv object.

Author(s)
Eloi Mercier <emercier@chibi.ubc.ca>

References
S Mahony, PE Auron, PV Benos, DNA familial binding profiles made easy: comparison of various motif al,

See Also
generateDBScores

Examples

```r
#####Database and Scores#####
path <- system.file(package="MotIV")
jaspar <- readPWMfile(paste(path,"/extdata/jaspar2010.txt",sep=""))
jaspar.scores <- readDBScores(paste(path,"/extdata/jaspar2010_PCC_SWU.scores",sep=""))

#####Input#####
data(FOXA1_rGADEM)
motifs <- getPWM(gadem)
motifs.trimed <- lapply(motifs,trimPWMedge, threshold=1)

#####Analysis#####
foxa1.analysis.jaspar <- motifMatch(inputPWM=motifs,align="SWU",cc="PCC",database=jaspar,DBscores=jaspar.scores,top=5)
summary(foxa1.analysis.jaspar)
```

motiv-class

Class "motiv"

Description
This object contains all informations about the motiv analysis.

Objects from the Class
Objects can be created by calls of the form `new("motiv", input, bestMatch, argv).

Slots
input List of input PWM.
bestMatch Object of class "matches".
argv List of arguments used.

Author(s)
Eloi Mercier <emercier@chibi.ubc.ca>
See Also
matches, alignments, transcriptionFactor

Examples
showClass("motiv")

motiv-methods

Motiv methods

Description
Methods for motiv objects.

Usage
```r
## S4 method for signature 'motiv'
summary(object)
## S4 method for signature 'motiv'
names(x)
## S4 method for signature 'motiv'
length(x)
## S4 method for signature 'motiv'
similarity(x)
## S4 method for signature 'motiv'
x[i,j=ANY, bysim=TRUE, ..., exact=TRUE, ignore.case=FALSE, drop=FALSE]
```

Arguments
- `object`: An object of class `motiv`.
- `x`: An object of class `motiv`.
- `i`: A string representing a motif name.
- `j`: NOT USED.
- `bysim`: If `TRUE`, select by similarity name.
- `...`: Further potential arguments passed to methods.
- `ignore.case`: If `FALSE`, the pattern matching is case sensitive and if `TRUE`, case is ignored during matching.
- `exact`: If `TRUE`, search only for perfect name match.
- `drop`: If `TRUE`, no match motifs will be dropped.

Author(s)
Eloi Mercier <<emercier@chibi.ubc.ca>>

See Also
matches, alignments, tf

Examples
```r
showClass("motiv")
```
Motifs Occurrences and Co-occurrences

Description

Get the number of motifs occurrences and co-occurrences from a rGADEM object.

Usage

occurences(gadem)
cooccurences(x)

Arguments

gadem An object of type rGADEM.
x A contingency table.

Value

occurences returns the contingency table of the number of motifs per sequences.
This object can be put in cooccurences to return the number of sequences where two motifs appear together.

Author(s)

Eloi Mercier <<emercier@chibi.ubc.ca>>

Examples

data("FOXA1_rGADEM")
oc <- occurences(gadem)
ococ <- cooccurences(oc)
oc

plot-methods

Plot Motiv

Description

This functions are used to visualise and validate motif analysis.

Usage

## S4 method for signature 'motiv,ANY'
plot(x, y=NULL, main=NULL, sub=NULL, ncol=0, nrow=0, top=3, bysim=TRUE, rev=FALSE, trim=0.05, cex)

## S4 method for signature 'motiv,gadem'
plot(x, y, sort=FALSE, group=FALSE, main=NULL, sub=NULL, ncol=0, nrow=0, xlim=NULL, correction=TRUE, ... col=c("blue", "red"), border=c("black", "black"), lwd=2, lty=1, nclass=20, bw="nrd0", cex=1, vcol=c("red", "green"))
Arguments

x An object of class motiv.

y The GADEM type object associated with the motiv object.

ncol, nrow A numeric value giving the number of columns and rows to plot.

top A numeric value giving the number of best matches per motif to display.

rev A logical value. If TRUE, print reverse motif for negative strand.

main An overall title for the plot: see title.

sub A sub title for the plot: see 'title'

type What type of plot should be drawn. Possible values are: distribution to display the binding sites distribution within the peaks or distance to show the pairwise distance between motifs.

strand If TRUE, distribution will be plotted for both forward and reverse strand.

group If TRUE, similar motifs will be grouped.

sort If TRUE, motifs will be plotted according to their computed variance.

bysim If TRUE, the 'similar' field (defined with the combine function) will be printed instead of the original name.

xlim A numeric vectors of length 2, giving the x coordinates ranges.

correction If TRUE, corrects the position according to the alignment.

trim A numeric value. Define the minimum information content value for which the logo letters are shown.

col, border, lwd, lty Define respectively the color, the border, the line width and the line type of both curve and histogram. See 'par'.

nclass A numerical value giving the number of class for the histogram.

bw The smoothing bandwidth to be used to calculate the density. See density.

cex, vcol A numerical value giving the amount by which plotting text should be magnified relative to the default.

Details

A single motiv object (usually provided by motifMatch) will plot the list of identified transcription factors for each motif. With rev=TRUE, the transcription factor logo will be printed to correspond to the real alignment instead of original TF PWM.

Giving a motiv object and a gadem object with type="distribution" will show the motif partition within gadem peaks. If strand=TRUE, a distinct distribution is made for forward and reverse strand.

A var.test is automatically made to help distinguish centered distribution. The distribution with lowest variance is assigned as "reference" distribution to compute the var.test statistic. With sort=TRUE, distribution are plotted according decreasing statistic.

type="distance" indicates to compute and plot the distance between each pair of motif. It also provides Venn diagram showing the proportion of common sequences per pair of motif.

The group argument indicates to consider similar motifs as a single motif.

With correction=TRUE the motif position is corrected according to the alignment. It means that the gap/"N" contained in the alignments are removed to give a corrected start and end position.
**readGademPWMFile**

---

### Description

This function is use to read a gadem file containing PWM.

### Usage

```r
readGademPWMFile(file)
```

### Arguments

- **file**: File’s name.

### Details

This function is made to read typically output file from Gadem (v1.2). Standard name is ‘observed-PWMS.txt’.

### Author(s)

Eloi Mercier <<emercier@chibi.ubc.ca>>
### readPWMfile

#### Description

This function is used to read standard Transfac type file.

#### Usage

```r
readPWMfile(file)
```

#### Arguments

- `file` Transfac file's name.

#### Details

This function is designed to read standard Transfac type file. For more information about the format, please refer to [http://mcast.sdsc.edu/doc/transfac-format.html](http://mcast.sdsc.edu/doc/transfac-format.html)

#### Value

A list of matrix.

#### Author(s)

Eloi Mercier <emercier@chibi.ubc.ca>

#### Examples

```r
#####Database and Scores#####
path <- system.file(package="MotIV")
jasper <- readPWMfile(paste(path,"/extdata/jaspar2010.txt",sep=""))
jasper.scores <- readDBScores(paste(path,"/extdata/jaspar2010_PCC_SWU.scores",sep=""))

#####Input#####
data(FOXA1_rGADEM)
motifs <- getPWM(gadem)
motifs.trimed <- lapply(motifs,trimPWMedge, threshold=1)
```
seqLogo2

Plot a sequence logo for a given position weight matrix

Description

This function takes the 4xW position weight matrix of a DNA sequence motif and plots the corresponding sequence logo.

Usage

seqLogo2(pwm, ic.scale=TRUE, xaxis=TRUE, yaxis=TRUE, xfontsize=15, yfontsize=15, vmargins=c(0,0), hmargins=c(0,0), size=1, trim=0)

Arguments

- **pwm**: numeric The 4xW position weight matrix.
- **ic.scale**: logical If TRUE, the height of each column is proportional to its information content. Otherwise, all columns have the same height.
- **xaxis**: logical If TRUE, an X-axis will be plotted.
- **yaxis**: logical If TRUE, a Y-axis will be plotted.
- **xfontsize**: numeric Font size to be used for the X-axis.
- **yfontsize**: numeric Font size to be used for the Y-axis.
- **vmargins**: numeric Vertical margins.
- **hmargins**: numeric Horizontal margins.
- **size**: numeric Graphic size.
- **trim**: numeric Print nucleotide only if the information content is superior to this trim threshold.

Details

Within each column, the height of a given letter is proportional to its frequency at that position. If ic.scale is TRUE, the height of each column in the plot indicates the information content at that position of the motif. Otherwise, the height of all columns are identical.

This is an internal function for the package MotIV. User should prefer the seqLogo function from the package seqLogo to visualize individual motif.

Value

None.

Author(s)

Oliver Bembom, <bembom@berkeley.edu>, modified by Eloi Mercier <<emercier@chibi.ubc.ca>>

Examples

```r
#mFile <- system.file("Exfiles/pwm1", package="seqLogo")
#m <- read.table(mFile)
#pwm <- makePWM(m)
#seqLogo2(pwm)
```
setFilter

Set Motif Filter

Description

This function is used to set a motif filter.

Usage

```r
setFilter(name='', tfname='', evalueMax=1, top=10, lengthMax=100, valid=NULL)
```

Arguments

- **name**: A name or a list of names.
- **tfname**: A transcription factor name or a list of TF names.
- **evalueMax**: An evalue between 0 and 1.
- **top**: Defines the depth of the filter.
- **lengthMax**: The maximum motif length.
- **valid**: The alignment that should be considered as valid.

Value

A filter object.

Author(s)

Eloi Mercier <<emercier@chibi.ubc.ca>>

See Also

`filter`, `split`, `combine`

Examples

```r
#####Database and Scores#####
path <- system.file(package="MotIV")
jaspar <- readPWMfile(paste(path,"/extdata/jaspar2010.txt",sep=""))
jaspar.scores <- readDBScores(paste(path,"/extdata/jaspar2010_PCC_SWU.scores",sep=""))

#####Input#####
data(FOXA1_rGADEM)
motifs <- getPWM(gadem)
motifs.trimed <- lapply(motifs,trimPWMedge, threshold=1)

#####Analysis#####
foxa1.analysis.jaspar <- motifMatch(inputPWM=motifs,align="SWU",cc="PCC",database=jaspar, DBscores=jaspar.scores,top=5)
summary(foxa1.analysis.jaspar )

#####Filters#####
f.foxa1<-setFilter(name="", tfname="FOXA1", top=3, evalueMax=10^-5)
f.ap1 <- setFilter (tfname="AP1", top=3)
f.foxa1.ap1 <- f.foxa1 | f.ap1
```
split-methods

Description

This function splits a 'motiv' object according to filters.

Usage

```r
## S4 method for signature 'motiv,filters'
split(x, f, exact=TRUE, drop=FALSE, verbose=TRUE, ...)
```

Arguments

- `x` An object of class motiv (usually provided by motifMatch).
- `f` A filter or a set of filters for motiv object.
- `drop` If TRUE, no match motifs will be dropped.
- `verbose` If FALSE, no output will be printed.
- `exact` If TRUE, search only for perfect name match.
- `...` Further potential arguments passed to methods.

Details

This function is used to split motifs that correspond to the filters.

Many filters could be passed in argument separated by comma. They will be considered independently (comma is considered as OR).

Value

A list of motiv object.

Author(s)

Eloi Mercier <emercier@chibi.ubc.ca>

See Also

setFilter, filter, combine
### transcriptionFactor-class

**Description**

This object contains the Transcription Factor name and PWM.

**Objects from the Class**

Objects can be created by calls of the form `new("transcriptionFactor", name, pwm).

**Slots**

- `name`  TF name.
- `pwm` TF PWM.

**Author(s)**

Eloi Mercier <eemerier@chibi.ubc.ca>

**See Also**

- `motiv`, `matches`, `alignments`

**Examples**

```r
showClass("transcriptionFactor")
```
**trimPWMedge**  
*Trim PWM edge*

**Description**  
This function is use to cut edges with low information content.

**Usage**  
```r  
trimPWMedge(x, threshold=1)  
```

**Arguments**

- `x`: A matrix representing a PWM.
- `threshold`: A transcription factor name or a list of TF names.

**Value**

A PWM.

**Author(s)**

Eloi Mercier <<emercier@chibi.ubc.ca>>

**See Also**

makePWM

**Examples**

####Database and Scores####
```r  
path <- system.file(package="MotIV")  
jaspar <- readPWMfile(paste(path,"/extdata/jaspar2010.txt",sep=""))  
jaspar.scores <- readDBScores(paste(path,"/extdata/jaspar2010_PCC_SWU.scores",sep=""))  
```

####Input####
```r  
data(FOXA1_rGADEM)  
motifs <- getPWM(gadem)  
motifs.trimed <- lapply(motifs,trimPWMedge, threshold=1)  
```

**viewAlignments**  
*Print Motifs Alignments*

**Description**

This function return a list of the alignments of a motif object for each motif.

**Usage**

```r  
viewAlignments(x)  
```
Arguments

x  An object of class motiv (usually provided by motifMatch).

Details

This function shows the alignments for each motif.

Author(s)

Eloi Mercier <emerrier@chibi.ubc.ca>

See Also

as.data.frame

Examples

##### Database and Scores #####
path <- system.file(package="MotIV")
jaspar <- readPWMfile(paste(path,"/extdata/jaspar2010.txt",sep=""))
jaspar.scores <- readDBScores(paste(path,"/extdata/jaspar2010_PCC_SFWU.scores",sep=""))

##### Input #####
data(FOXA1_rGADEM)
motifs <- getPWM(gadem)
motifs.trimed <- lapply(motifs,trimPWMedge, threshold=1)

##### Analysis #####
foxa1.analysis.jaspar <- motifMatch(inputPWM=motifs, align="SWU", cc="PCC", database=jaspar, DBscores=jaspar.scores, top=5)
summary(foxa1.analysis.jaspar)
viewAlignments(foxa1.analysis.jaspar)

---

viewMotifs-methods  Print Identified Motifs

Description

This function returns a list of the identified motifs contained in a motiv object.

Usage

## S4 method for signature 'motiv'
viewMotifs(x, n=100)

Arguments

x  An object of class motiv (usually provided by motifMatch).

n  The number of motifs shown.

Details

This function shows the number of identified motif.
Value

A list of motifs names.

Author(s)

Eloi Mercier <emercier@chibi.ubc.ca>

Examples

```
# Database and Scores
path <- system.file(package="MotIV")
jaspar <- readPWMfile(paste(path,"/extdata/jaspar2010.txt",sep=""))
jaspar.scores <- readDBScores(paste(path,"/extdata/jaspar2010_PCC_SWU.scores",sep=""))

# Input
data(FOXA1_rGAdEM)
motifs <- getPWM(gadem)
motifs.trimed <- lapply(motifs,trimPWMedge, threshold=1)

# Analysis
foxa1.analysis.jaspar <- motifMatch(inputPWM=motifs,align="SWU",cc="PCC",database=jaspar,DBscores=jaspar.scores,top=5)
viewMotifs(foxa1.analysis.jaspar, 5)
```
Index

*Topic classes
  alignments-class, 2
  filter-class, 8
  filters-methods, 9
  matches-class, 14
  motiv-class, 17
  transcriptionFactor-class, 26

*Topic methods
  as.data.frame, 3
  combineMotifs, 4
  filter, 7
  motif-methods, 18
  plot-methods, 19
  split-methods, 25

*Topic misc
  exportAsRangedData, 5
  exportAsTransfacFile, 6
  FOXA1_rGADEM, 10
  generatedDBScores, 10
  getGademPWM, 12
  jaspar2010, 13
  makePWM, 14
  motifDistances, 15
  motifMatch, 16
  occurrences, 19
  readGademPWMFile, 21
  readPWMFile, 22
  seqLogo2, 23
  setFilter, 24
  trimPWMedge, 27
  viewAlignments, 27
  viewMotifs-methods, 28
  [,motiv,ANY,ANY-method (motiv-methods), 18
  [,motiv-method (motiv-methods), 18
  &,filters,filters-method (filters-methods), 9
  combineMotifs, 4
  combineMotifs,motiv,filters-method
    (combineMotifs), 4
  combineMotifs,motiv,list-method
    (combineMotifs), 4
  combineMotifs-method (combineMotifs), 4
  cooccurrences (occurrences), 19
  exportAsRangedData, 5
  exportAsTransfacFile, 6
  exportAsTransfacFile, list-method
    (exportAsTransfacFile), 6
  exportAsTransfacFile,motiv-method
    (exportAsTransfacFile), 6
  exportAsTransfacFile-methods
    (exportAsTransfacFile), 6
  filter, 7
  filter,motiv,filters-method (filter), 7
  filter,motiv,list-method (filter), 7
  filter-class, 8
  filter-methods (filter), 7
  filters-methods, 9
  FOXA (FOXA1_rGADEM), 10
  FOXA1_rGADEM, 10
  gadem (FOXA1_rGADEM), 10
  generatedDBScores, 10
  getGademPWM, 12
  getPWM, 12
  getPWM,motiv-method (getPWM), 12
  getPWM-methods (getPWM), 12
  jaspar (jaspar2010), 13
  jaspar2010, 13
  length, motiv-method (motiv-methods), 18
  makePWM, 14
  matches-class, 14
  motifCutree (motifDistances), 15
  motifDistances, 15
  motifHclust (motifDistances), 15
  motifMatch, 16
  motiv (motiv-methods), 18

30
motiv-class, 17
motiv-methods, 18
names, filter-method (filters-methods), 9
names, filters-method (filters-methods), 9
names, motiv-method (motiv-methods), 18
names<-, motiv-method (motiv-methods), 18
occurences, 19
plot (plot-methods), 19
plot, motiv, ANY-method (plot-methods), 19
plot, motiv, gadem-method (plot-methods), 19
plot, motiv-method (plot-methods), 19
plot-methods, 19
readDBScores (generateDBScores), 10
readGademPWMFile, 21
readPWMFile, 22
seqLogo2, 23
setFilter, 24
show, filter-method (filters-methods), 9
show, motiv-method (motiv-methods), 18
similarity (motiv-methods), 18
similarity, list-method (motiv-methods), 18
similarity, motiv-method (motiv-methods), 18
split, motiv, filters-method (split-methods), 25
split, motiv, list-method (split-methods), 25
split-methods, 25
summary, filter-method (filters-methods), 9
summary, filters-method (filters-methods), 9
summary, list-method (motiv-methods), 18
summary, motiv-method (motiv-methods), 18
transcriptionFactor-class, 26
trimPWMedge, 27
viewAlignments, 27
viewMotifs (viewMotifs-methods), 28
viewMotifs, motiv-method (viewMotifs-methods), 28
viewMotifs-methods, 28
writeDBScores (generateDBScores), 10