

rnaSeqMap

March 24, 2012

NDplots

Genomic plots based upon NucleotideDistr objects

Description

Various plots of genomic coverage for data from `NucleotideDistr` objects

Usage

```
distrCOVPlot(nd, expts)
distrSIPlot(nd, ex1, ex2, mi, minsup=5)
```

Arguments

<code>nd</code>	NucleotideDistr object
<code>expts</code>	vectors of experiment numbers to plot
<code>ex1, ex2</code>	experiment numbers to plot
<code>mi</code>	threshold in the region mining algorithm
<code>minsup</code>	minimal support - minimal length of the irreducible region found

Author(s)

Michal Okoniewski, Anna Lesniewska

Examples

```
data(sample_data_rnaSeqMap)
rs <- rs.list[[1]]
if (xmapConnected())
{
  nd.cov <- getCoverageFromRS(rs, 1:6)
  distrSIPlot(nd.cov, 1, 3, mi=5, minsup=10)
}
```

NucleotideDistr-class

Numeric distributions by nucleotide - class

Description

An S4 class that inherits from `eSet` and holds all the numeric distributions of functions defined over the genome. The values may include coverage, splicing, fold change, etc. for a region defined by genomic coordinates.

Slots/List Components

Objects of this class contain (at least) the following list components:

`chr`: numeric matrix containing the read counts.

`start`: data.frame containing the library size and group labels.

`end`: data.frame containing the library size and group labels.

`strand`: data.frame containing the library size and group labels.

`start`: data.frame containing the library size and group labels.

Methods

`distrib`s gives the matrix of distributions from `assayData`

`getDistr` gives a single distributions from `assayData` as a vector

`newNucleotideDistr` (`distrib`, `chr`, `start`, `end`, `strand`, `type`="UNKNOWN", `phenoData`=NULL, `featureData`=NULL) constructor from a matrix of data and chromosome coordinates.

Author(s)

Anna Lesniewska, Michal Okoniewski

See Also

`SeqReads`, `NDtransforms`

`RleList2matrix`

RleList2matrix

Description

Function transforms list of Rle objects to matrix.

Usage

```
RleList2matrix(list);
```

Arguments

`list` list of Rle objects.

Value

Produces the full, unpacked coverage matrix from a list of Rle objects. Used to re-format the coverage data.

Author(s)

Michal Okoniewski, Anna Lesniewska

Examples

```
if (xmapConnected())
{
  rs <- newSeqReads(1,1,20000,1)
  rs <- getBamData(rs,1:3)
  nd.cov <- getCoverageFromRS(rs,1:3)
  RleList2matrix(nd.cov@data)
}
```

SeqReads

SeqReads - a container for RNAseq reads

Description

SeqReads objects keep the reads information in the form of a list, containing one matrix of reads per experiment. Matrices of dimension $n \times 2$ should come from a mapping to the regions defined by genome coordinates (chromosome, start, end, strand) in the SeqReads object.

The object may be filled in from the database or from list with read data. It is recommended to create one SeqReads object per gene or intergenic region. The object are used then ot create object of class NucleotideDistr

Usage

```
newSeqReads(chr, start, end, strand, datain=NULL, phenoData=NULL, featureData=NULL)
newSeqReadsFromGene(g)
```

Arguments

<code>chr</code>	Chromosome
<code>start</code>	Start of the region on a chromosome
<code>end</code>	End of the region on a chromosome
<code>strand</code>	Genome strand: 1 or -1
<code>datain</code>	If supplied, it must be a list of matrices of reads start and stop
<code>g</code>	Ensembl identifier of a gene
<code>phenoData</code>	
<code>featureData</code>	
<code>covdesc</code>	Filename for experiment description

Value

Object of a class SeqReads

Author(s)

Michal Okoniewski, Anna Lesniewska

addBamData *addBamData - getting sample data from BAM file.*

Description

Add data from experimental samples stored in BAM file.

Usage

```
addBamData(rs, file, exp, phenoDesc=NULL)
```

Arguments

rs	SeqReads object to modify
file	BAM file to read
exp	Numbers of sample slot in the object
phenoDesc	A vector to add to phenoData

Value

SeqReads object with samples added from the BAM files. List of BAM files comes from the covdesc. The covdesc content becomes phenoData of the object.

Author(s)

Michal Okoniewski, Anna Lesniewska

Examples

```
if (xmapConnected())
{
  rs <- newSeqReads(1,1,20000,1)
  rs <- addBamData(rs,1:3)
}
```

addDataToReadset *addDataToReadset - adding one more sample in the SeqRead on R level*

Description

Add another reads matrix to the readset. No control of region consistency, the matrix needs just 2 columns: starts and ends.

Usage

```
addDataToReadset(rs, datain, spl)
```

Arguments

rs
datain
spl Number or name of the experimental sample

Value

SeqReads object with one more sample added.

Author(s)

Michal Okoniewski, Anna Lesniewska

Examples

```
rs <- newSeqReads(1,1,20000,1)
my.data1 <- rbind(c(1,50), c(3,53), c(11,60))
rs <- addDataToReadset(rs, my.data1, 1)
```

addExperimentsToReadset
 addExperimentsToReadset - getting sample data from the database.

Description

Add data from experimental samples in the xXMAP database to the readset. Connection to the database required.

Usage

```
addExperimentsToReadset(rs, exps)
```

Arguments

rs SeqReads object to modify
exps Vector of numbers of experimental samples in xXMAP

Value

SeqReads object with samples added from the database.

Author(s)

Michal Okoniewski, Anna Lesniewska

Examples

```
if (xmapConnected())
{
  rs <- newSeqReads(1,1,20000,1)
  rs <- addExperimentsToReadset(rs,1:3)
}
```

averageND

averageND, sumND, combineNS, log2ND - operations on distributions

Description

Set of functions to operate on `NucleotideDistr` objects.

`averageND` calculates the mean for samples, `sumND` adds up selected samples' distributions, `combineND` adds two objects with the same size of distribution matrix, `log2ND` transforms all numeric data in the object into log space.

Usage

```
averageND(nd, exps);
sumND(nd, exps);
combineND(nd1, nd2);
log2ND(nd);
```

Arguments

`nd, nd1, nd2` `NucleotideDistr` objects
`exps` a pair of numbers of samples in the experiment

Value

`NucleotideDistr` object of the same type as input objects

Author(s)

Michal Okoniewski, Anna Lesniewska

Examples

```

if (xmapConnected())
{
  rs <- newSeqReads(1,1,20000,1)
  nd.cov <- getCoverageFromRS(rs,1:3)
  nd.avg <- averageND(nd.cov,c(1,3))
  nd.sum <- averageND(nd.cov,c(1,3))
  nd.sum <- combineND(nd.cov,nd.cov)
  nd.log <- log2ND(nd.cov)
}

```

bam2sig

*bam2sig - encapsulated pipeline of finding significant expression***Description**

Reads BAM files according to annotation and produces output table processed with DESeq negative binomial test.

Usage

```
bam2sig(annotlib, covdesc="covdesc", species=NULL, level="gene")
```

Arguments

annotlib	Character table or data frame with columns: chr, start, end, strand, name
covdesc	Name of the file that includes BAM files (experiment description file)
species	Species name - needed for .chr.convert function - to match BAM and annotation chromosome names
level	The level of annotation for calculating the counts: gene, transcript of exon

Value

Output table with significant expression results, as from DESeq

Author(s)

Michal Okoniewski, Anna Lesniewska

Examples

```

if (1==0)
{
  all.g <- all.genes(as.vector=F)
  ss <- sample(1:20000, 10)
  genes <- as.data.frame(all.g[ss,])

  deseqRes <- bam2sig("cassava.db")
  deseqRes[1:10,]
}

```

buildDESeq *buildDESeq - create CountDataSet*

Description

Creates `CountDataSet` from the data in the database using the list of genes supplied - for further analysis with DESeq

Usage

```
buildDESeq(genes, exps, conds=NULL)
```

Arguments

<code>genes</code>	vector of Ensembl gene IDs
<code>exps</code>	vector of experiments
<code>conds</code>	Vector of experimental condition descriptions for the samples

Value

`CountDataSet` object filled with the data of gene-level counts of reads

Author(s)

Michal Okoniewski, Anna Lesniewska

See Also

buildDGEList

Examples

```
if (xmapConnected())
{
  data(sample_data_rnaSeqMap)
  gg <- names(rs.list)
  cds <- buildDESeq(gg, 1:6, c("a", "b", "b", "a", "a", "b"))
}
```

buildDGEList *buildDGEList - create DGEList (edgeR)*

Description

Creates `DGEList` from the data in the database using the list of genes supplied - for further analysis with edgeR

Usage

```
buildDGEList(genes, exps, conds=NULL)
```

Arguments

genes	vector of Ensembl gene IDs
exps	vector of experiments
conds	Vector of experimental condition descriptions for the samples

Value

DGEList object filled with the data of gene-level counts of reads

Author(s)

Michal Okoniewski, Anna Lesniewska

See Also

buildDESeq

Examples

```
if (xmapConnected())
{
  data(sample_data_rnaSeqMap)
  gg <- names(rs.list)
  cds <- buildDGEList(gg, 1:6, c("a", "b", "b", "a", "a", "b"))
}
```

findRegionsAsIR *findRegionsAsIR - finding regions of high coverage using Lindell-Aumann algorithm.*

Description

The function is running Lindell-Aumann algorithm to find regions of irreducible expression on the coverage data in the `NucleotideDistr` object. The function may be used to find the location and boundaries of significant expression of exons and small RNA.

Usage

```
findRegionsAsIR(nd, mi, minsup=5, exp)
```

Arguments

nd	An object of <code>NucleotideDistr</code> class that has coverage values for a given region
mi	The threshold of coverage that makes the region significant
minsup	Minimal support of the numeric association rule - namely, in this case, the minimal length of the discovered region
exp	Sample (experiment) number

Value

IRanges object with irreducible regions with high coverage.

Author(s)

Michal Okoniewski, Anna Lesniewska

Examples

```
if (xmapConnected())
{
  rs <- newSeqReads(1,1,20000,1)
  rs <- addExperimentsToReadset(rs,1:3)
  nd.cov <- getCoverageFromRS(rs,1:3)
  nd.regs <- findRegionsAsND(nd.cov, 10)
}
```

findRegionsAsND *findRegionsAsND - finding regions of high coverage using Lindell-Aumann algorithm.*

Description

The function is running Lindell-Aumann algorithm to find regions of irreducible expression on the coverage data in the `NucleotideDistr` object. The function may be used to find the location and boundaries of significant expression of exons and small RNA.

Usage

```
findRegionsAsND(nd, mi, minsup=5)
```

Arguments

<code>nd</code>	An object of <code>NucleotideDistr</code> class that has coverage values for a given region
<code>mi</code>	The threshold of coverage that makes the region significant
<code>minsup</code>	Minimal support of the numeric association rule - namely, in this case, the minimal length of the discovered region

Value

`NucleotideDistr` object that includes a matrix with zeros where no region was found and the value of `mi` for all the nucleotides included in the region. The type of the object is "REG".

Author(s)

Michal Okoniewski, Anna Lesniewska

Examples

```
if (xmapConnected())
{
  rs <- newSeqReads(1,1,20000,1)
  rs <- addExperimentsToReadset(rs,1:3)
  nd.cov <- getCoverageFromRS(rs,1:3)
  nd.regs <- findRegionsAsND(nd.cov, 10)
}
```

geneInChromosome *geneInChromosome*

Description

Finds all the genes in the given chromosome regions

Usage

```
geneInChromosome(chr, start, end, strand)
```

Arguments

chr	Chromosome
start	Start of the region on a chromosome
end	End of the region on a chromosome
strand	Genome strand: 1 or -1

Value

table of the genes in a given regions, produced with stored procedure

Author(s)

Michal Okoniewski, Anna Lesniewska

Examples

```
if (xmapConnected())
{
  geneInChromosome(1, 1, 80000, 1)
}
```

generators

Generators for synt data and

Description

Various generators for experiments.

Usage

```
generatorAddSquare(nd, deg, length.prop=0.5)
generatorAdd(nd, deg, length.prop=0.5)
generatorMultiply(nd, deg, length.prop=0.5)
generatorTrunc(nd, deg)
generatorSynth(nd, deg, length.prop=0.5)
generatorPeak(nd, deg, sr=10, mult=10)
```

Arguments

<code>nd</code>	nucleotide distribution object
<code>deg</code>	degeneration level for the output profile
<code>length.prop</code>	a fraction of the genome region to be degenerated - (0,1)
<code>sr</code>	distance from the 5' end for the peak
<code>mult</code>	multiplier - how many times the peak is supposed to be higher than the maximum of the distribution

Generators of synthetic and semi-synthetic coverage profiles, for RNA-seq measures testing.

Author(s)

Anna Lesniewska, Michal Okoniewski

Examples

```
rs <- newSeqReads('chr2', 220238268, 220254744, -1)
f <- c("test1.bam", "test2.bam", "test3.bam", "test4.bam", "test5.bam")
ff <- sapply(f, function(x) system.file("extdata", x, package = "rnaSeqMap"))
rs <- getBamData(rs, 1:5, files = ff)
nd <- getCoverageFromRS(rs, 1:5)
generatorTrunc(nd, 0.5)
```

getBamData *getBamData - getting sample data from BAM file.*

Description

Add data from experimental samples stored in BAM file.

Usage

```
getBamData(rs, exps=NULL, files=NULL, unstranded=FALSE, covdesc="covdesc")
```

Arguments

rs	SeqReads object to modify
exps	Vector of numbers of experimental samples
files	Vector of BAM files to read
unstranded	Flag which type of data are using (with distinguishing strand or not)
covdesc	Alternatively, the experiment description file

Value

SeqReads object with samples added from the BAM files. List of BAM files comes from the covdesc. The covdesc content becomes phenoData of the object.

Author(s)

Michal Okoniewski, Anna Lesniewska

Examples

```
if (xmapConnected())
{
  rs <- newSeqReads(1,1,20000,1)
  rs <- getBamData(rs,1:3)
}
```

getCoverageFromRS *getCoverageFromRS - conversion to coverage object*

Description

Calculates the coverage function for the reads encapsulated in the SeqReads object.

Usage

```
getCoverageFromRS(rs, exps)
```

Arguments

`rs` SeqReads object to modify
`exps` Vector of numbers of experimental samples in xXMAP

Value

NucleotideDistr object with coverage matrix in assayData slot and type "COV".

Author(s)

Michal Okoniewski, Anna Lesniewska

Examples

```
if (xmapConnected())
{
  rs <- newSeqReads(1,1,20000,1)
  rs <- addExperimentsToReadset(rs,1:6)
  nd.cov <- getCoverageFromRS(rs,1:3)
}
```

`getExpDescription` *getExpDescription*

Description

Gets the `bio_sample` table from the database. May be used as `phenoData`.

Usage

```
getExpDescription()
```

Value

Table of experimental factors assigned to numbers of samples.

Author(s)

Michal Okoniewski, Anna Lesniewska

getFCFromND	<i>getFCFromND - calculating fold change of coverages</i>
-------------	---

Description

This function calculates the fold change of two sample coverages from a `NucleotideDistr` objects. The coverages are assumed to be after logarithmic transformation, so the function basically subtracts the value and generates new `NucleotideDistr` object with a single vector of fold changes.

Usage

```
getFCFromND(nd, exps)
```

Arguments

<code>nd</code>	<code>NucleotideDistr</code> object with coverages
<code>exps</code>	a pair of numbers of samples in the experiment

Value

`NucleotideDistr` object of type "FC" with a single vector of fold changes

Author(s)

Michal Okoniewski, Anna Lesniewska

Examples

```
if (xmapConnected())
{
  rs <- newSeqReads(1,1,20000,1)
  rs <- addExperimentsToReadset(rs,1:3)
  nd.cov <- getCoverageFromRS(rs,1:3)
  nd.fc <- getFCFromND(nd.cov,c(1,3))
}
```

getSIFromND	<i>getSIFromND - calculating splicing index of two coverages</i>
-------------	--

Description

This function calculates the splicing index value of two sample coverages from a `NucleotideDistr` object. It is assumed that the region in the `NucleotideDistr` is a single gene. Splicing index is calculated in similar way to the implementation for exon Affy microarrays (see Gardina et al, Genome Biology, 2007 for details), but it is run for each nucleotide in the region and instead of gene-level average expression values, it uses sums of reads for both samples.

Usage

```
getSIFromND(nd, exps)
```

Arguments

nd NucleotideDistr object with coverages
exps a pair of numbers of samples in the experiment

Value

NucleotideDistr object of type "FC" with a single vector of splicing index values

Author(s)

Michal Okoniewski, Anna Lesniewska

Examples

```
if (xmapConnected())  
{  
  rs <- newSeqReads(1,1,20000,1)  
  nd.cov <- getCoverageFromRS(rs,1:3)  
  nd.fc <- getSIFromND(nd.cov,c(1,3))  
}
```

getSumsExp

getSumsExp

Description

Gets the sum of reads in all the samples present in the database in the seq_read table

Usage

```
getSumsExp()
```

Value

Vector of sums

Author(s)

Michal Okoniewski, Anna Lesniewska

Examples

```
if (xmapConnected())  
{  
  sums <- getSumsExp()  
  nsums  
}
```

measures

Measures

Description

Various measures to find differential expression.

Usage

```
ks_test(dd)
diff_area(dd, cconst)
diff_derivative_area(dd, cconst)
qq_plot(dd)
qq_derivative_plot(dd)
pp_plot(dd)
pp_derivative_plot(dd)
hump_diff1(dd)
hump_diff2 (dd)
```

Arguments

dd	a matrix with 2 columns for samples and rows for nucleotides, containing coverage data (like from BED files)
cconst	NULL default The measures give various assesment of the difference between two sequencing samples shapes. Full description will follow in the paper.

Author(s)

Anna Lesniewska,Michal Okoniewski

Examples

```
if (xmapConnected())
{
  ks_test(dd)
}
```

normalizations

Normalization Methods

Description

Various normalization methods.

Usage

```

standarizationNormalize(nd)
min_maxNormalize(nd)
densityNormalize(nd)
globalCountsNormalize(nd, sums)

```

Arguments

nd	nucleotide distribution object
sums	sum of reads in a sequencing sample

Normalizations of a single coverage profile for multiple samples contained in the `NucleotideDistr` object. Full description will follow in a paper.

Author(s)

Anna Lesniewska, Michal Okoniewski

Examples

```

rs <- newSeqReads('chr2', 220238268, 220254744, -1)
f <- c("test1.bam", "test2.bam", "test3.bam", "test4.bam", "test5.bam")
ff <- sapply(f, function(x) system.file("extdata", x, package = "rnaSeqMap"))
rs <- getBamData(rs, 1:5, files = ff)
nd <- getCoverageFromRS(rs, 1:5)
min_maxNormalize(nd)

```

normalizeBySum	<i>Normalization of NucleotideDistr by global number of reads</i>
----------------	---

Description

`normalizeBySum` function normalizes the coverage values in `NucleotideDistr` by dividing all the numbers for all samples by the sum of reads for each sample. The number of reads from each sample may be taken from the database by the function `getSumsExp`, which is a wrapper for an appropriate SQL procedure. Alternatively, it is passed directly as a vector of numeric values of the same length as the number of samples analyzed. Such simple normalization allows comparisons of the coverage values for samples with different number of reads

Usage

```
normalizeBySum(nd, r=NULL)
```

Arguments

nd	<code>NucleotideDistr</code> object with raw read counts
r	Vector of numbers. If there is no such parameter, a database procedure summarizing reads is run

Value

NucleotideDistr object

Author(s)

Michal Okoniewski, Anna Lesniewska

See Also

getSumsExp

Examples

```
if (xmapConnected())
{
  rs <- newSeqReads(1,10000,20000,1)
  nd.cov <- getCoverageFromRS(rs,1:3)
  nd.norm <- normalizeBySum(nd.cov)
  nd.norm <- normalizeBySum(nd.cov, r=c(100, 200, 1000))
}
```

parseGff3

parseGff3 - parsing gff3 file format

Description

Parses gff3 file into genes, transcripts and exons.

Usage

```
parseGff3(filegff, fileg="genes.txt", filet="transcripts.txt", filee="exons.txt")
```

Arguments

filegff	Input file in GFF3 format
fileg	Filename for output: genes
filet	Filename for output: transcripts
filee	Filename for output: exons
nofiles	Flag: just optput list, no files

Value

List with elements "genes", "transcripts", "exons" with appropriate tables.

Author(s)

Michal Okoniewski, Anna Lesniewska

Examples

```
if (xmapConnected())
{
  parseGff3("Athaliana.gff3")
}
```

plotGeneCoverage *Genomic plots with rnaSeqMap*

Description

Various plots of genomic coverage for experiments.

Usage

```
plotGeneCoverage(gene_id, ex)
plotRegionCoverage(chr, start, end, strand, ex)
plotExonCoverage (exon_id, ex)
plotCoverageHistogram (chr, start, end, strand, ex, skip)
plotGeneExonCoverage(gene_id, ex)
plotSI(chr, start, end, strand, exp1, exp2 )
```

Arguments

ex	vectors of experiment numbers to plot
exp1, exp2	experiment numbers for splicing index
gene_id	Ensembl gene ID
exon_id	Ensembl exon ID
chr	Chromosome
start	Start position of region on the chromosome
end	Start position of region on the chromosome
strand	Strand
skip	size of the bucket in histogram

Author(s)

Michal Okoniewski, Anna Lesniewska

Examples

```
if (xmapConnected())
{
  plotGeneCoverage( "ENSG00000144567", 1:3) # plotting FAM134A for experiments 1,2,3
  plotRegionCoverage( 2, 220040947, 220050201, 1, 1:3 ) # the same, using coordinates
}
```

readsInRange *readsInRange*

Description

Finds all the reads for a genomic range

Usage

```
readsInRange(chr, start, end, strand, ex)
```

Arguments

chr	Chromosome
start	Start of the region on a chromosome
end	End of the region on a chromosome
strand	Genome strand: 1 or -1
ex	experiment

Value

table of reads, as in the database

Author(s)

Michal Okoniewski, Anna Lesniewska

Examples

```
if (xmapConnected())
{
  tmp <- readsInRange( 1, 10000, 20000, 1,3)
}
```

regionBasedCoverage

regionBasedCoverage - transformation of the region coverage by the Lindell-Aumann regions

Description

The function builds a `NucleotideDistr` object from another object of coverage, using sequential call of Lindell-Aumann algorithm on the same data with a sequence of mi-levels. Each nucleotide is assigned the maximum mi-value of a region that covers it.

The output `NucleotideDistr` object has the distribution without peaks and small drops of coverage, but the trade-off is that the level of coverage are discrete: `seq*maxexp`.

Usage

```
regionBasedCoverage(nd, seqq=1:10, maxexp=20, minsup=5)
```

Arguments

nd	An object of <code>NucleotideDistr</code> class that has coverage values for a given region
seqq	Vector of numbers used to divide the range of coverage for subsequent mi-levels
maxexp	The maximal mi-level for coverage
minsup	Minimal support of the numeric association rule - namely, in this case, the minimal length of the discovered region

Value

NucleotideDistr object that includes a matrix with zeros where no region was found and a maximum of mi-levels used for the sequential region searched. The distributions are similar to coverage, but have removed outliers of coverage peaks and short drops of coverage.

Author(s)

Michal Okoniewski, Anna Lesniewska

Examples

```
if (xmapConnected())
{
  rs <- newSeqReads(1,1,20000,1)
  rs <- addExperimentsToReadset(rs,1:3)
  nd.cov <- getCoverageFromRS(rs,1:3)
  nd.regs <- regionBasedCoverage(nd.cov, 1:10, 100)
  #runs the Lindell-Aumann algorithm at 100, 90, ... and picks maximal mi-level, where th
}
```

regionCoverage *regionCoverage*

Description

Finds all the reads for a genomic range

Usage

```
regionCoverage(chr, start, end, strand, ex, db = "FALSE" )
```

Arguments

chr	Chromosome
start	Start of the region on a chromosome
end	End of the region on a chromosome
strand	Genome strand: 1 or -1
ex	experiment
db	Use database (SQL) implementation of the algorithm

Value

coverage vector, independent from `NucleotideDistr`

Author(s)

Michal Okoniewski, Anna Lesniewska

Examples

```
if (xmapConnected())
{
  tmp <- regionCoverage( 1, 10000, 20000, 1,3)
}
```

rs.list

Example of sequencing data for rnaSeqMap library

Description

A fragment of sequencing data from 6 samples - human.

Usage

```
data(sample_data_rnaSeqMap)
```

Format

A list with 17 `SeqReads` objects, each with sequencing reads from 6 samples sequenced with ABI SOLID machine.

Examples

```
data(sample_data_rnaSeqMap)
length(rs.list)
geneIrs <- rs.list[[1]]
```

setSpecies

setSpecies

Description

Sets the species name for chromosomes X, Y and MT translation into consecutive numbers. If you use `xmap.connect`, no need to call `setSpecies`. Both set the internal variable of `xmapcore`.

Usage

```
setSpecies(name=NULL)
```

Arguments

name Species name

Author(s)

Michal Okoniewski, Anna Lesniewska

Examples

```
setSpecies("mus_musculus")
```

spaceInChromosome *spaceInChromosome*

Description

Finds all the intergenic spaces in the given chromosome region

Usage

```
spaceInChromosome(chr, start, end, strand)
```

Arguments

chr	Chromosome
start	Start of the region on a chromosome
end	End of the region on a chromosome
strand	Genome strand: 1 or -1

Value

table of the intergenic spaces in a given regions, produced with stored procedure

Author(s)

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Examples

```
if (xmapConnected())  
{  
  spaceInChromosome(1, 1, 80000, 1)  
}
```

`xmapConnected` *xmapConnected*

Description

Checks if the connection to the xmap database has been already done. If not, use `xmap.connect`.

Usage

`xmapConnected()`

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