Package: blockmatrix (via r-universe)

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Title Tools to Solve Algebraic Systems with Partitioned Matrices

Type Package

Author Emanuele Cordano

Description Some elementary matrix algebra tools are implemented to manage block matrices or partitioned matrix, i.e. ``matrix of matrices" (http://en.wikipedia.org/wiki/Block_matrix). The block matrix is here defined as a new S3 object. In this package, some methods for ``matrix" object are rewritten for ``blockmatrix" object. New methods are implemented. This package was created to solve equation systems with block matrices for the analysis of environmental vector time series . Bugs/comments/questions/collaboration of any kind are warmly welcomed.

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Depends R (>= 2.13)

URL https://github.com/ecor/blockmatrix

Repository https://ecor.r-universe.dev

RemoteUrl https://github.com/ecor/blockmatrix

RemoteRef HEAD

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Contents

`as.blockmatrix` *Coerces to a Blockmatrix*

Description

Coerces to a Blockmatrix

`as.blockmatrix` S3 method for `blockmatrix`, `matrix` and `NULL` object

Usage

```
as.blockmatrix(M = NULL, ...)

## Default S3 method:
as.blockmatrix(M, adjust_zero = TRUE, zero_element = "0",
  ...)

## S3 method for class 'blockmatrix'
as.blockmatrix(M, adjust_zero = TRUE,
  add_zero_matrix = FALSE, zero_element = "0", ...)

## S3 method for class 'matrix'
as.blockmatrix(M, nrowe = nrow(M), ncole = ncol(M),
  nrow = NULL, ncol = NULL, adjust_zero = TRUE, zero_element = "0", ...)

## Default S3 method:
as.blockmatrix(M, adjust_zero = TRUE, zero_element = "0",
  ...)

## S3 method for class 'numeric'
as.blockmatrix(M, adjust_zero = TRUE, zero_element = "0",
  ...)
```

Arguments

M	a matrix or blockmatrix object
...	further arguments
adjust_zero	logical value. If TRUE (Default) it replaces the zero matrices with zero_element.
zero_element	see ncol_elements or nrow_elements
add_zero_matrix	logical value. If TRUE it adds a zero-element element matrix as an object called zero_element in the blockmatrix
nrowe	number of rows for each block (element of the blockmatrix)
ncole	number of columns for each block (element of the blockmatrix)
nrow	number of rows for block-matrix
ncol	number of columns of blockmatrix

Details

In case of coercion from a matrix, ncole and/or ncol must be a submultiple of the number of columns of M; nrowe and/or nrow must be a submultiple of the number of rows of M.

Author(s)

Emanuele Cordano

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as.matrix.blockmatrix as.matrix *S3 method for* blockmatrix *object*

Description

as.matrix S3 method for blockmatrix object

Usage

```
## S3 method for class 'blockmatrix'
as.matrix(x, zero_element = "0", ...)
```

Arguments

x	a blockmatrix object
zero_element	(see ncol_elements or nrow_elements)
...	further arguments (see ncol_elements or nrow_elements)

Author(s)

Emanuele Cordano

`blockmatmult` *implements the implents betwwen two blockmatrix (see* `matmult` *for* `matrx` *objects)*

Description

`blockmatmult` implements the implents betwwen two blockmatrix (see `matmult` for `matrx` objects)

Usage

```
blockmatmult(x, y, ...)
```

Arguments

`x, y`	`blockmatrix` objects
`...`	further arguments

Value

The inner product between `x` and `y` as a `blockmatrix` object

Author(s)

Emanuele Cordano

`blockmatrix` *This function builds a blockmatrix*

Description

This function builds a blockmatrix

Usage

```
blockmatrix(dim, value = NULL, names = NULL, list = NULL,
  use.as.blockmatrix = TRUE, adjust_zero = TRUE, add_zero_matrix = FALSE,
  zero_element = "0", ...)
```

Arguments

dim	dimension of a block-matrix
value	matrix containing the indices (names) of blockmatrix element. If missing, it is NULL (Default). (sse value
names	charcarcter vector containing the names for each matrix-type element of the block-matrix
list	list containing the matrices to be inserted into the block-matrix. If NULL (Default) the matrix are faken from ...
use.as.blockmatrix	logical value. If TRUE (Default) the method as.blockmatrix for blockmatrix object is applied to the output blockmatrix before being returned.
adjust_zero, add_zero_matrix, zero_element	arguments passed to as.blockmatrix
...	elements of the block-matrix.

Author(s)

Emanuele Cordano

See Also

as.blockmatrix

Examples

```
rm(list=ls())
library(blockmatrix)

A <- array(rnorm(9,mean=1),c(3,3))
B <- 0 #array(rnorm(9,mean=2),c(3,3))
C <- 0
D <- array(rnorm(9,mean=4),c(3,3))
F <- array(rnorm(9,mean=10),c(3,3))

M <- blockmatrix(names=c("A","0","D","0"),A=A,D=D,dim=c(2,2))
E <- blockmatrix(names=c("0","F","D","0"),F=F,D=D,dim=c(2,2))

R <- M+E
S <- solve(R)
P <- blockmatmult(R,E)

l <- list(A=A,B=B,C=C,D=D,F=F)
mv <- array(c("A","B","C","D","F","F"),c(3,2))
BB <- blockmatrix(value=mv,list=l)
```

dim.blockmatrix dim *S3 method for* blockmatrix *object*

Description

dim S3 method for blockmatrix object

Usage

```
## S3 method for class 'blockmatrix'
dim(x)
```

Arguments

x	a blockmatrix object

Author(s)

Emanuele Cordano

is.zero.blockmatrix *is.zero.bolockmatrix*

Description

is.zero.bolockmatrix

Usage

```
is.zero.blockmatrix(M, not.a.blockmatrix = FALSE)
```

Arguments

M	a blockmatrix object
not.a.blockmatrix	value to be returned in case M is not a a blockmatrix object

Value

logical value in case M is a zero blockmatrix

Author(s)

Emanuele Cordano

length.blockmatrix *length S3 method for* blockmatrix *object*

Description

length S3 method for blockmatrix object

Usage

```
## S3 method for class 'blockmatrix'
length(x)
```

Arguments

x	a blockmatrix object

Author(s)

Emanuele Cordano

Math.blockmatrix *Math and* Ops *group of S3 methods for* blockmatrix *object*

Description

Math and Ops group of S3 methods for blockmatrix object

Usage

```
## S3 method for class 'blockmatrix'
Math(x, as.blockmatrix = TRUE, ...)

## S3 method for class 'blockmatrix'
Ops(e1, e2)
```

Arguments

x, e1, e2	blockmatrix objects
as.blockmatrix	logical value. If TRUE (Default), the output is a blockmatrix object
...	further arguments

Author(s)

Emanuele Cordano

names.blockmatrix names *S3 method for* blockmatrix *object*

Description

names S3 method for blockmatrix object

Usage

```
## S3 method for class 'blockmatrix'
names(x)
```

Arguments

x	a blockmatrix object

Author(s)

Emanuele Cordano

names<-.blockmatrix names<- *S3 Replacement method for* blockmatrix *object*

Description

names<- S3 Replacement method for blockmatrix object

Usage

```
## S3 replacement method for class 'blockmatrix'
 names(x) <- value
```

Arguments

x	a blockmatrix object
value	character vector with the new names replacing the old names

Value

x with new names and replaced names in the value matrix.

Author(s)

Emanuele Cordano

Examples

```
library(blockmatrix)

M <- as.blockmatrix(array(rnorm(100),c(10,10)),nrow=2,ncol=2)


pn <- paste("p",names(M),sep="")
names(M) <- pn
```

`ncol.blockmatrix` `ncol` *S3 method for* `blockmatrix` *object*

Description

`ncol` S3 method for `blockmatrix` object

Usage

```
## S3 method for class 'blockmatrix'
ncol(M)
```

Arguments

`M`	a `blockmatrix` object

Value

Numbner of columns of blockmatrix `M`

Author(s)

Emanuele Cordano

`ncol_elements` `ncol_elements` *S3 method for* `blockmatrix` *object*

Description

`ncol_elements` S3 method for `blockmatrix` object

`ncol_elements` S3 method for `blockmatrix` object

Usage

```
ncol_elements(M, zero_element = "0", ...)

## Default S3 method:
ncol_elements(M, zero_element = "0", ...)

## S3 method for class 'blockmatrix'
ncol_elements(M, zero_element = "0", ...)
```

Arguments

M	a blockmatrix object
zero_element	character value indicating a zero matrix. Default is "0"
...	further arguments

Value

The number of columns of a matrix-type element of M. It is NA if the elements has different number of columns.

Author(s)

Emanuele Cordano

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nrow.blockmatrix nrow *S3 method for* blockmatrix *object*

Description

nrow S3 method for blockmatrix object

Usage

```
## S3 method for class 'blockmatrix'
nrow(M)
```

Arguments

M	a blockmatrix object

Value

Number of rows of blockmatrix M

Author(s)

Emanuele Cordano

nrow_elements nrow_elements *S3 method for* blockmatrix *object*

Description

nrow_elements S3 method for blockmatrix object

nrow_elements S3 method for blockmatrix object

Usage

```
nrow_elements(M, zero_element = "0", ...)

## Default S3 method:
nrow_elements(M, zero_element = "0", ...)

## S3 method for class 'blockmatrix'
nrow_elements(M, zero_element = "0", ...)
```

Arguments

M	a blockmatrix object
zero_element	character value indicating a zero matrix. Default is "0"
...	further arguments

Value

The number of rows of a matrix-type element of M. It is NA if the elements has different number of rows.

Author(s)

Emanuele Cordano

solve.blockmatrix *solve*

Description

dim S3 solve for blockmatrix object

Usage

```
## S3 method for class 'blockmatrix'
solve(a, b = NULL, as.blockmatrix = TRUE, ...)
```

Arguments

a	a blockmatrix or numeric object
b	a blockmatrix or numeric object. If omitted, it is NULL. See Details.
as.blockmatrix	logical value. If TRUE (Default), the output is a blockmatrix object
...	further arguments for method solve

Value

the object x such that a * x = b where * is the matrix product.

Note

If b is missing, i.e. NULL, it will be replaced by the corresponding identity matrix. So x is calculated as the right inverse of a. The matrix system must be nonsingular and nonhomogeneous.

Author(s)

Emanuele Cordano

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t.blockmatrix t *'transpose' S3 method for* blockmatrix *object*

Description

t 'transpose' S3 method for blockmatrix object

Usage

```
## S3 method for class 'blockmatrix'
t(x)
```

Arguments

x	a blockmatrix object

Author(s)

Emanuele Cordano

value value *S3 method for* blockmatrix *object*

Description

value S3 method for blockmatrix object

value S3 method for blockmatrix object

Usage

```
value(M)

## Default S3 method:
value(M)

## S3 method for class 'blockmatrix'
value(M)
```

Arguments

M	a blockmatrix object

Value

The character matrix without numerical values (e.g. only the matrix M$value)

Author(s)

Emanuele Cordano

value<- value<- *S3 Replacement method for* blockmatrix *object*

Description

value<- S3 Replacement method for blockmatrix object

value<- S3 Replacement method for blockmatrix object

Usage

```
value(M) <- value

## Default S3 replacement method:
 value(M) <- value

## S3 replacement method for class 'blockmatrix'
 value(M) <- value
```

Arguments

M	a blockmatrix object
value	object replaced matrix

Value

Replaces M$value with a new matrix value

Author(s)

Emanuele Cordano

[.blockmatrix [*S3 method for* blockmatrix *object*

Description

[S3 method for blockmatrix object

Usage

```
## S3 method for class 'blockmatrix'
 M[i = 1:nrow(M), j = 1:ncol(M),numeric_value=TRUE,blockmatrix=FALSE,...]
```

Arguments

M	a blockmatrix object
i, j	matrix indices (numerical or character)
numeric_value	logical value . If TRUE (Default if i,j have both length 1) and i,j have both length 1, a i,j numeric matrix is returened.
blockmatrix	logical value. If TRUE (Default if i or j have length greater than 1) a blockmatrix is returned.
...	further argument for [method

Value

The i,j matrix as a numarical matrix if blockmatrix is FALSE, otherwise the returen oblect is a blockmatrix object. In case i is a character vector, the method returns a list of objects with name containing in i and taken from M.

Author(s)

Emanuele Cordano

`[<-.blockmatrix` *'[<-' S3 Replacement method for* `blockmatrix` *object*

Description

'[<-' S3 Replacement method for `blockmatrix` object

Usage

```
## S3 replacement method for class 'blockmatrix'
M[i = 1:nrow(M), j = 1:ncol(M)] <- value
```

Arguments

`M`	a `blockmatrix` object
`i, j`	matrix indices (numerical or character)
`value`	a `blockmatrix` object to be replaced

Value

The "replaced" `blockmatrix` object.

Note

In case `i` is a character vector, the elements whose names is in `value` is replaced.

Author(s)

Emanuele Cordano

Examples

```
rm(list=ls())
library(blockmatrix)
A <- array(rnorm(9,mean=1),c(3,3))
B <- 0 #array(rnorm(9,mean=2),c(3,3))
C <- 0
D <- array(rnorm(9,mean=4),c(3,3))
F <- array(rnorm(9,mean=10),c(3,3))
M <- blockmatrix(names=c("A","0","D","0"),A=A,D=D,dim=c(2,2))
E <- blockmatrix(names=c("0","F","D","0"),F=F,D=D,dim=c(2,2))
E[,1] <- M[,1]
```

Index