Package 'umfpackr'

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Type Package

Title Sparse linear algebra with UMFPACK

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Description This package contains methods for solving linear and non-linear systems of equations using the sparse linear algebra package UMFPACK.

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Encoding UTF-8

LazyData true

LinkingTo Rcpp

Imports Rcpp

Depends methods, Matrix

RoxygenNote 6.1.1

Suggests testthat, nleqslv

R topics documented:

`umf_solve` *Solves the system of linear equations $Ax = b$ using UMFPACK*

Description

Solves the system of linear equations $Ax = b$ using UMFPACK

Usage

```
umf_solve(a, b)
```

Arguments

a	an object of class dgCMatrix (see dgCMatrix-class)
b	the vector b

Value

the solution x

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umf_solve_nl *Solves a system of non-linear equations $F(x) = 0$ using UMFPACK*

Description

Solves a system of non-linear equations $F(x) = 0$ using UMFPACK

Usage

```
umf_solve_nl(start, fn, jac, ..., control = list(), global = c("no",
  "cline"), scaling = c("no", "col"))
```

Arguments

start	initial guess of the solution x
fn	the function F
jac	a function returning the Jacobian of the function as a dgCMatrix object
...	arguments passed to fn and jac
control	a list with control parameters. See Details.
global	The global strategy. Possible values are "no" (no global strategy, the default) and "cline" (cubic line search) (cubic line search)
scaling	The scaling method. The default is no scaling. See Details.

Details

Control options: Argument control is a named list containing one or more of the following components:

ftol The function value tolerance. Convergence is reached if the largest function value is smaller than ftol. The default value is 1e-8.

xtol The relative step size tolerance. When the relative step size is smaller than xtol, then the iteration is stopped. The default value is 1e-8.

maxiter The maximum number of iterations. The default is 20.

`trace` A logical. If `TRUE` then the progress of the iteraton is printed. The default is `FALSE`.

`silent` A logical. If `TRUE` then all output is suppressed. The default is `FALSE`.

`allow_singular` A logical value (default `FALSE`) indicating if a small correction to the Jacobian is applied when it is singular or too ill-conditioned. The method used is similar to a Levenberg-Marquardt correction and is explained in Dennis and Schnabel (1996) on page 151. The correction is only applied if the estimated inverse condition of the Jacobian is smaller than or equal to `cndtol` (see below).

`cndtol` The tolerance of test for ill conditioning of the Jacobian when applying a correction of the Jacobian (see above). The default value is 0, which means that the correction is only applied if the jacobian is exactly singular.

`acc_cnd` A logical (default `FALSE`) indicating if the inverse condition is estimated accurately or approximately. For large matrices an accurate calculation can require a lot of time.

Scaling: TODO: DESCRIBE SCALING METHODS

Value

a list with the following components:

`solved`	A logical equal to `TRUE` if convergence of the function values has been achieved.
`iter`	the number of iterations
`x`	the final values of x
`fval`	the function value
`message`	A string equal to `"ok"` if a solution has been found. Otherwise it describes the reason why the iteration was stopped without success

Examples

```
library(umfpackr)

dslnex <- function(x, c) {
   y <- numeric(2)
   y[1] <- x[1]^2 + x[2]^2 - c
   y[2] <- exp(x[1]-1) + x[2]^3 - c
   y
}

jacdsln <- function(x, c) {
   n <- length(x)
   Df <- matrix(numeric(n*n),n,n)
   Df[1,1] <- 2*x[1]
   Df[1,2] <- 2*x[2]
   Df[2,1] <- exp(x[1]-1)
   Df[2,2] <- 3*x[2]^2

   return(as(Df, "dgCMatrix"))
}


xstart <- c(2,3)
```

```
print(umf_solve_nl(xstart, dslnex, jacdsln, c = 2,
                   control = list(trace = TRUE)))
```

Index