

**NAME**

CUTEST\_csgr\_threaded – CUTEst tool to evaluate constraints gradients and gradient of objective/Lagrangian function.

**SYNOPSIS**

CALL CUTEST\_csgr\_threaded( status, n, m, X, Y, grlagf, nnzj, lj, J\_val, J\_var, J\_fun, thread )

**DESCRIPTION**

The CUTEST\_csgr\_threaded subroutine evaluates the gradients of the general constraints and of either the objective function or the Lagrangian function  $l(x, y) = f(x) + y^T c(x)$  corresponding to the problem decoded from a SIF file by the script *sifdecode* at the point  $(x, y) = (X, Y)$ . It also evaluates the Hessian matrix of the Lagrangian function at  $(x, y)$ . The gradients are stored in a sparse format.

The problem under consideration is to minimize or maximize an objective function  $f(x)$  over all  $x \in R^n$  subject to general equations  $c_i(x) = 0$ , ( $i \in 1, \dots, m_E$ ), general inequalities  $c_i^l(x) \leq c_i(x) \leq c_i^u(x)$ , ( $i \in m_E + 1, \dots, m$ ), and simple bounds  $x^l \leq x \leq x^u$ . The objective function is group-partially separable and all constraint functions are partially separable.

**ARGUMENTS**

The arguments of CUTEST\_csgr\_threaded are as follows

**status** [out] - integer

the output status: 0 for a successful call, 1 for an array allocation/deallocation error, 2 for an array bound error, 3 for an evaluation error, 4 for an out-of-range thread,

**n** [in] - integer

the number of variables for the problem,

**m** [in] - integer

the total number of general constraints,

**X** [in] - real/double precision

an array which gives the current estimate of the solution of the problem,

**Y** [in] - real/double precision

an array which should give the Lagrange multipliers whenever grlagf is set .TRUE. but need not otherwise be set,

**grlagf** [in] - logical

a logical variable which should be set .TRUE. if the gradient of the Lagrangian function is required and .FALSE. if the gradient of the objective function is sought,

**nnzj** [out] - integer

the number of nonzeros in J\_val,

**lj** [in] - integer

the actual declared dimensions of J\_val, J\_var and J\_fun,

**J\_val** [out] - real/double precision

an array which gives the values of the nonzeros of the gradients of the objective, or Lagrangian, and general constraint functions evaluated at X and Y. The i-th entry of J\_val gives the value of the derivative with respect to variable J\_var(i) of function J\_fun(i),

**J\_var** [out] - integer

an array whose i-th component is the index of the variable with respect to which J\_val(i) is the derivative,

**J\_fun** [out] - integer

an array whose i-th component is the index of the problem function whose value J\_val(i) is the derivative. J\_fun(i) = 0 indicates the objective function whenever grlagf is .FALSE. or the Lagrangian function when grlagf is .TRUE., while J\_fun(i) = j > 0 indicates the j-th general constraint function,

**thread** [in] - integer

thread chosen for the evaluation; threads are numbered from 1 to the value threads set when calling CUTEst\_csetup\_threaded.

## AUTHORS

I. Bongartz, A.R. Conn, N.I.M. Gould, D. Orban and Ph.L. Toint

## SEE ALSO

*CUTEr (and SifDec): A Constrained and Unconstrained Testing Environment, revisited,*

N.I.M. Gould, D. Orban and Ph.L. Toint,

ACM TOMS, **29**:4, pp.373-394, 2003.

*CUTE: Constrained and Unconstrained Testing Environment*, I. Bongartz, A.R. Conn, N.I.M. Gould and Ph.L. Toint, TOMS, **21**:1, pp.123-160, 1995.

cutest\_ugr\_threaded(3M), cutest\_cgr\_threaded(3M), sifdecode(1).

**NAME**

CUTEST\_csgr\_threaded – CUTEst tool to evaluate constraints gradients and gradient of objective/Lagrangian function.

**SYNOPSIS**

CALL CUTEST\_csgr\_threaded( status, n, m, X, Y, grlagf, nnzj, lj, J\_val, J\_var, J\_fun, thread )

**DESCRIPTION**

The CUTEST\_csgr\_threaded subroutine evaluates the gradients of the general constraints and of either the objective function or the Lagrangian function  $l(x, y) = f(x) + y^T c(x)$  corresponding to the problem decoded from a SIF file by the script *sifdecode* at the point  $(x, y) = (X, Y)$ . It also evaluates the Hessian matrix of the Lagrangian function at  $(x, y)$ . The gradients are stored in a sparse format.

The problem under consideration is to minimize or maximize an objective function  $f(x)$  over all  $x \in R^n$  subject to general equations  $c_i(x) = 0$ , ( $i \in 1, \dots, m_E$ ), general inequalities  $c_i^l(x) \leq c_i(x) \leq c_i^u(x)$ , ( $i \in m_E + 1, \dots, m$ ), and simple bounds  $x^l \leq x \leq x^u$ . The objective function is group-partially separable and all constraint functions are partially separable.

**ARGUMENTS**

The arguments of CUTEST\_csgr\_threaded are as follows

**status** [out] - integer

the output status: 0 for a successful call, 1 for an array allocation/deallocation error, 2 for an array bound error, 3 for an evaluation error, 4 for an out-of-range thread,

**n** [in] - integer

the number of variables for the problem,

**m** [in] - integer

the total number of general constraints,

**X** [in] - real/double precision

an array which gives the current estimate of the solution of the problem,

**Y** [in] - real/double precision

an array which should give the Lagrange multipliers whenever grlagf is set .TRUE. but need not otherwise be set,

**grlagf** [in] - logical

a logical variable which should be set .TRUE. if the gradient of the Lagrangian function is required and .FALSE. if the gradient of the objective function is sought,

**nnzj** [out] - integer

the number of nonzeros in J\_val,

**lj** [in] - integer

the actual declared dimensions of J\_val, J\_var and J\_fun,

**J\_val** [out] - real/double precision

an array which gives the values of the nonzeros of the gradients of the objective, or Lagrangian, and general constraint functions evaluated at X and Y. The i-th entry of J\_val gives the value of the derivative with respect to variable J\_var(i) of function J\_fun(i),

**J\_var** [out] - integer

an array whose i-th component is the index of the variable with respect to which J\_val(i) is the derivative,

**J\_fun** [out] - integer

an array whose i-th component is the index of the problem function whose value J\_val(i) is the derivative. J\_fun(i) = 0 indicates the objective function whenever grlagf is .FALSE. or the Lagrangian function when grlagf is .TRUE., while J\_fun(i) = j > 0 indicates the j-th general constraint function,

**thread** [in] - integer

thread chosen for the evaluation; threads are numbered from 1 to the value threads set when calling CUTEst\_csetup\_threaded.

## AUTHORS

I. Bongartz, A.R. Conn, N.I.M. Gould, D. Orban and Ph.L. Toint

## SEE ALSO

*CUTEr (and SifDec): A Constrained and Unconstrained Testing Environment, revisited,*

N.I.M. Gould, D. Orban and Ph.L. Toint,

ACM TOMS, **29**:4, pp.373-394, 2003.

*CUTE: Constrained and Unconstrained Testing Environment*, I. Bongartz, A.R. Conn, N.I.M. Gould and Ph.L. Toint, TOMS, **21**:1, pp.123-160, 1995.

cutest\_ugr\_threaded(3M), cutest\_cgr\_threaded(3M), sifdecode(1).