NAME

CUTEST_csgrsh − CUTEst tool to evaluate constraints gradients, sparse Lagrangian Hessian and the gradient of either the objective/Lagrangian in sparse format.

SYNOPSIS

CALL CUTEST_csgrsh(status, n, m, X, Y, grlagf, nnzj, lj, J_val, J_var, J_fun, nnzh, lh, H_val, H_row, H_col)

For real rather than double precision arguments, instead

CALL CUTEST_csgrsh_s(...)

and for quadruple precision arguments, when available,

CALL CUTEST_csgrsh_q(...)

DESCRIPTION

The CUTEST_csgrsh subroutine evaluates the gradients of the general constraints, the Hessian matrix of the Lagrangian function $l(x, y) = f(x) + y^T c(x)$ and the gradient of either the objective function or the Lagrangian corresponding to the problem decoded from a SIF file by the script *sifdecoder* at the point $(x, y) =$ (X,Y). The data is stored in 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 $c_i(x) = 0$, $(i \in 1, \ldots, m_E)$, general inequalities $c_i^l \leq c_i(x) \leq c_i^u$, $(i \in m_E + 1, \ldots, m)$, 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_csgrsh are as follows

status [out] - integer
: the outputr status: 0 for a succesful call, 1 for an array allocation/deallocation error, 2 for an array bound error, 3 for an evaluation error,

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,

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,

Y [in] - real/double precision
: an array which should give the Lagrange multipliers,

nnzj [out] - integer
the number of nonzeros in J_val,

lj [in] - integer
the actual declared dimensions of J_val, J_fun and J_var,

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,

nnzh [out] - integer
the number of nonzeros in H_val,

lh [in] - integer
the actual declared dimensions of H_val, H_row and H_col,

H_val [out] - real/double precision
an array which gives the value of the Hessian matrix of the Lagrangian function evaluated at X and Y. The i-th entry of H_val gives the value of the nonzero in row H_row(i) and column H_col(i). Only the upper triangular part of the Hessian is stored,

H_row [out] - integer
an array which gives the row indices of the nonzeros of the Hessian matrix of the Lagrangian function evaluated at X and Y,

H_col [out] - integer
an array which gives the column indices of the nonzeros of the Hessian matrix of the Lagrangian function evaluated at X and Y.

NOTE

Calling this routine is more efficient than separate calls to CUTEST_csgr and CUTEST_csh.

AUTHORS

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SEE ALSO

CUTEst: a Constrained and Unconstrained Testing Environment with safe threads,
N.I.M. Gould, D. Orban and Ph.L. Toint,
Computational Optimization and Applications **60**:3, pp.545-557, 2014.

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,
ACM TOMS, **21**:1, pp.123-160, 1995.

cutest_cgr(3M), sifdecoder(1).