NAME

CSGREH − CUTEr tool to evaluate both the constraint gradients, the Lagrangian Hessian in finite element format and the gradient of either the objective/Lagrangian in sparse format.

SYNOPSIS

CALL CSGREH(N, M, X, GRLAGF, LV, V, NNZJ, LCJAC, CJAC, INDVAR, INDFUN, NE, IRNHI, LIRNHI, LE, IPRNHI, HI, LHI, IPRHI, BYROWS)

DESCRIPTION

The CSGREH subroutine evaluates both the gradients of the general constraint functions and the Hessian matrix of the Lagrangian function for the problem decoded into OUTSDIF.d at the point X in the constrained minimization case. This Hessian matrix is stored as a sparse matrix in finite element format

H = sum H_i (i=1,...,NE),

where each square symmetric element H_i involves a small subset of the rows of the Hessian matrix. The subroutine also obtains the gradient of either the objective function or the Lagrangian function, stored in a sparse format.

By convention, the signs of the Lagrange multipliers V are set so the Lagrangian function can be written as *L(X, V) = f(X) + < c(X), V >*.

ARGUMENTS

The arguments of CSGREH are as follows

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,

LV [in] - integer
: the actual declared dimension of V,

V [in] - real/double precision
: an array which gives the Lagrange multipliers,

NNZJ [out] - integer
: the number of nonzeros in CJAC,

IRNHI [out] - integer
: an array which holds a list of the row indices involved which each element. Those for element i directly preceed those for element i+1, i = 1, ..., NE-1. Since the elements are symmetric, IRNHI is also the list of column indices involved with each element.

LCJAC [in] - integer
: the actual declared dimensions of CJAC, INDVAR and INDFUN,

CJAC [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 V. The i-th entry of CJAC gives the value of the derivative with respect to variable INDVAR(i) of function INDFUN(i),

INDVAR [out] - integer
: an array whose i-th component is the index of the variable with respect to which CJAC(i) is the derivative,

INDFUN [out] - integer
: an array whose i-th component is the index of the problem function whose value CJAC(i) is the derivative. INDFUN(i) = 0 indicates the objective function whenever GRLAGF is .FALSE. or the Lagrangian function when GRLAGF is .TRUE., while INDFUN(i) = j > 0 indicates the j-th general constraint function.

NE [out] - integer
: the number, ne, of "finite-elements" used,

LIRNHI [in] - integer
: the actual declared dimension of IRNHI,

LE [in] - integer
: the actual declared dimensions of IPRNHI and IPRHI,

IPRNHI [out] - integer
: IPRNHI(i) points to the position in IRNHI of the first row index involved with element number i: the row indices of element number i are stored in IRNHI between the indices IPRNHI(i) and IPRNHI(i+1)-1. IPRNHI(NE+1) points to the first empty location in IRNHI,

HI [out] - real/double precision
: an array of the nonzeros in the upper triangle of H_i, evaluated at X and stored by rows, or by columns. Those for element i directly proceed those for element, i+1, i = 1, ..., NE-1. Element number i contains the values stored between

  HI(IPRHI(i)) and HI(IPRHI(i+1)-1)

  and involves the rows/columns stored between

  IRNHI(IPRNHI(i)) and IRNHI(IPRNHI(i+1)-1).

LHI [in] - integer
: the actual declared dimension of HI,

IPRHI [out] - integer
: IPRHI(i) points to the position in HI of the first nonzero involved with element number i: the values involved in element number i are stored in HI between the indices IPRHI(i) and IPRHI(i+1)-1. IPRHI(NE+1) points to the first empty location in HI,

BYROWS [in] - logical
: must be set to .TRUE. if the upper triangle of each H_i is to be stored by rows, and to .FALSE. if it is to be stored by columns.

AUTHORS

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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.

cgreh(3M).