NAME

UGREH − CUTEr tool to evaluate the gradient and sparse Hessian matrix in finite element format.

SYNOPSIS

CALL UGREH(N, X, G, NE, IRNHI, LIRNHI, LE, IPRNHI, HI, LHI, IPRHI, BYROWS)

DESCRIPTION

The UGREH subroutine evaluates the gradient and Hessian matrix of the objective function of the problem decoded into OUTSDIF.d at the point X in the case where the only possible constraints are bound constraints. 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.

ARGUMENTS

The arguments of UGREH are as follows

N [in] - integer
the number of variables for the problem,

X [in] - real/double precision
an array which gives the current estimate of the solution of the problem,

G [out] - real/double precision
an array which gives the value of the gradient of the objective function evaluated at X

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

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.

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.

NOTE

Calling this routine is more efficient than separate calls to UGR and UEH.

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.

csgreh(3M).