

NAME

CUTEST_ueh – CUTEst tool to evaluate the sparse Hessian matrix in finite element format.

SYNOPSIS

CALL CUTEST_ueh(status, n, X, ne, lhe_ptr, HE_row_ptr, HE_val_ptr, lhe_row, HE_row, lhe_val, HE_val, byrows)

DESCRIPTION

The CUTEST_ueh subroutine evaluates the Hessian matrix of the objective function of the problem decoded from a SIF file by the script *sifdecoder* at the point X. This Hessian matrix is stored as a sparse matrix in finite element format

$$H = \sum_{e=1}^{ne} H_e,$$

where each square symmetric element H_e involves a small subset of the rows of the Hessian matrix.

The problem under consideration is to minimize or maximize an objective function $f(x)$ over all $x \in R^n$ subject to the simple bounds $x^l \leq x \leq x^u$. The objective function is group-partially separable.

ARGUMENTS

The arguments of CUTEST_ueh 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,

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,

ne [out] - integer

the number, ne, of "finite-elements" used,

lhe_ptr [in] - integer

the actual declared dimensions of HE_row_ptr and HE_val_ptr,

HE_row_ptr [out] - integer

HE_row_ptr(i) points to the position in HE_row of the first row index involved with element number i: the row indices of element number e are stored in HE_row between the indices HE_row_ptr(e) and HE_row_ptr(e+1)-1. HE_row_ptr(ne+1) points to the first empty location in HE_row,

HE_val_ptr [out] - integer

HE_val_ptr(i) points to the position in HE_val of the first nonzero involved with element number i: the values involved in element number e are stored in HE_val between the indices HE_val_ptr(e) and HE_val_ptr(e+1)-1. HE_val_ptr(ne+1) points to the first empty location in HE_val,

lhe_row [in] - integer

the actual declared dimension of HE_row,

HE_row [out] - integer

an array which holds a list of the row indices involved with each element. Those for element e directly precede those for element e+1, e = 1, ..., ne-1. Since the elements are symmetric, HE_row is also the list of column indices involved with each element.

lhe_val [in] - integer

the actual declared dimension of HE_val,

HE_val [out] - real/double precision

an array of the nonzeros in the upper triangle of H_e , evaluated at X and stored by rows, or by columns. Those for element e directly precede those for element e+1, e = 1, ..., ne-1. Element number e

contains the values stored between

HE_val(HE_val_ptr(e)) and HE_val(HE_val_ptr(e+1)-1)

and involves the rows/columns stored between

HE_row(HE_row_ptr(e)) and HE_row(HE_row_ptr(e+1)-1).

byrows [in] - logical

must be set to .TRUE. if the upper triangle of each H_e is to be stored by rows, and to .FALSE. if it is to be stored by columns.

AUTHORS

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

SEE ALSO

CUTEst: a Constrained and Unconstrained Testing Environment with safe threads,
N.I.M. Gould, D. Orban and Ph.L. Toint,
Technical Report, Rutherford Appleton Laboratory, 2013.

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_ceh(3M), sifdecoder(1).