

NAME

CUTEST_cchprods_threaded – CUTEst tool to form the matrix-vector products of a vector with each of the Hessian matrices of the constraint functions.

SYNOPSIS

```
CALL CUTEST_cchprods_threaded( status, n, m, goth, X, Y, VECTOR, lchp, CHP_val, CHP_ind,
                              CHP_ptr, thread )
```

For real rather than double precision arguments, instead

```
CALL CUTEST_cchprods_threaded_s( ... )
```

and for quadruple precision arguments, when available,

```
CALL CUTEST_cchprods_threaded_q( ... )
```

DESCRIPTION

The CUTEST_cchprods_threaded subroutine forms the product of a vector with each of the Hessian matrix of the constraint functions $c(x)$ corresponding to the problem decoded from a SIF file by the script *sifdecoder* at the point $x = X$.

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 $c_i^l \leq c_i(x) \leq c_i^u$ ($i \in m_E + 1, \dots, m$), 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_cchprods_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,

n [in] - integer

the number of variables for the problem,

m [in] - integer

the total number of general constraints,

goth [in] - logical

a logical variable which specifies whether the second derivatives of the groups and elements, and the indexing information held in

CHP_ind and CHP_ptr (see below) have already been set (goth = .TRUE.) or if this information should be computed (goth = .FALSE.),

X [in] - real/double precision

when goth = .FALSE., the Hessians will be evaluated at X. Otherwise X is not used.

VECTOR [in] - real/double precision

an array which gives the vector whose product with the constraint Hessians is required,

lchp [in] - integer

a variable that specifies the declared lengths of `CHP_val` and `CHP_ind`. The precise length required may be found by calling `CUTEst_cdimchp` prior to `CUTEst_cchprods_threaded`,

CHP_val [out] - real/double precision

an array that gives the values of the nonzeros in the result obtained by multiplying the constraint Hessians by `VECTOR`. The values for the *i*-th constraint are stored in `CHP_val(CHP_ptr(i):CHP_val(i+1)-1)`,

CHP_ind [inout] - integer

an array that gives the indices of the nonzeros in the result obtained by multiplying the constraint Hessians by `VECTOR`. The indices for the *i*-th constraint are stored in `CHP_ind(CHP_ptr(i):CHP_ptr(i+1)-1)`, and match the values stored in `CHP_val`,

CHP_ptr [inout] - integer

an array of length *m*+1 that gives pointers to the starting positions in `CHP_ind` and `CHP_val` for the nonzeros for the product with each Hessian. `CHP_ptr(m+1)-1` gives the total space required by `CHP_ind` and `CHP_val`.

thread [out] - integer

thread chosen for the evaluation; threads are numbered from 1 to the value `threads` set when calling `CUTEst_csetup_threaded`.

NOTE

`goth` should be set to `.TRUE.` only when a previous call to `CUTEst_cchprods_threaded`, with `goth = .FALSE.`, at the current point has been made. Otherwise, it should be set `.FALSE.`

AUTHORS

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SEE ALSO

CUTEst: a Constrained and Unconstrained Testing Environment with safe threads for mathematical optimization,

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_cdimchp(3M)`, `sifdecoder(1)`.