

**NAME**

CUTEST\_cjprod\_threaded – CUTEst tool to form the matrix-vector product of a vector with the Jacobian of the constraints, or its transpose.

**SYNOPSIS**

CALL CUTEST\_cjprod\_threaded( status, n, m, gotj, jtrans, X, VECTOR, lvector, RESULT, lresult, thread )

For real rather than double precision arguments, instead

CALL CUTEST\_cjprod\_threaded\_s( ... )

and for quadruple precision arguments, when available,

CALL CUTEST\_cjprod\_threaded\_q( ... )

**DESCRIPTION**

The CUTEST\_cjprod\_threaded subroutine forms the product of a vector with the Jacobian matrix, or with its transpose, of the constraint functions of the problem decoded from a SIF file by the script *sifdecoder* evaluated at the point 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\_cjprod\_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, 4 for an out-of-range thread,

**n** [in] - integer

the number of variables for the problem,

**m** [in] - integer

the total number of general constraints,

**gotj** [in] - logical

a logical variable which specifies whether the first derivatives of the groups and elements have already been set (gotj = .TRUE.) or if they should be computed (gotj = .FALSE.),

**jtrans** [in] - logical

a logical variable which specifies whether the product should involve the Jacobian (jtrans = .FALSE.) or its transpose (jtrans = .TRUE.),

**X** [in] - real/double precision

when gotj = .FALSE., the derivatives 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 Jacobian or its transpose is required,

**lvector** [in] - integer

the actual declared dimension of VECTOR.

**RESULT** [out] - real/double precision

an array which gives the result of multiplying the Jacobian or its transpose by VECTOR.

**lresult** [in] - integer

the actual declared dimension of RESULT.

## NOTE

gotj should be set to .TRUE. whenever

(1)

a call has been made to CUTEST\_cgr\_threaded, CUTEST\_csgr\_threaded, CUTEST\_cgrdh\_threaded, CUTEST\_csgreh\_threaded or CUTEST\_csgersh\_threaded at the current point, or

(2)

a previous call to CUTEST\_cjprod\_threaded, with gotj = .FALSE., at the current point has been made.

Otherwise, it should be set .FALSE.,

**thread** [in] - integer

thread chosen for the evaluation; threads are numbered from 1 to the value threads set when calling CUTEST\_csetup\_threaded.

## 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.

sifdecoder(1).