
Operator TO FACTORIZE

1 Goal

Factorizing an assembled matrix or **manufacturing a matrix of pre conditioning**.

The matrix produced by this operator is provided to the operator `TO SOLVE` [U4.55.02] to solve the linear systems.

This operator allows:

1. Either to factorize the matrix assembled (in a product of two triangular matrixes) for the direct methods,
2. Or to build a matrix of pre conditioning for the iterative methods with an aim of accelerating convergence during the resolution.

This command is a compulsory precondition before calling the ordering of resolution (`TO SOLVE`)

Produced (or enriches) a data structure of the type `matr_asse`.

2 Syntax

```

mat [matr_asse_*] =FACTORISER
(
  ◊reuse=mat
  ,
  ◆MATR_ASSE=mat
  # If method MULT_FRONT , MUMPS , LDLT :
      / [matr_asse_DEPL_R]
      / [matr_asse_DEPL_C]
      / [matr_asse_TEMP_R]
      / [matr_asse_TEMP_C]
      / [matr_asse_PRES_R]
      / [matr_asse_PRES_C]

  # If method PCG or PETSC :
      / [matr_asse_DEPL_R]
      / [matr_asse_TEMP_R]
      / [matr_asse_PRES_R]

  # If method MULT_FRONT :
      ◊STOP_SINGULIER=/ "OUI" , [DEFAULT]
      / "NON".
      ◊NPREC=/nprec , [I]
      /8 . [DEFAULT]

  # If method MUMPS :
      ◊TYPE_RESOL=/ "AUTO" , [DEFAULT]
      / "NONSYM",
      / "SYMDEF",
      / "SYMGEM".
      ◊PCENT_PIVOT=/10 , [DEFAULT]
      /pcpiv . [R]
      ◊PRETRAITEMENTS=/ "AUTO" , [DEFAULT]
      / "SANS".
      ◊ELIM_LAGR2=/ "OUI" , [DEFAULT]
      / "NON".
      ◊GESTION_MEMOIRE=/ "IN_CORE" , [DEFAULT]
      / "OUT_OF_CORE",
      /'' EVAL'.

  # If method PCG :
      ◊PRE_COND=' LDLT_INC' , [DEFAULT]
      ◊NIVE_REPLISSAGE=/0 , [DEFAULT]
      / N. [I]

  # If method PETSC :
      ◊PRE_COND=/ "LDLT_INC" , [DEFAULT]
      / "JACOBI",
      / "SOR",
      / "LDLT_SP".
      ◊NIVE_REPLISSAGE=/0 , [DEFAULT]
      /n , [I]
      ◊REPLISSAGE=/1 , [DEFAULT]
      / Cr. [R]

```

Warning : The translation process used on this website is a "Machine Translation". It may be imprecise and inaccurate in whole or in part and is provided as a convenience.

```

      ◇RENUM=/
      ◇REAC_PRECOND=/30
      # If method LDLT :
      ◇STOP_SINGULIER=/
      ◇NPREC=/nprec
      /8
      ◇/BLOC_DEBUT=bd
      / DDL_DEBUT=dd
      ◇/BLOC_FIN=bf
      / DDL_FIN=df
      ◇TITER=titer
      ◇INFO=/1
      /2
    )

if MATR_ASSE:
    [matr_asse_DEPL_R] then [*] - >DEPL_R
    [matr_asse_DEPL_C] DEPL_C
    [matr_asse_TEMP_R] TEMP_R
    [matr_asse_TEMP_C] TEMP_C
    [matr_asse_PRES_R] PRES_R
    [matr_asse_PRES_C] PRES_C
```

3 Operands

the choice of the method of resolution is made as a preliminary in command NUME_DDL (key word METHODE).

Five methods are possible: "MULT_FRONT", "MUMPS", "PCG", "PETSC" and "LDLT".

3.1 Key word reuse = subdued

- For methods "MULT_FRONT", "MUMPS", "PETSC" and "LDLT" the factorized matrix is stored beside the initial matrix. It is strongly recommended for these methods to use a concept reentrant in order to avoid duplicating the initial matrix.
- For the methods "MUMPS" and "PETSC", the factorized matrix is stored only in memory. When computation finishes, factorized is lost. It is thus necessary Re-to factorize the matrixes with each POURSUITE.
- For the method "PCG", it is not allowed to use a concept reentrant.

3.2 Operand MATR_ASSE

◆MATR_ASSE = mat

Name of the matrix assembled to factorize or with pre conditioning according to the method.

For methods "LDLT", "MULT_FRONT" and "MUMPS", this matrix can be real or complex, symmetric or not. On the other hand for the methods "PCG" and "PETSC", this matrix must be real. For "PCG", the matrix must also be symmetric.

3.3 Operands STOP_SINGULIER, NPREC, TYPE_RESOL, PCENT_PIVOT, PRETRAITEMENTS, GESTION_MEMOIRE, PRE_COND, NIVE_REEMPLISSAGE, REEMPLISSAGE, RENUM, REAC_PRECOND and ELIM_LAGR2

These keys key are described in [U4.50.01].

3.4 Operand TITER

◆TITER = title

Titrate that one wants to give to result [U4.02.01].

3.5 Operand INFO

◆INFO =

1 : no partial

3.6 the Factorization printing (method LDLT)

For method "LDLT", the operator makes it possible to factorize only partially the matrix. This possibility makes it possible to factorize the matrix in several times (several works) to even modify

with the flight the last lines of this factorized. Today, this functionality presents little interest except for certain methods (known as discrete) of contact-friction where one has, intentionally, placed in the last lines of the matrix the terms concerning the nodes likely to be in contact. Thus, as iterations of pairing, the relations between these nodes changing, one erases then recomputes that these last contributions of factorized. It is a typical example where the astute use of an algorithm enough frustrates little to bring major gains (in time).

```
◇/BLOC_DEBUT      = comic
    comic: partial factorization since the comic-ième block included.

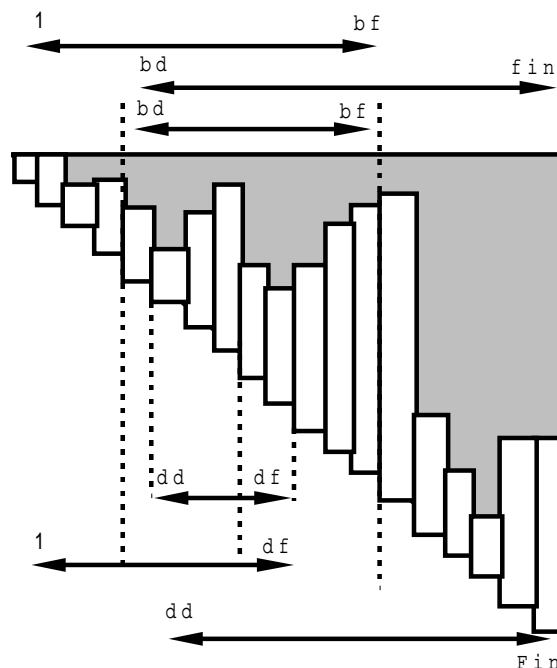
/DDL_DEBUT        = dd
    dd: partial factorization since the dd-ième equation included (in internal classification
    established by the operator NUME_DDL [U4.61.11]).

◇/BLOC_FIN        = bf
    bf: partial factorization to the bf-ième block included.

/DDL_FIN          = df
    df: partial factorization until the df-ième equation included (in internal classification
    established by the operator NUME_DDL [U4.61.11]).
```

BLOC_DEBUT and DDL_DEBUT

- in the absence of key keys BLOC_DEBUT and DDL_DEBUT, the matrix will be factorized from its first line.
- if argument comic of key word BLOC_DEBUT is negative or null, the matrix will be factorized starting from the first block. If not, one carries out a partial factorization starting from the comics-ième block included.
- if the argument dd of key word DDL_DEBUT is negative or null, the matrix will be factorized from the first equation. If not, one carries out a partial factorization from the dd-ième equation included.



4 Examples

Warning : The translation process used on this website is a "Machine Translation". It may be imprecise and inaccurate in whole or in part and is provided as a convenience.

See the examples in documentation of the command `TO SOLVE [U4.55.02]`.