
MUMPS01 - Validation of the solver MUMPS

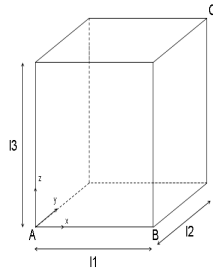
Summarized:

This benchmark makes it possible to validate the MUMPS solver under various configurations:

- Taking into account or not of Dirichlets (AFFE_CHAR_CINE/MECA)
- Taken into account of the options of the type of problem of MUMPS (SYMDEF/SYMGEN/NONSYM)
- Modification of the value of key word PARALLELISME (CENTRALISE, MAIL_DISPERSER, SOUS_DOMAINE).

1 Problem of reference

1.1 Geometry



Coordinated of the points (m) :

$$\begin{aligned} A &: (0., 0., 0.) \\ B &: (10., 0., 0.) \\ C &: (10., 10., 10.) \end{aligned}$$

Geometry of the cube (m) :

$$l1 = l2 = l3 = 10.$$

Mesh group:

base1 : lower surface of the cube (plane XOY)

1.2 Properties of the material

- $E = 1.0 \text{ E5 } N/m^2$
- $\nu = 0.3$
- $\rho = 9800. \text{ Kg}/m^{-3}$

1.3 Boundary conditions and loadings

- imposed Displacements:

- *base1* : $DX = 10. , \quad DY = DZ = 0.$

- Loading imposed:

- Revolved according to $-z \quad g = 9.81 \text{ ms}^{-2}$

2 Reference solution

2.1 Méthode de calcul used for the reference solution

the reference solution was obtained with operator `MECA_STATIQUE` (`MULT_FRONT` and `METIS`).

2.2 Quantities and results of reference

the reference variable used is displacement according to the axis z with the node C .

Displacement with point: $C \quad DZ = -41,6 \text{ E} - 3 \text{ m}$.

2.3 Configurations of solver tested

- # 1 : computation of reference (MONGREL)
- # 2.1: MUMPS (centralized) charge dualized + kinematical load + SYMGEN
- # 2.2: MUMPS (centralized) kinematical load + SYMDEF
- # 2.3: MUMPS (centralized) charge dualized + kinematical load + NONSYM
- # 3.1: MUMPS (distributed by meshes) charge dualized + kinematical load + SYMGEN
- # 3.2: MUMPS (distributed by meshes) kinematical load + SYMDEF
- # 3.3: MUMPS (distributed by meshes) charge dualized + kinematical load + NONSYM
- # 4.1: MUMPS (distributed by subdomains) charge dualized + kinematical load + SYMGEN
- # 4.2: MUMPS (distributed by subdomains) kinematical load + SYMDEF
- # 4.3: MUMPS (distributed by subdomains) charge dualized + kinematical load + NONSYM

3 Modelization A

3.1 Characteristic of the modelization A

Modelization 3D :

Many nodes	125		
Number of meshes	84	Are:	
		SEG2	4
		QUAD4	16
		HEXA8	64

3.2 Results

Points	Quantity	Reference (<i>m</i>)	Tolerance (%)
<i>C</i>	<i>DZ</i>	$-41.6 E-3$	$1.00 E-06$

4 Summary of the results

This benchmark shows the correct operation of the solver MUMPS in the various studied cases.