

PERF003 - Eigen modes of a square plate embedded on 2 edges

Summarized:

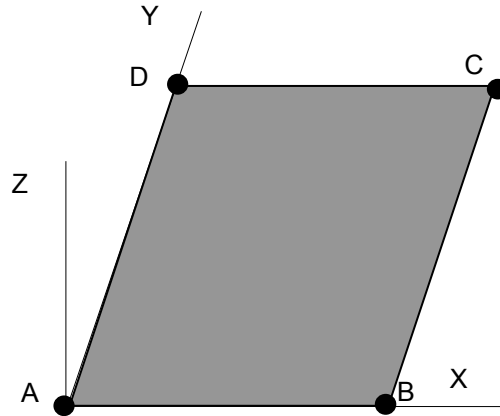
The purpose of this benchmark is to measure the performances of a modal computation.

The three modelizations *DKT* carried out are the following ones:

- Modelization a: mesh QUAD4 , 1.0 E5 degrees of freedom, CALC_MODAL ("MULT_FRONT")
- Modelization b: mesh QUAD4 , 2.6 E5 degrees of freedom, CALC_MODAL ("MULT_FRONT")
- Modelization C: mesh QUAD4 , 1.0 E6 degrees of freedom, CALC_MODAL ("MULT_FRONT")
- Modelization D: mesh QUAD4 , 1.0 E5 degrees of freedom, MODE_ITER_INV

1 Problem of reference

1.1 Geometry



Square Plate:

dimensioned $1 \times 1 \text{ m}^2$
thickness 0.02 m

1.2 Properties of the material

- $E = 5.10^{11} \text{ Pa}$
- $\nu = 0.3$
- $\rho = 9800 \text{ kg.m}^{-3}$

1.3 Boundary conditions and loadings

- imposed Displacements:
 - $AB : DX = DY = DZ = DRX = DRY = DRZ = 0.$
 - $DA : DX = DY = DZ = DRX = DRY = DRZ = 0.$

2 Reference solution

2.1 Method of calculating

the thirteenth eigenfrequency, obtained with the modélisationest A used like result of reference.

2.2 Results of reference

Thirteenth eigenfrequency: 993.5 Hz

2.3 Uncertainties

numerical Solution.

3 Modelization A

3.1 Characteristic of the modelization A

Modelization DKT :

| | | | |
|------------------|--------|-------|--------|
| Many nodes | 16 900 | | |
| Number of meshes | 17 157 | Are: | |
| | | SEG2 | 516 |
| | | QUAD4 | 16 641 |

3.2 Results

| Quantity | Reference Hz | Tolerance (%) |
|---------------------|--------------|---------------|
| <i>FREQ</i> (n° 13) | 993.5 | 3.000E-3 |

4 Modelization B

4.1 Characteristic of the modelization B

Modelization *DKT* :

| | | | |
|------------------|--------|-------|--------|
| Many nodes | 42 025 | | |
| Number of meshes | 42 432 | Are: | |
| | | SEG2 | 816 |
| | | QUAD4 | 41 616 |

4.2 Results

| Quantity | Reference Hz | Tolerance (%) |
|--------------------|--------------|---------------|
| <i>FREQ</i> (n°13) | 993.5 | 3.000E-3 |

5 Modelization C

5.1 Characteristic of the modelization C

Modelization DKT :

| | | | |
|------------------|--------|-------|--------|
| Many nodes | 167281 | | |
| Number of meshes | 168096 | Are: | |
| | | SEG2 | 1632 |
| | | QUAD4 | 166464 |

5.2 Results

| Quantity | Reference Hz | Tolerance (%) |
|---------------------|--------------|---------------|
| <i>FREQ</i> (n° 13) | 993.5 | 3.000E-3 |

6 Modelization D

6.1 Characteristic of the modelization D

Modelization DKT :

| | | | |
|------------------|-------|-------|-------|
| Many nodes | 16900 | | |
| Number of meshes | 17157 | Are: | |
| | | SEG2 | 516 |
| | | QUAD4 | 16641 |

Note:

This modelization checks the performances of the operator `MODE_ITER_INV` who compared to the uses different algorithms for the modal resolution of the problem macro-command `CALC_MODAL`, based it on operator `MODE_ITER_SIMULT`.

6.2 Results

| Quantity | Reference Hz | Tolerance (%) |
|---------------------|--------------|---------------|
| $FREQ(n^{\circ}13)$ | 993.5 | 3.000E-3 |

7 Summary of the results

| Machine | Aster | MOD | Nb DDL | Memory (Mo) | | Time execution (CALC_MODAL/MODE_ITER_INV) (dry) | | | |
|--------------------------------|-------|-----|-----------------|-------------|------|---|--------|-----------|---------|
| | | | | Allocated | Used | USERS | SYSTEM | USERS+SYS | ELAPSED |
| Linux 64 bits (ia64) "Bull" | 10.1 | A | 104.508 .129 | | 99 | 82.71 | 28.14 | 110.85 | 110.99 |
| | | B | 257.058 .309 | | 251 | 233.53 | 89.19 | 322.72 | 323.36 |
| | | C | 1.013.490 | 1196 | 916 | 1252.30 | 403.39 | 1655.69 | 1656.32 |
| | | D | 104.508 .129 | | 99 | 196.37 | 20.50 | 216.87 | 216.96 |