

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

Summary:

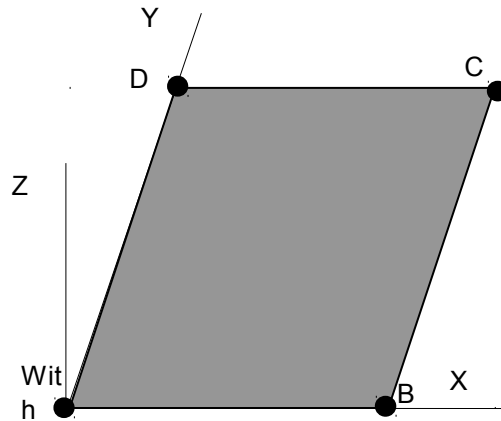
The objective of this CAS-test is to measure the performances of a modal calculation.

Four modelings *DKT* carried out are the following ones:

- Modeling a: grid QUAD4 , 1.0 E5 degrees of freedom, operator CALC_MODES, OPTION='BANDE'
- Modeling B: grid QUAD4, 2.6 E5 degrees of freedom, operator CALC_MODES, OPTION='BANDE'
- Modeling C: grid QUAD4, 1.0 E6 degrees of freedom, operator CALC_MODES, OPTION='BANDE'
- Modeling D: grid QUAD4 , 1.0 E5 degrees of freedom, operator CALC_MODES, OPTION='SEPRE'

1 Problem of reference

1.1 Geometry



Square plate:

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

1.2 Properties of 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 Eigen frequency, obtained with modeling A is used as result of reference.

2.2 Results of reference

Thirteenth Eigen frequency: 993.5 Hz

2.3 Uncertainties

Digital solution.

3 Modeling A

3.1 Characteristics of modeling A

Modeling DKT :

Many nodes	16 900	
Many meshes	17 157	That is to say:
		SEG2 516
		QUAD4 16 641

3.2 Results

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

4 Modeling B

4.1 Characteristics of modeling B

Modeling *DKT* :

Many nodes	42 025	
Many meshes	42 432	That is to say:
		SEG2 816
		QUAD4 41 616

4.2 Results

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

5 Modeling C

5.1 Characteristics of modeling C

Modeling DKT :

Many nodes	167281	
Many meshes	168096	That is to say:
		SEG2 1632
		QUAD4 166464

5.2 Results

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

6 Modeling D

6.1 Characteristics of modeling D

Modeling DKT :

Many nodes	16 900	
Many meshes	17 157	That is to say:
		SEG2 516
		QUAD4 16 641

Note:

This modeling checks the performances of the operator `CALC_MODES`, `OPTION=' SEPARÉ '` who uses algorithms of the type powers opposite for the resolution of the modal problem.

6.2 Results

Size	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_MODES) (dryness)			
				Allocated	Used	USERS	SYSTEM	USERS+SYS	ELAPSED
Linux 64 bits (ia64) "Bull"	10.1	With	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