

SDLS111 - Substructuring dynamics: triangular plate

Abstract:

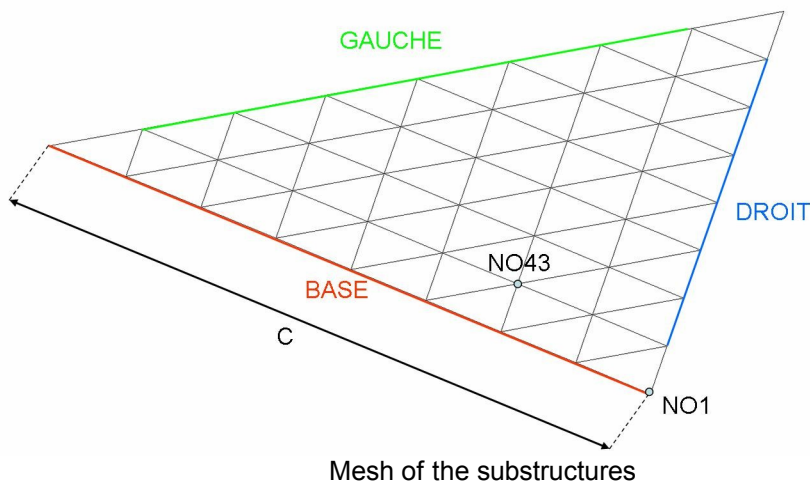
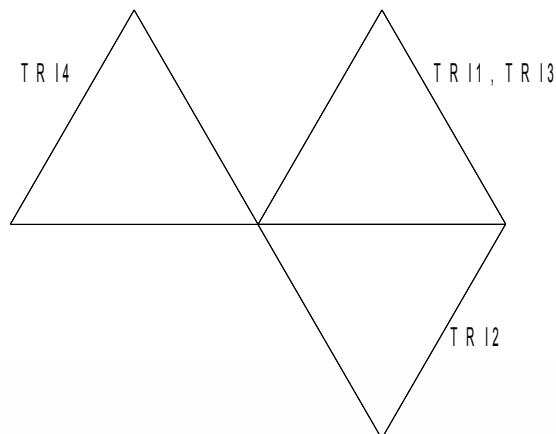
The purpose of this case test is in the case of to validate the classical substructuring with interfaces of the type CRAIG-BAMPTON a triangular plate.

The case test is composed of a modelization DKT of the triangular plate

1 Problem of reference

1.1 Geometry

Geometry of four substructures (*TRI1* *TRI2* *TRI3* , *TRI4*):



Geometry of the triangle (*m*) :

$C=1$
thickness: $e=0.01$

Coordinates of the nodes:

$NO1=(1.0,0.0)$
 $NO43=(0.687, 0.108)$

Mesh group:

BASE : together nodes forming the base of the triangle
GAUCHE : together nodes forming the right side of the triangle
DROITE : together nodes forming the left side of the triangle
TOUT : together nodes forming the triangle

1.2 elastic Properties of the materials

- modulus Young: $E = 2.1E11 Pa$
- Poisson's ratio: $\nu = 0.3$
- voluminal density: $\rho = 7800.0 kg.m^{-3}$

1.3 Boundary conditions and loadings

- Substructure: *TRI1* :
 - Imposed displacements:
 - *TOUT* : $DRZ = 0.0$
 - *BASE* : $DX = DY = DZ = DRX = DRY = 0.0$
 - Interfaces:
 - *BASE* : type: CRAIGB , mask: *DRZ*
- Substructure: *TRI2* :
 - Nautical angles (α, β, γ) : $(0.0, 0.0, 180.0)$
 - Imposed displacements:
 - *TOUT* : $DRZ = 0.0$
 - *BASE* : $DX = DY = DZ = DRX = DRY = 0.0$
 - *DROITE* : $DX = DY = DZ = DRX = DRY = 0.0$
 - *GAUCHE* : $DX = DY = DZ = DRX = DRY = 0.0$
 - Interfaces:
 - *BASE* : type: CRAIGB , mask: *DRZ*
 - *GAUCHE* : type: CRAIGB , mask: *DRZ*
 - *DROITE* : type: CRAIGB , mask: *DRZ*
- Substructure: *TRI3* :
 - Imposed displacements:
 - *TOUT* : $DRZ = 0.0$
 - *BASE* : $DX = DY = DZ = DRX = DRY = 0.0$
 - *DROITE* : $DX = DY = DZ = DRX = DRY = 0.0$
 - Interfaces:
 - *DROITE* : type: CRAIGB , mask: *DRZ*
- Substructure: *TRI4* :
 - Nautical angles (α, β, γ) : $(0.0, 180.0, 0.0)$
 - Imposed displacements:
 - *TOUT* : $DRZ = 0.0$
 - *BASE* : $DX = DY = DZ = DRX = DRY = 0.0$
 - *DROITE* : $DX = DY = DZ = DRX = DRY = 0.0$
 - Interfaces:
 - *DROITE* : type: CRAIGB , mask: *DRZ*

2 Reference solution

2.1 Computation of reference

Unfolding of the case test:

- Computation of the eigen modes of each one of the triangles
 - *TRI1* AND *TRI2* , search of the eigen modes for $f \in [10,3000]$
 - *TRI3* AND *TRI4* , search despremiers 25 Definition
- eigen modes and computation of the static modal base of each one of the triangles
- Creation of one modele generalized static by coupling of the bases
- Computation and restitution, on physical base, of the modes of total structure
 - Test of Test
 - displacements of the eigenfrequencies

2.2 Quantities and results of reference

- *FREQ* : frequency
- *DZ* : displacement following *Z*

Test of the results restored on physical base:

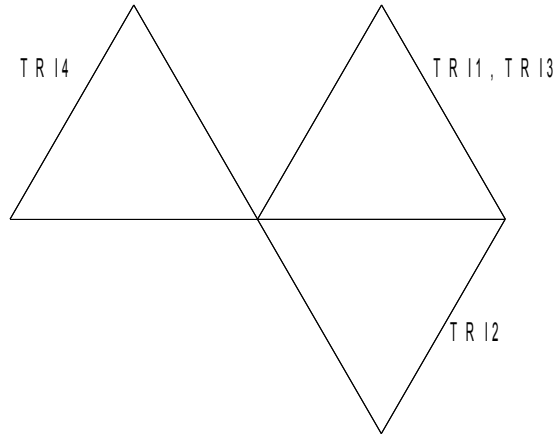
	Component	Reference (<i>m</i>)
Displacement of the node <i>NO1</i>	<i>DZ</i>	0.454388
Displacement of the node <i>NO43</i>	<i>DZ</i>	0.60375

Test of values of the eigenfrequencies:

Component	N° mode	Reference (<i>Hz</i>)
FREQ	1	5.5
	2	21.66
	3	23.64
	4	55.63
	5	56.97

3 Modelization A

3.1 Characteristic of the modelization



Modelization DKT :

Many nodes 45
Number of meshes 64 Are:
TRI3 64

3.2 Quantities tested and result

Node	Component	Reference	Component (%)
NO1	DZ	0.454388 (m)	0.1
NO43	DZ	0.60375 (m)	0.1

Tolerance	N° mode	Reference (Hz)	Tolerance (%)
FREQ	1	430.852	1.3
	2	707.717	1.3
	3	808.549	1.3
	4	930.199	1.3
	5	1193.94	1.3

4 Summary of the results

the got results are satisfactory.