

SSLS200 - Linear mechanics modelings of hull

Summary:

This test is a test of not-regression. It does not have an analytical solution. The objective is to test a large number of different elementary calculations:

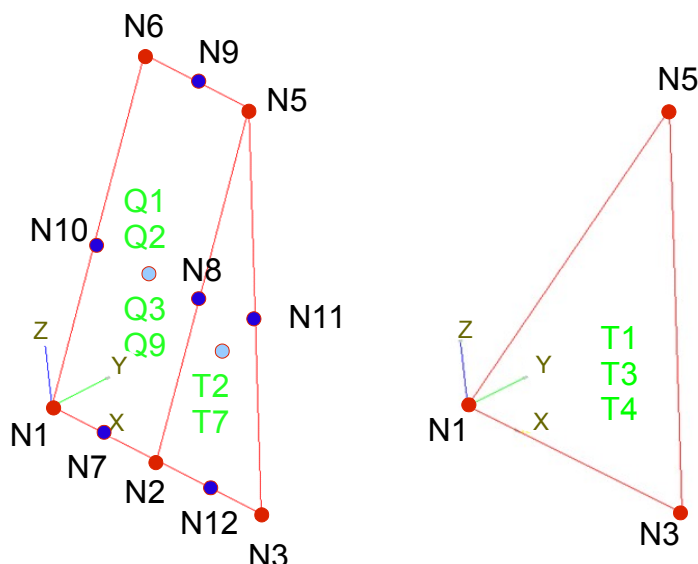
- tally: linear mechanics (MECA_STATIQUE)
- very varied loadings (in form "reality" or "function")
- all possible types of meshes

Modeling A :

- Modeling DKT Q4G DST COQUE_3D

1 Problem of reference

1.1 Geometry



Coordinates of the nodes:

	N1	N2	N3	N5	N6	N7	N8	N9	N10	N11	N12
x	0.	1.	2.	1.	0.	0.5	1.	0.5	0.	1.5	1.5
y	0.	0.	0.	1.	1.	0.	0.5	1.	0.5	0.5	0.
z	0.	0.	0.	2.	2.	0.	1.	2.	1.	1.	0.

Thickness = 0.7

1.2 Material properties

- Young modulus

	Temperature	
	-1000 °	1000 °
E	-1200	1200

- Poisson's ratio: $\nu = 0.3$
- Density $\rho = 8.1$
- Thermal dilation coefficient:

	Temperature	
	-1000 °	1000 °
α	-1200	1200

- Temperature of definition of the thermal dilation coefficient: 1.5 °

1.3 Boundary conditions and loadings

Boundary conditions:

- Node $N1$: $DX=1$; $DY=2$; $DZ=3$; $DRX=1$; $DRY=2$; $DRZ=3$
- Node $N6$: $DX=2$; $DY=3$; $DZ=4$; $DRX=1$; $DRY=2$; $DRZ=5$

Loadings

GRAVITY	$g=9,8$ According to the direction $(0.3;0.1;-0.4)$	
FORCE_ARETE	Linear force	$FZ=8$
FORCE_COQUE	Distributed load	$F1=5.$ $F2=8.$ $F3=9.$ $MF1=5.$
FORCE_COQUE	Uniform pressure	$PRES=5.$

Temperature

- Temperature on the higher skin of the hull: $TEMP_SUP=24^\circ$
- Temperature on the average skin of the hull: $TEMP = 18^\circ$
- Temperature on the lower skin of the hull: $TEMP_INF=12^\circ$
- Temperature of reference = 1.5°

2 Reference solution

2.1 Method of calculating used for the reference solution

The reference solution corresponds to a solution of not-regression

2.2 Results of reference

One tests the sum of the absolute values of the components:

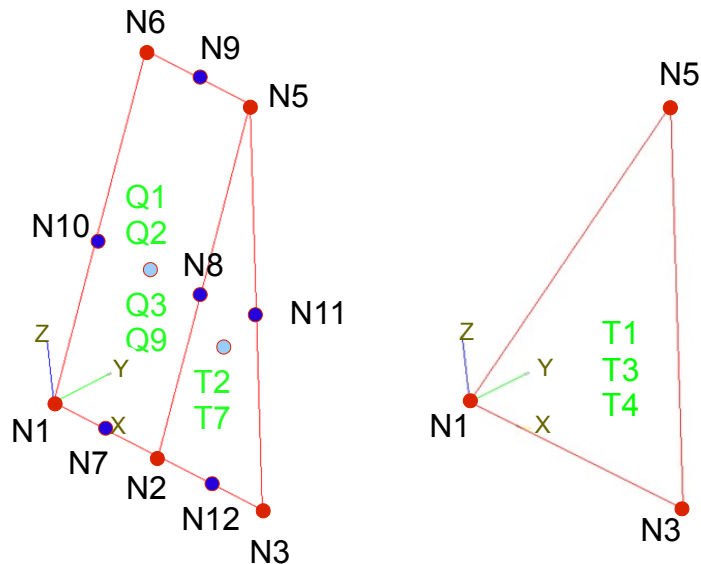
- Fields:
 - DEPL
 - EFGE_ELNO
 - EPSI_ELGA
 - EPSI_ELNO
 - EPSI_NOEU
 - SIEF_ELGA
 - SIGM_ELNO
 - DEGE_ELNO
 - DEGE_ELGA
- Potential energy ENER_POT :
 - TOTAL
 - POUR_CENT
- Mass and inertia MASS_INER :
 - MASS
 - CDG_X
 - CDG_Y
 - CDG_Z
 - IX_G
 - IY_G
 - IZ_G
 - IXY_G
 - IXZ_G
 - IYZ_G
 - IX_PRIN_G
 - IY_PRIN_G
 - IZ_PRIN_G
 - ALPHA
 - BETA
 - GAMMA

2.3 Uncertainty on the solution

Digital solution

3 Modeling A

3.1 Characteristics of modeling



Mesh	Modeling
Q1	DKT
T1	DKT
T2	DKT
Q2	Q4G
T4	Q4G
Q3	DST
T3	DST
Q9	COQUE_3D
T7	COQUE_3D

3.2 Characteristics of the grid

Many nodes: 14

Many meshes and types: 9 (4 TRIA3, 1 TRIA7, 3 QUAD4, 1 QUAD9)

3.3 Sizes tested and results

Size	Identification	Type of reference	Values of reference
DEPL	SOMM_ABS	'NON_REGRESSION'	44977.374738
EFGE_ELNO	SOMM_ABS	'NON_REGRESSION'	1.837595E+05
EPSI_ELGA	SOMM_ABS	'NON_REGRESSION'	85388.64440
EPSI_ELNO	SOMM_ABS	'NON_REGRESSION'	31611.626917
EPSI_NOEU	SOMM_ABS	'NON_REGRESSION'	9400.462073
SIEF_ELGA	SOMM_ABS	'NON_REGRESSION'	1.366574E+06
SIGM_ELNO	SOMM_ABS	'NON_REGRESSION'	1.597725E+06
DEGE_ELNO	SOMM_ABS	'NON_REGRESSION'	53984.851273
DEGE_ELGA	SOMM_ABS	'NON_REGRESSION'	48101.597890

Size	Component	Type of test	Type of reference	Values of reference
	NUME_ORDRE	SOMM_ABS	'NON_REGRESSION'	6
	INST	SOMM_ABS	'NON_REGRESSION'	0.0
	TOTAL	SOMM_ABS	'NON_REGRESSION'	3.172095E+07
	POUR_CENT	SOMM_ABS	'NON_REGRESSION'	100.0
MASS_INER	MASS	SOMM_ABS	'NON_REGRESSION'	101.428043
	CDG_X	SOMM_ABS	'NON_REGRESSION'	0.791667
	CDG_Y	SOMM_ABS	'NON_REGRESSION'	0.4166667
	CDG_Z	SOMM_ABS	'NON_REGRESSION'	0.833333
	IX_G	SOMM_ABS	'NON_REGRESSION'	42.881522
	IY_G	SOMM_ABS	'NON_REGRESSION'	52.774983
	IZ_G	SOMM_ABS	'NON_REGRESSION'	32.016044
	IXY_G	SOMM_ABS	'NON_REGRESSION'	2.817446
	IXZ_G	SOMM_ABS	'NON_REGRESSION'	5.634891
	IYZ_G	SOMM_ABS	'NON_REGRESSION'	13.839293
	IX_PRIN_G	SOMM_ABS	'NON_REGRESSION'	23.090901
	IY_PRIN_G	SOMM_ABS	'NON_REGRESSION'	44.887018
	IZ_PRIN_G	SOMM_ABS	'NON_REGRESSION'	59.694630
	ALPHA	SOMM_ABS	'NON_REGRESSION'	125.443769
	BETA	SOMM_ABS	'NON_REGRESSION'	58.461140
	GAMMA	SOMM_ABS	'NON_REGRESSION'	148.756141