SSLV157 – Relations of the type RBE3 between a cube and discrete

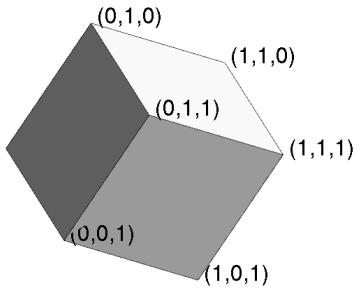
Summary:

The objective of this test is to check the relation of the type RBE3 between an element 3D and discrete.

1 Problem of reference

1.1 Geometry

One considers a cubic unit and a discrete element with the following coordinates.



.(2,3,4)

1.2 Properties of material

$E=210000\text{MPa}$	Young modulus
$\nu=0.3$	Poisson's ratio

1.3 Boundary conditions and loadings

The node of the cube of coordinates $(0,0,0)$ is blocked according to DZ.
The node of the cube of coordinates $(1,0,0)$ is blocked according to DX, DY, DZ.
The node of the cube of coordinates $(1,1,0)$ is blocked according to DX, DZ.
The node of the cube of coordinates $(0,1,0)$ is subjected to a nodal force $FX=-0.123456701636$, $FY=-0.246913403273$, $FZ=-0.370370090008$.

1.4 Initial conditions

Nothing

2 Reference solution

2.1 Method of calculating

The reference solution is obtained by software Nastran.

2.2 Sizes and results of reference

One notes displacement on various nodes of which the discrete one.

Identification	Value of reference
NOEUD=' N000007', NOM_CMP=' DX',	2.09288E-05
NOEUD=' N000006', NOM_CMP=' DY',	-7.29517E-06
NOEUD=' N000002', NOM_CMP=' DZ',	0.00000E+00
NOEUD=' N000002', NOM_CMP=' DX',	-6.23697E-06

NOEUD=' N000002', NOM_CMP=' DY',	-2.45257E-05
NOEUD=' N000007', NOM_CMP=' DZ',	-2.79835E-05
NOEUD=' N000009', NOM_CMP=' DX',	8.655062E-05
NOEUD=' N000009', NOM_CMP=' DY',	3.349630E-05
NOEUD=' N000009', NOM_CMP=' DZ',	-7.131093E-05
NOEUD=' N000009', NOM_CMP=' DRX',	-1.834213E-05
NOEUD=' N000009', NOM_CMP=' DRY',	1.222809E-05
NOEUD=' N000009', NOM_CMP=' DRZ',	-1.493772E-05

2.3 Uncertainties on the solution

None

3 Modeling A

3.1 Characteristics of modeling

One uses a linear relation of type RBE3.

3.2 Characteristics of the grid

The grid contains 9 nodes, 1 elements of the type POI1, 1 element of the type HEXA8.

3.3 Sizes tested and results

Identification	Value of reference	Tolerance
NOEUD=' N000007', NOM_CMP=' DX',	2.09288E-05	3rd-4%
	-7.29517E-06	1e-4%
NOEUD=' N000006', NOM_CMP=' DY',	0.00000E+00	1e-10
	-6.23697E-06	1e-4%
NOEUD=' N000002', NOM_CMP=' DZ',	-2.45257E-05	2nd-4%
	-2.79835E-05	1e-4%
NOEUD=' N000002', NOM_CMP=' DX',	8.655062E-05	1e-4%
	3.349630E-05	1e-4%
NOEUD=' N000002', NOM_CMP=' DY',	-7.131093E-05	1e-4%
	-1.834213E-05	1e-4%
NOEUD=' N000007', NOM_CMP=' DZ',	1.222809E-05	1e-4%
	-1.493772E-05	1e-4%
NOEUD=' N000009', NOM_CMP=' DX',		
NOEUD=' N000009', NOM_CMP=' DY',		
NOEUD=' N000009', NOM_CMP=' DZ',		
NOEUD=' N000009', NOM_CMP=' DRX',		
NOEUD=' N000009', NOM_CMP=' DRY',		
NOEUD=' N000009', NOM_CMP=' DRZ',		

4 Modeling B

4.1 Characteristics of modeling

One uses a classical linear relation equivalent to the linear constraint of type RBE3.

4.2 Characteristics of the grid

The grid contains 9 nodes, 1 elements of the type POI1, 1 element of the type HEXA8.

4.3 Sizes tested and results

Identification	Value of reference	Tolerance
NOEUD=' N000007', NOM_CMP=' DX',	2.09288E-05	3rd-4%
	-7.29517E-06	1e-4%

NOEUD=' N000006', NOM_CMP=' DY',	0.00000E+00	1e-10
NOEUD=' N000002', NOM_CMP=' DZ',	-6.23697E-06	1e-4%
NOEUD=' N000002', NOM_CMP=' DX',	-2.45257E-05	2nd-4%
NOEUD=' N000002', NOM_CMP=' DY',	-2.79835E-05	1e-4%
NOEUD=' N000007', NOM_CMP=' DZ',	8.655062E-05	1e-4%
NOEUD=' N000009', NOM_CMP=' DX',	3.349630E-05	1e-4%
NOEUD=' N000009', NOM_CMP=' DY',	-7.131093E-05	1e-4%
NOEUD=' N000009', NOM_CMP=' DZ',	-1.834213E-05	1e-4%
NOEUD=' N000009', NOM_CMP=' DRX',	1.222809E-05	1e-4%
NOEUD=' N000009', NOM_CMP=' DRY',	-1.493772E-05	1e-4%
NOEUD=' N000009', NOM_CMP=' DRZ',		

5 Summary of the results

The results are in very good agreement with software Nastran.