ZZZZ229 - Validation of the order

**AFFE_CHAR_MECA/LIAISON_SOLIDE + TRAN + ANGL_NAUT**

**Summary:**

This problem tests the got results, by the application of a translation and a rotation, with the operator **AFFE_CHAR_MECA/LIAISON_SOLIDE.**
1 Problem of reference

1.1 Geometry

The square is in space \([0.,1.] \times [0.,1.]\).

Coordinates of the points \((m)\):

\[
\begin{align*}
A &: (0., 0.) \\
B &: (1., 0.) \\
C &: (1., 1.) \\
D &: (0., 1.)
\end{align*}
\]

1.2 Properties of material

- \(E = 1.0 \ E5 \ N/m^2\)
- \(\nu = 0.3\)
- \(\rho = 9800. \ kg/m^3\)

1.3 Boundary conditions and loadings

- Imposed displacements:
  - Rotation of 90° around the point \(D\)
  - \(ABCD: DX = -1 \ m\) and \(DY = 1 \ m\)
2 Reference solution

2.1 Sizes and results of reference

The variable reference used are displacements according to $X$ and $Y$ point $C$.

Analytical solution:

- Rotation of $90^\circ$ around the point $D$: $C(1,1) \rightarrow C(0,2)$
- Translation of (-1.1): $C(0,2) \rightarrow C(-1,3)$

One from of deduced displacements from reference to the point $C$:

- $DX = -2\,m$
- $DY = 2\,m$
3 Modeling A

3.1 Characteristics of modeling A

Modeling D_PLAN:

Many nodes 9
Many meshes 12

That is to say:

<table>
<thead>
<tr>
<th></th>
<th>SEG2</th>
<th>QUAD4</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
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</tbody>
</table>

3.2 Results

<table>
<thead>
<tr>
<th>Points</th>
<th>Size</th>
<th>Reference</th>
<th>Tolerance (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>DX</td>
<td>−2.0</td>
<td>0.100</td>
</tr>
<tr>
<td></td>
<td>DY</td>
<td>2.0</td>
<td>0.100</td>
</tr>
</tbody>
</table>
4 Summary of the results

This CAS-test shows the good performance of the operator `AFFE_CHAR_MECA` used with the keyword `LIAISON_SOLIDE` in the case of a rotation and of a translation.

Note:

- If rotation is worthless, one can make the same thing with `DDL_IMPO`.
- If rotation is strong, the "solid" is really not deformed but the constraints are not forcing worthless (assumption of the small transformations by default).