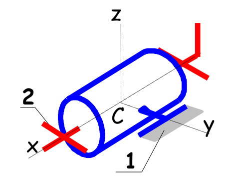
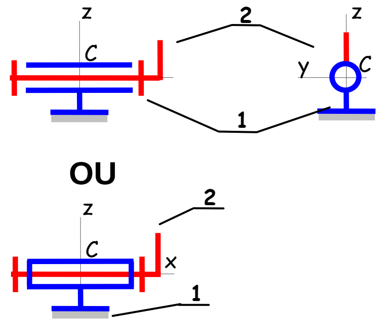
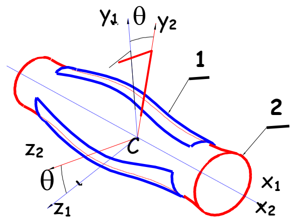
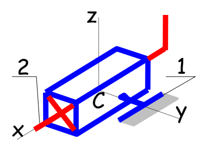
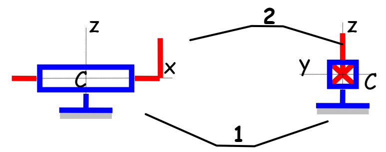
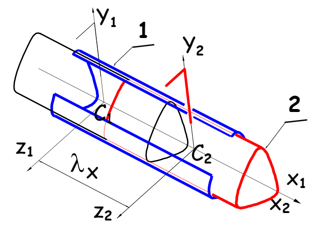
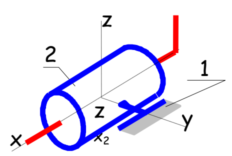
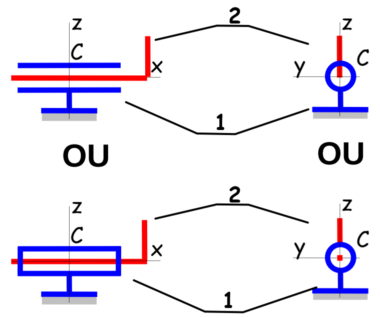
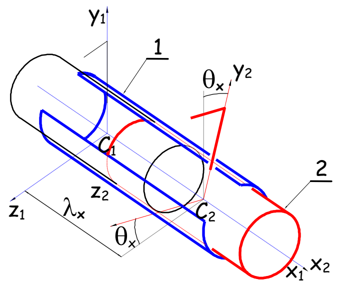
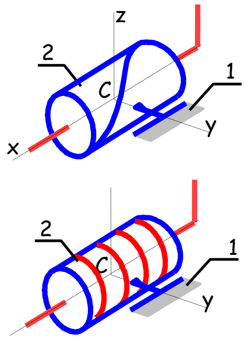
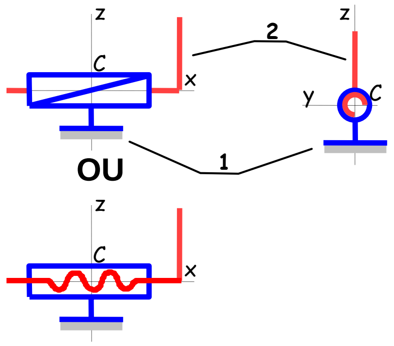
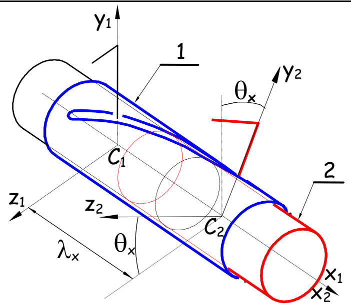
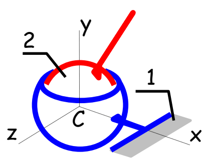
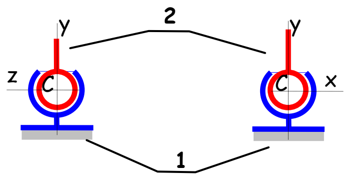
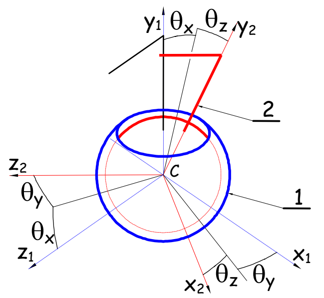
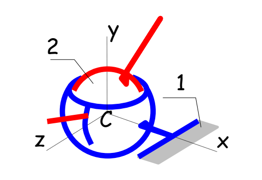
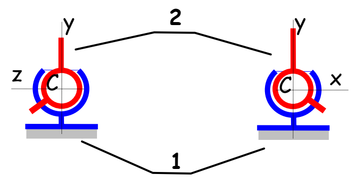
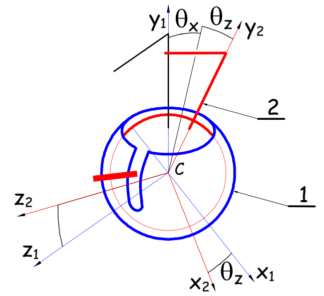
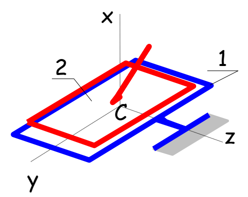
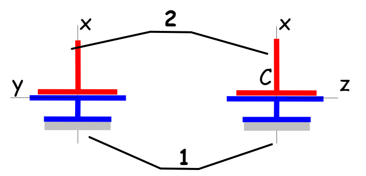
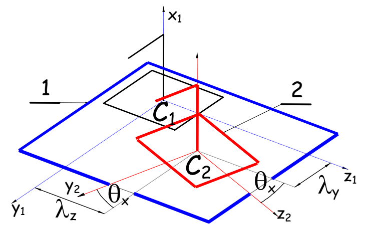
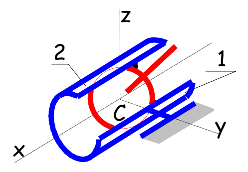
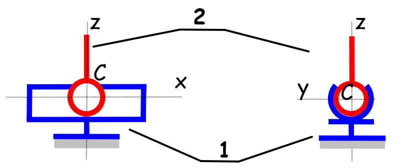
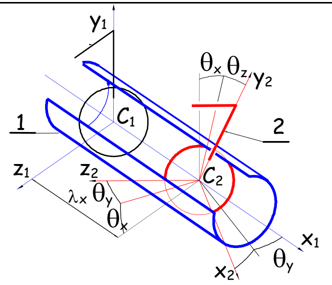
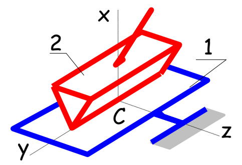
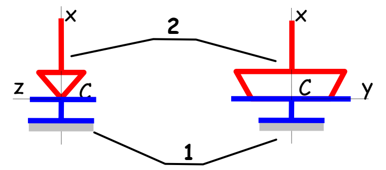
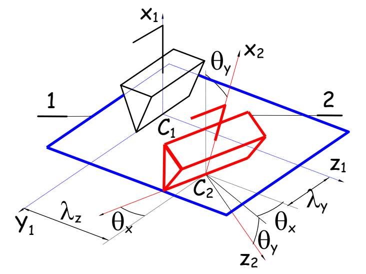
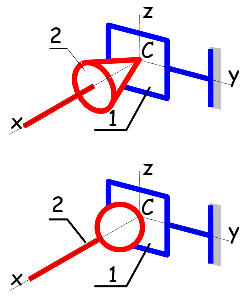
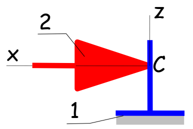
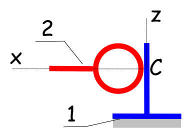
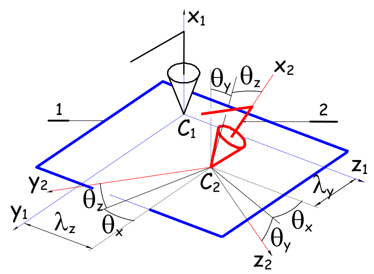
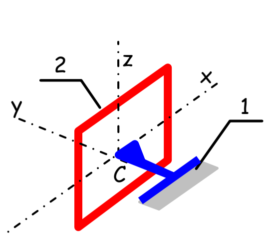
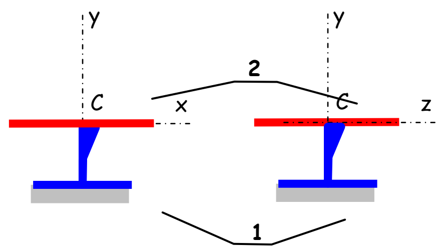
LIAISONS NORMALISEES

<table>
<tr><th>NOM
+ caractéristiques associées</th><th>Représentation normalisée 3D</th><th>Représentations normalisées 2D</th><th>Géométrie de la zone de contact</th><th>Degrés de libertés</th><th>Torseur cinématique associé</th><th>Torseur des actions de contact</th></tr>
<tr><td>PIVOT
axe</td><td></td><td></td><td>Surface de révolution non cylindrique
</td><td>1 DDL
1 rotation
<table><tr><th></th><th>R</th><th>T</th></tr><tr><td>X</td><td>1</td><td>0</td></tr><tr><td>Y</td><td>0</td><td>0</td></tr><tr><td>Z</td><td>0</td><td>0</td></tr></table>Paramètre : θ</td><td>$\{V_{2/1}\} = {}_P\begin{Bmatrix} p_{21}\vec{x} \\ \vec{0} \end{Bmatrix}$
$P \in (C,\vec{x})$</td><td>$\{F_{1\to2}\} = {}_P\begin{Bmatrix} X_{12}\vec{x}+Y_{12}\vec{y}+Z_{12}\vec{z} \\ M_{12}\vec{y}+N_{12}\vec{z} \end{Bmatrix}$
$P \in (C,\vec{x})$</td></tr>
<tr><td>GLISSIERE
direction</td><td></td><td></td><td>Surface cylindrique (sauf cylindre de révolution)
</td><td>1 DDL
1 translation
<table><tr><th></th><th>R</th><th>T</th></tr><tr><td>X</td><td>0</td><td>1</td></tr><tr><td>Y</td><td>0</td><td>0</td></tr><tr><td>Z</td><td>0</td><td>0</td></tr></table>Paramètre : λ_x</td><td>$\{V_{2/1}\} = {}_P\begin{Bmatrix} \vec{0} \\ u_{21}\vec{x} \end{Bmatrix}$
$\forall P$</td><td>$\{F_{1\to2}\} = {}_P\begin{Bmatrix} Y_{12}\vec{y}+Z_{12}\vec{z} \\ L_{12}\vec{x}+M_{12}\vec{y}+N_{12}\vec{z} \end{Bmatrix}$
$\forall P$</td></tr>
<tr><td>PIVOT GLISSANT
axe</td><td></td><td></td><td>Cylindre de révolution
</td><td>2 DDL
1 translation
1 rotation
<table><tr><th></th><th>R</th><th>T</th></tr><tr><td>x</td><td>1</td><td>1</td></tr><tr><td>y</td><td>0</td><td>0</td></tr><tr><td>z</td><td>0</td><td>0</td></tr></table>Paramètre : λ_x, θ_x</td><td>$\{V_{2/1}\} = {}_P\begin{Bmatrix} p_{21}\vec{x} \\ u_{21}\vec{x} \end{Bmatrix}$
$P \in (C,\vec{x})$</td><td>$\{F_{1\to2}\} = {}_P\begin{Bmatrix} Y_{12}\vec{y}+Z_{12}\vec{z} \\ M_{12}\vec{y}+N_{12}\vec{z} \end{Bmatrix}$
$P \in (C,\vec{x})$</td></tr>
<tr><td>HELICOIDALE
axe</td><td></td><td></td><td>Surface hélicoïdale
</td><td>2 DDL
1 translation
1 rotation
liées
<table><tr><th></th><th>R</th><th>T</th></tr><tr><td>x</td><td>1</td><td>1</td></tr><tr><td>y</td><td>0</td><td>0</td></tr><tr><td>z</td><td>0</td><td>0</td></tr></table>liées
Paramètres : λ_x, θ_x
liés par la relation : $\lambda_x = \theta_x \frac{pas}{2\pi}$</td><td>$\{V_{2/1}\} = {}_P\begin{Bmatrix} p_{21}\vec{x} \\ u_{21}\vec{x} \end{Bmatrix}$
Avec : $u_{21} = p_{21}\frac{pas}{2\pi}$
(1 inconnue cin.)
$P \in (C,\vec{x})$</td><td>$\{F_{1\to2}\} = {}_P\begin{Bmatrix} X_{12}\vec{x}+Y_{12}\vec{y}+Z_{12}\vec{z} \\ L_{12}\vec{x}+M_{12}\vec{y}+N_{12}\vec{z} \end{Bmatrix}$
Avec : $L_{12} = X_{12}\frac{pas}{2\pi}$
(5 inconnues stat.)
$P \in (C,\vec{x})$</td></tr>
<tr><td>ROTULE
centre</td><td></td><td></td><td>Surface sphérique
</td><td>3 DDL
3 rotations
<table><tr><th></th><th>R</th><th>T</th></tr><tr><td>x</td><td>1</td><td>0</td></tr><tr><td>y</td><td>1</td><td>0</td></tr><tr><td>z</td><td>1</td><td>0</td></tr></table>Paramètres : $\theta_x, \theta_y, \theta_z$</td><td>$\{V_{2/1}\} = {}_P\begin{Bmatrix} p_{21}\vec{x}+q_{21}\vec{y}+r_{21}\vec{z} \\ \vec{0} \end{Bmatrix}$
$P = C$</td><td>$\{F_{1\to2}\} = {}_P\begin{Bmatrix} X_{12}\vec{x}+Y_{12}\vec{y}+Z_{12}\vec{z} \\ \vec{0} \end{Bmatrix}$
$P = C$</td></tr>
</table>

<table>
<tr><th>NOM
+ caractéristiques associées</th><th>Représentation normalisée 3D</th><th>Représentations normalisées 2D</th><th>Géométrie de la zone de contact</th><th>Degrés de libertés</th><th>Torseur cinématique associé</th><th>Torseur des actions de contact</th></tr>
<tr><td>SPHERIQUE A DOIGT (ROTULE A DOIGT)
Centre</td><td></td><td></td><td>Surface sphérique + contact ponctuel </td><td>3 DDL
2 rotations
<table><tr><th></th><th>R</th><th>T</th></tr><tr><td>x</td><td>1</td><td>0</td></tr><tr><td>y</td><td>0</td><td>0</td></tr><tr><td>z</td><td>1</td><td>0</td></tr></table>Paramètres : θ_x, θ_z</td><td>$\{V_{2/1}\} = \begin{Bmatrix} p_{21}\vec{x} + r_{21}\vec{z} \\ \vec{0} \end{Bmatrix}_P$
$P = C$</td><td>$\{F_{1\to 2}\} = \begin{Bmatrix} X_{12}\vec{x} + Y_{12}\vec{y} + Z_{12}\vec{z} \\ M_{12}\vec{y} \end{Bmatrix}_P$
$P = C$</td></tr>
<tr><td>APPUI PLAN
Normale</td><td></td><td></td><td>Surface plane, ou ligne plane (sauf droite) normales au contact parallèles </td><td>3 DDL
1 rotation
2 translations
<table><tr><th></th><th>R</th><th>T</th></tr><tr><td>x</td><td>1</td><td>0</td></tr><tr><td>y</td><td>0</td><td>1</td></tr><tr><td>z</td><td>0</td><td>1</td></tr></table>Paramètres : λ_y, λ_z, θ_x</td><td>$\{V_{2/1}\} = \begin{Bmatrix} p_{21}\vec{x} \\ v_{21}\vec{y} + w_{21}\vec{z} \end{Bmatrix}_P$
$\forall P$</td><td>$\{F_{1\to 2}\} = \begin{Bmatrix} X_{12}\vec{x} \\ M_{12}\vec{y} + N_{12}\vec{z} \end{Bmatrix}_P$
$\forall P$</td></tr>
<tr><td>LINEAIRE ANNULAIRE (SPHERE -CYLINDRE)
axe</td><td></td><td></td><td>Cercle, normales au contact concourantes </td><td>4 DDL
3 rotations
1 translation
<table><tr><th></th><th>R</th><th>T</th></tr><tr><td>x</td><td>1</td><td>1</td></tr><tr><td>y</td><td>1</td><td>0</td></tr><tr><td>z</td><td>1</td><td>0</td></tr></table>Paramètres : λ_x, θ_x, θ_y, θ_z</td><td>$\{V_{2/1}\} = \begin{Bmatrix} p_{21}\vec{x} + q_{21}\vec{y} + r_{21}\vec{z} \\ u_{21}\vec{x} \end{Bmatrix}_P$
$P = C$</td><td>$\{F_{1\to 2}\} = \begin{Bmatrix} Y_{12}\vec{y} + Z_{12}\vec{z} \\ \vec{0} \end{Bmatrix}_P$
$P = C$</td></tr>
<tr><td>LINEAIRE RECTILIGNE
Arête + normale</td><td></td><td></td><td>Droite </td><td>4 DDL
2 rotations
2 translations
<table><tr><th></th><th>R</th><th>T</th></tr><tr><td>x</td><td>1</td><td>0</td></tr><tr><td>y</td><td>1</td><td>1</td></tr><tr><td>z</td><td>0</td><td>1</td></tr></table>Paramètres : λ_y, λ_z, θ_x, θ_y</td><td>$\{V_{2/1}\} = \begin{Bmatrix} p_{21}\vec{x} + q_{21}\vec{y} \\ v_{21}\vec{y} + w_{21}\vec{z} \end{Bmatrix}_P$
$P \in (C, \vec{x}, \vec{y})$</td><td>$\{F_{1\to 2}\} = \begin{Bmatrix} X_{12}\vec{x} \\ N_{12}\vec{z} \end{Bmatrix}_P$
$P \in (C, \vec{x}, \vec{y})$</td></tr>
<tr><td>PONCTUELLE (SPHERE-PLAN)
Point + normale</td><td></td><td>
OU
</td><td>Point </td><td>5 DDL
3 rotations
2 translations
<table><tr><th></th><th>R</th><th>T</th></tr><tr><td>x</td><td>1</td><td>0</td></tr><tr><td>y</td><td>1</td><td>1</td></tr><tr><td>z</td><td>1</td><td>1</td></tr></table>Paramètres : λ_y, λ_z, θ_x, θ_y, θ_z</td><td>$\{V_{2/1}\} = \begin{Bmatrix} p_{21}\vec{x} + q_{21}\vec{y} + r_{21}\vec{z} \\ v_{21}\vec{y} + w_{21}\vec{z} \end{Bmatrix}_P$
$P \in (C, \vec{x})$</td><td>$\{F_{1\to 2}\} = \begin{Bmatrix} X_{12}\vec{x} \\ \vec{0} \end{Bmatrix}_P$
$P \in (C, \vec{x})$</td></tr>
<tr><td>ENCASTREMENT</td><td></td><td></td><td></td><td>0 DDL
<table><tr><th></th><th>R</th><th>T</th></tr><tr><td>x</td><td>0</td><td>0</td></tr><tr><td>y</td><td>0</td><td>0</td></tr><tr><td>z</td><td>0</td><td>0</td></tr></table></td><td>$\{V_{2/1}\} = \begin{Bmatrix} \vec{0} \\ \vec{0} \end{Bmatrix}_P$
$\forall P$</td><td>$\{F_{1\to 2}\} = \begin{Bmatrix} X_{12}\vec{x} + Y_{12}\vec{y} + Z_{12}\vec{z} \\ L_{12}\vec{x} + M_{12}\vec{y} + N_{12}\vec{z} \end{Bmatrix}_P$
$\forall P$</td></tr>
</table>