0.1)

How you can make use of deformation over time to calculate nonlinear static deformation problems.

0.2)

1.1)

Because without a Deformation F and C equal the Identity matrix which results for C\_elasticity in the same equation as for the Linear St Venant Kirchhoff model.

1.2)

|  |  |  |
| --- | --- | --- |
| Material | Y – Displacement [mm] | X – Displacement [mm] |
| LinearStVenantKirchhoff | 0.1 | 0.0223412 |
| 1 | 0.224312 |
| 10 | 2.24312 |
| NonlinearStVenantKirchhof | 0.1 | 0.0224481 |
| 1 | 0.226003 |
| 10 | 2.41259 |
| NeoHookean | 0.1 | 0.0224194 |
| 1 | 0.23133 |
| 10 | 2.13624 |

As mentioned in 1.1 the different material models yield similar results for small displacements.

This changes when the displacement is increased. The Linear StVenantKirchhoff linearly scales while the other two models scale nonlinearly.

2)

|  |  |
| --- | --- |
| P in MPa | Delta y in mm |
| 10 | 2.59193 |
| 50 | 11.7027 |
| 100 | 22.0298 |
| 200 | 46.2138 |

As the pressure increases the ring is getting in a way deformed where the elliptic inner boundary where the pressure is applied deforms towards a circle which better distributes the stress.

Judging from the low E modulus of the material of the ring could be some kind of thermoplastics. For these materials under such loads a material model like NeoHookean is a good choice.

Therefore, the maximum deformation is on the minor vertexes of the ellipse.

The vertical displacement of the upper minor vertex of the ellipse scales pretty linearly with the pressure.

