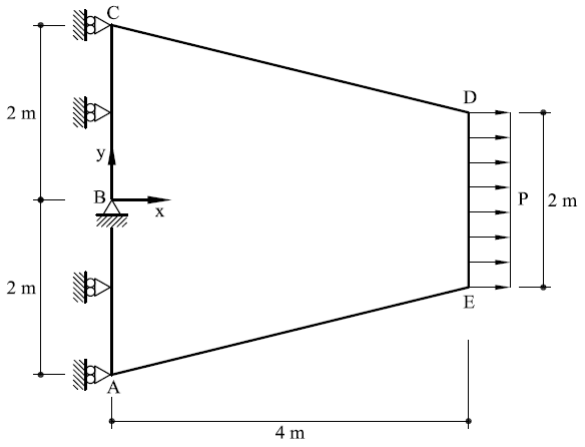
1 Plane stress

1.1 Thin plate under axial load



(a)

Data

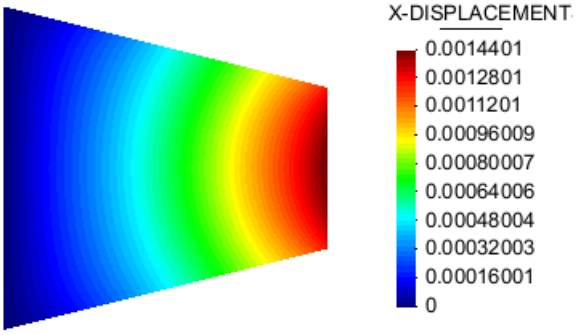
Material $\begin{cases} E = 2.1e5MPa \\ \nu = 0.30 \\ Thickness = 0.10m \end{cases}$

Boundary conditions $\begin{cases} \text{Edge AC restricted in direction x} \\ \text{Point B restricted in direction y} \end{cases}$

Load $\begin{cases} \text{Edge DE load P} = 10\dfrac{MN}{m} \end{cases}$

Sought Solution : $\begin{cases} \text{Center of side DE u} = 0.00144m \\ \text{Point B } \sigma_x = 61.3\dfrac{MN}{m^2} \end{cases}$

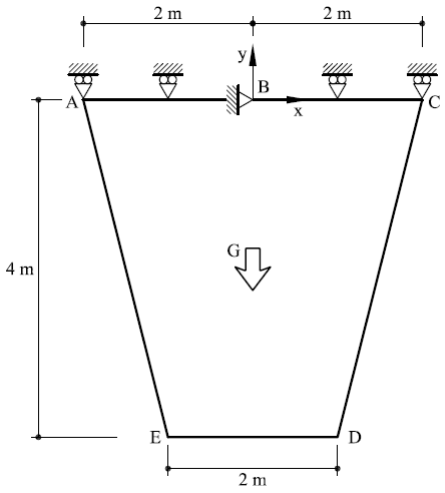
(b)



(c)

Figure 1: Problem data and selection of results.

1.2 Thin plate under dead weight



(a)

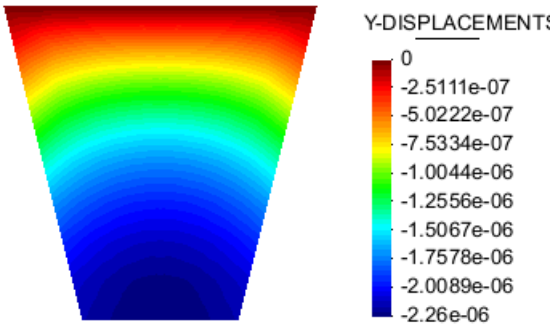
Data

Material $\begin{cases} E = 2.1e5MPa \\ \nu = 0.30 \\ \gamma = 7000 \frac{kg}{m^3} \\ Thickness = 0.10m \end{cases}$

Boundary conditions $\begin{cases} \text{Edge AC restricted in direction y} \\ \text{Point B restricted in direction x} \end{cases}$

Sought solution : $\begin{cases} \text{Center of side ED Displ - Y = 2.26e - 6 m} \\ \text{Point B } \sigma_y = 0.247 \frac{MN}{m^2} \end{cases}$

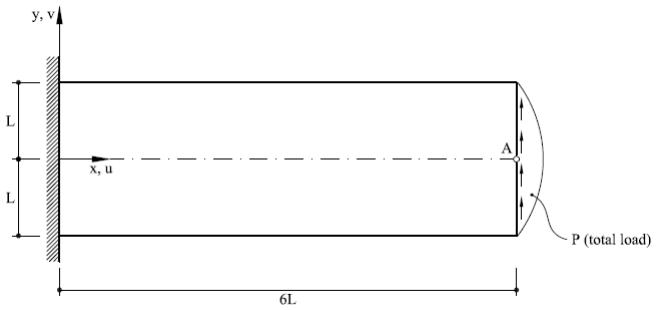
(b)



(c)

Figure 2: Problem data and selection of results.

1.3 Cantilever under a parabolic load on the edge



(a)

Data

Material $\begin{cases} E = 2.1e5MPa \\ \nu = 0.30 \end{cases}$

Thickness = 0.30m

L = 1m

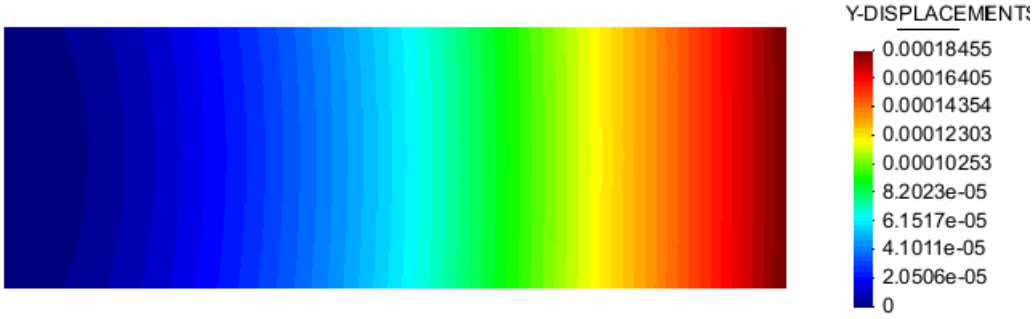
P = 0.10MN

$$f_{max} = \frac{P(6L)^3}{3EI} + \frac{P(6L)}{\frac{5}{6}AG}$$

A = Cross section area

$$G = \frac{E}{2(1+\nu)}$$

(b)

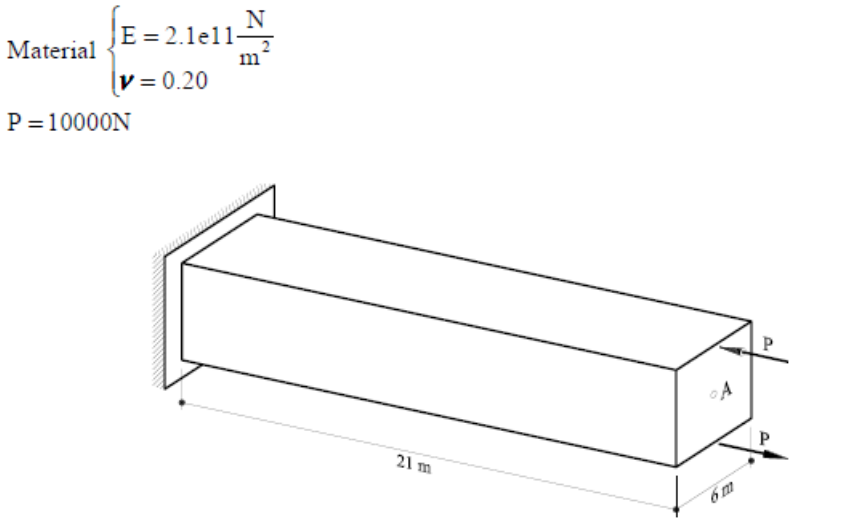


(c)

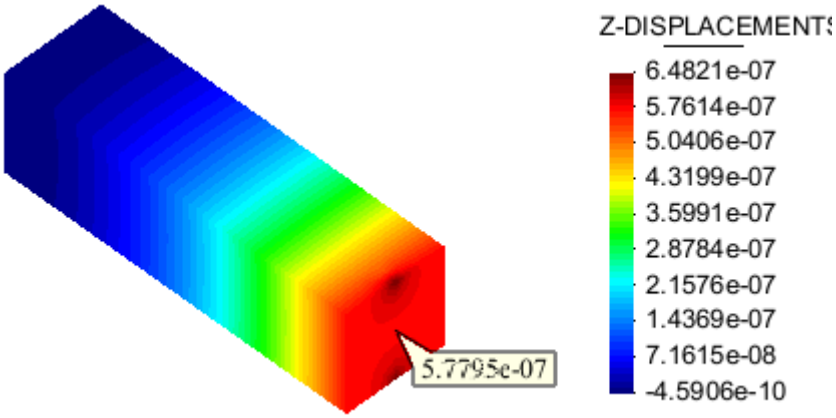
Figure 3: Problem data and selection of results.

2 3D Solids

2.1 Bending of a cantilever beam



(a)

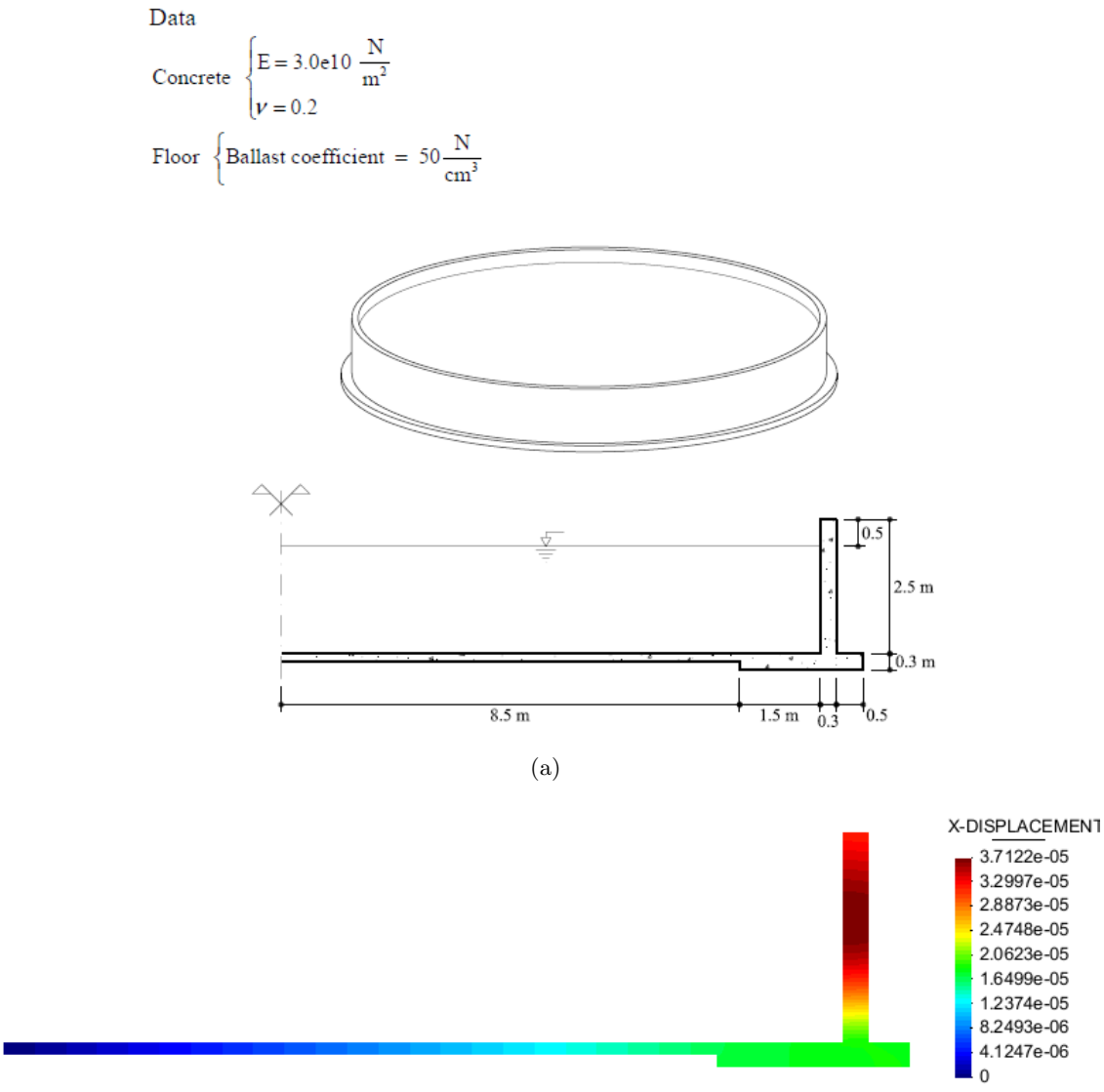


(b)

Figure 4: Problem data and selection of results.

3 Revolution solids

3.1 Cylindrical tank



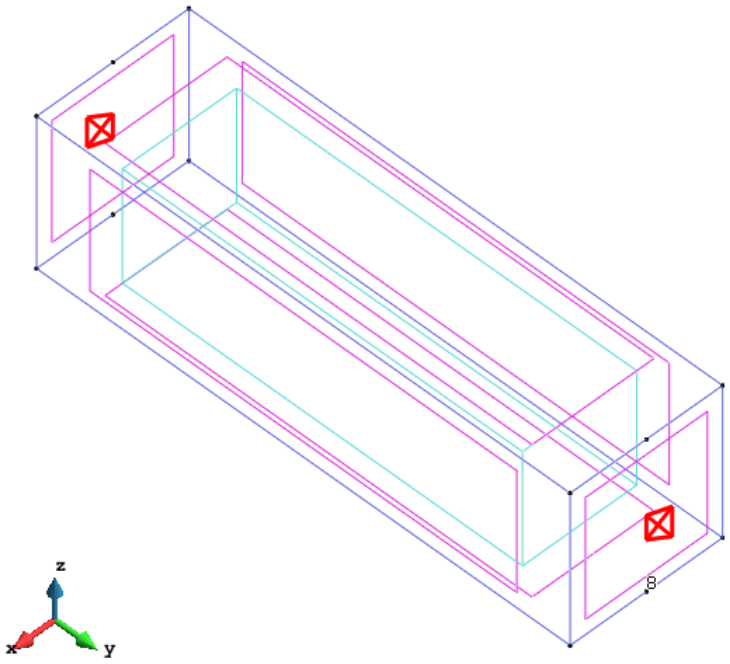
(a)

(b)

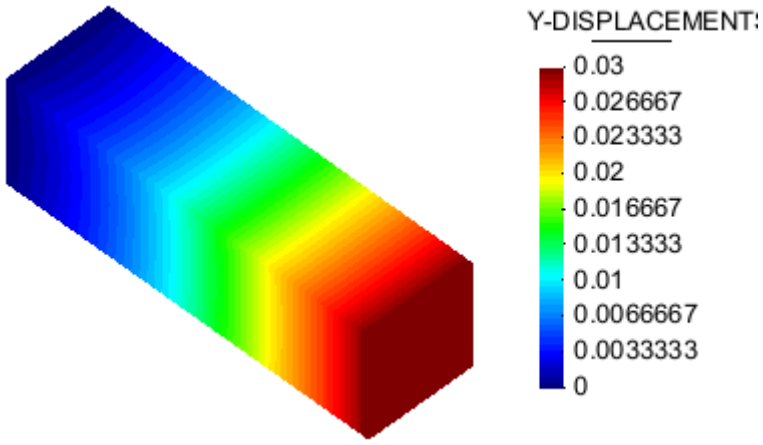
Figure 5: Problem data and selection of results.

4 Plasticity

4.1 3D Beam

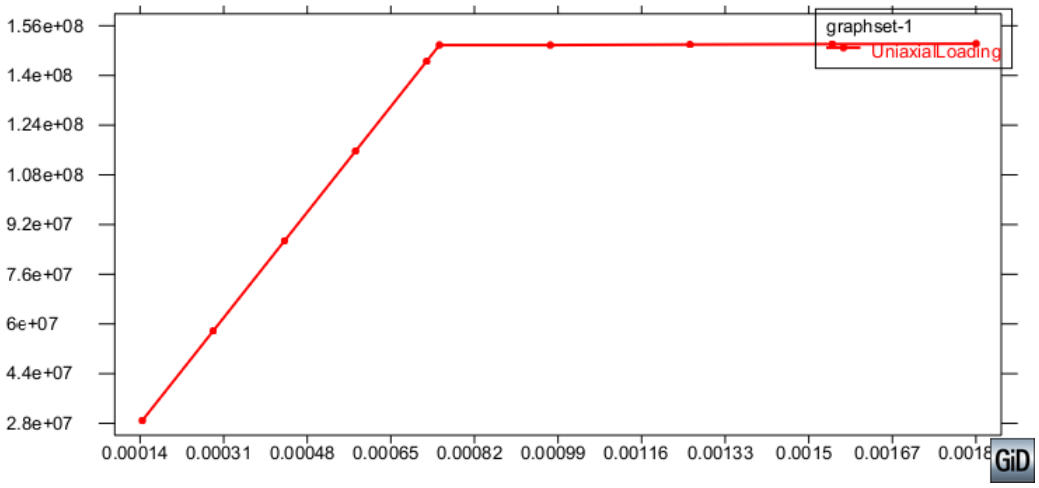


(a)

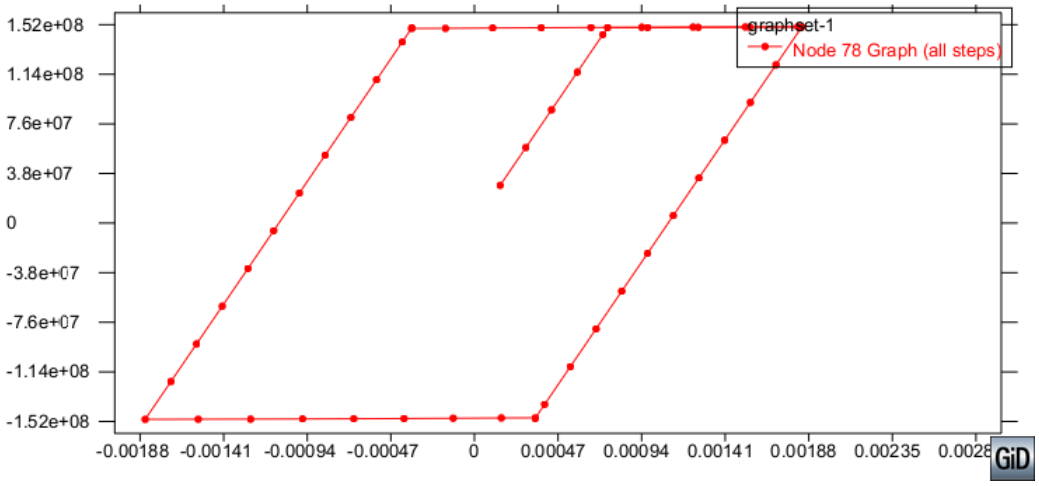


(b)

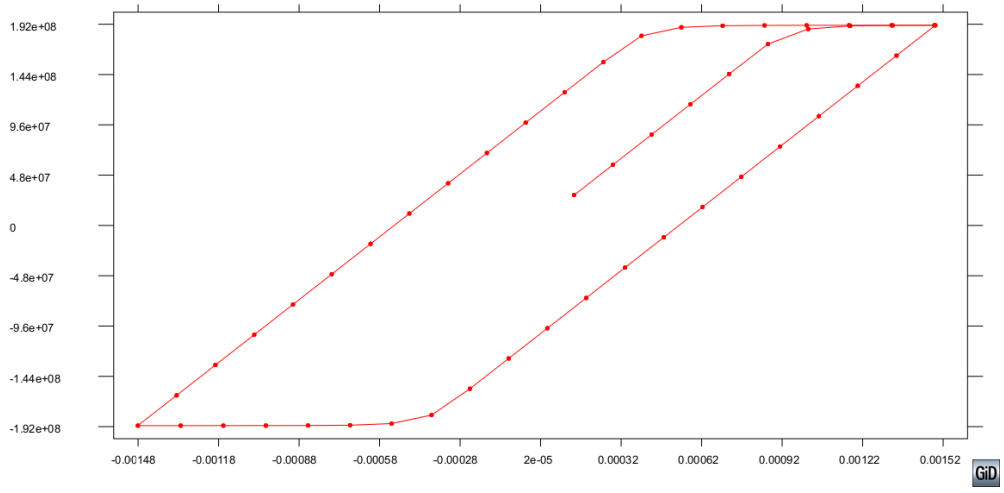
Figure 6: Problem data



(a) Rate independent

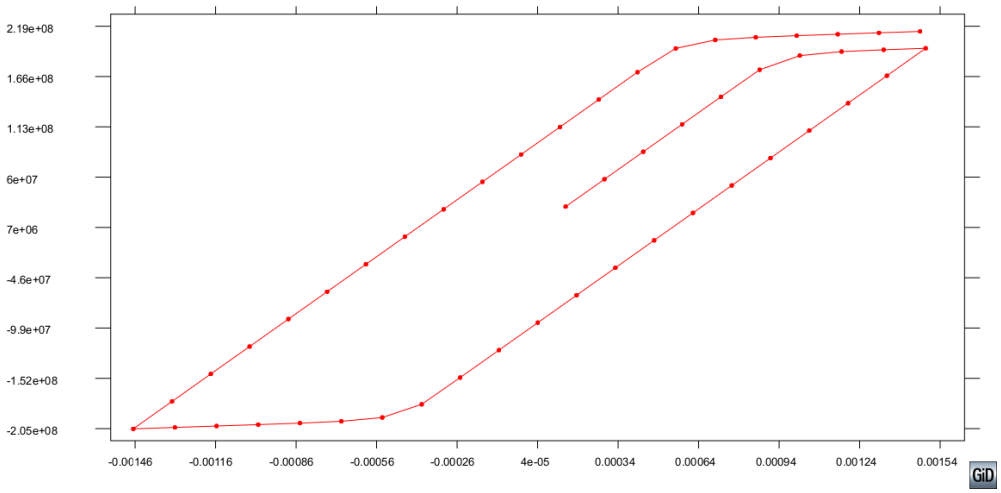


(b) Rate independent

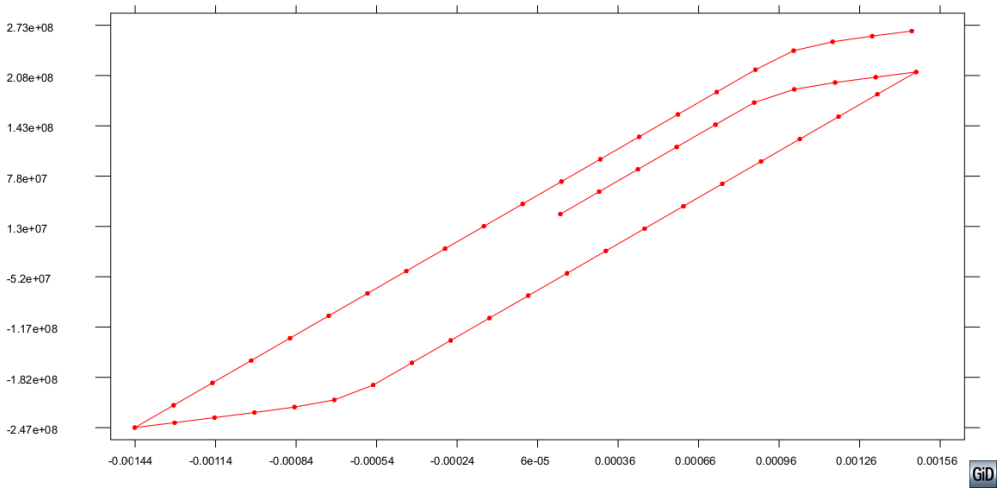


(c) Rate dependent

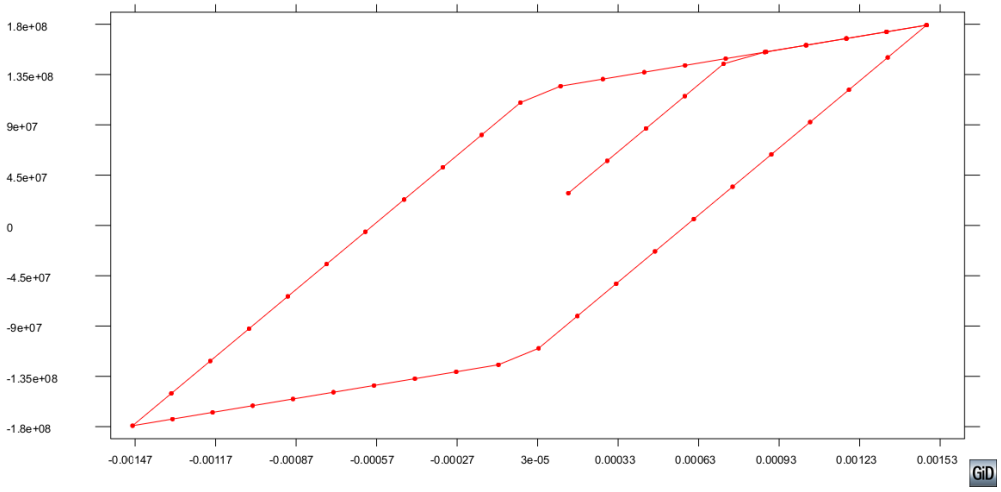
Figure 7: Perfect plasticity



(a) RD. Linear isotropic

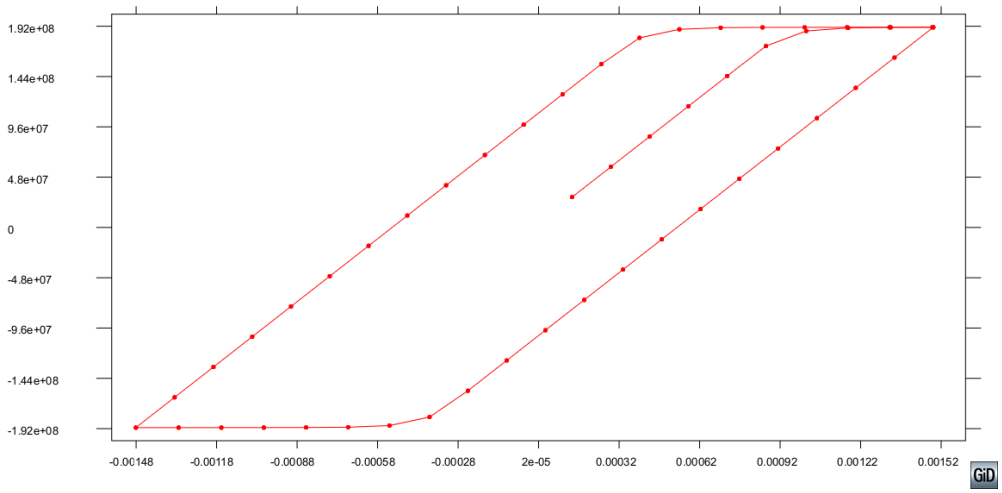


(b) RD. Nonlinear isotropic

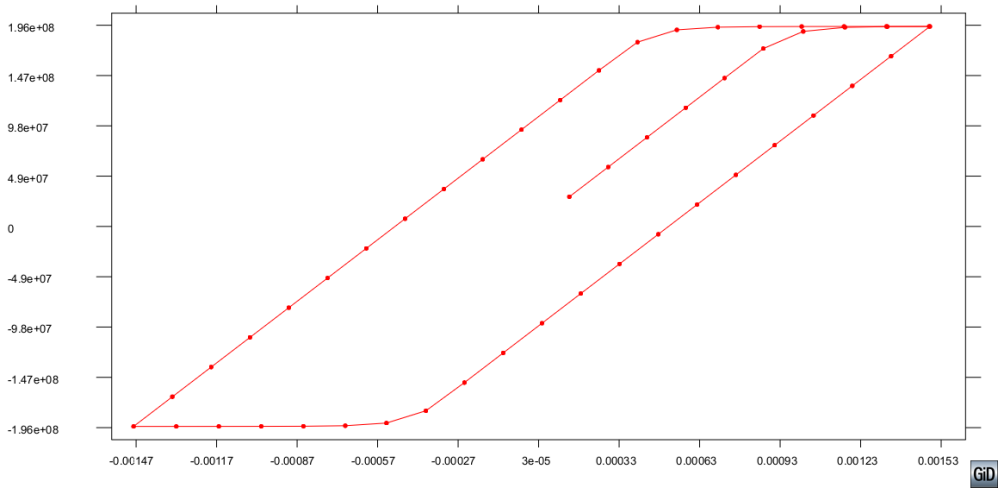


(c) RI. Linear kinematic

Figure 8: Plastic hardening



(a) 1x



(b) 2x

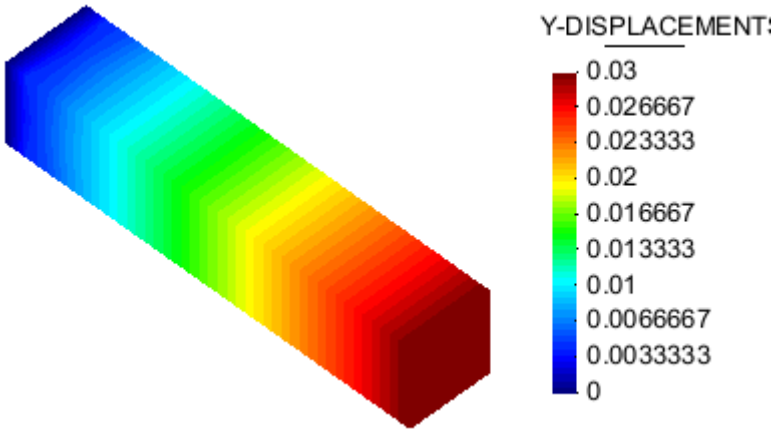
Figure 9: Strain rate

5 Damage

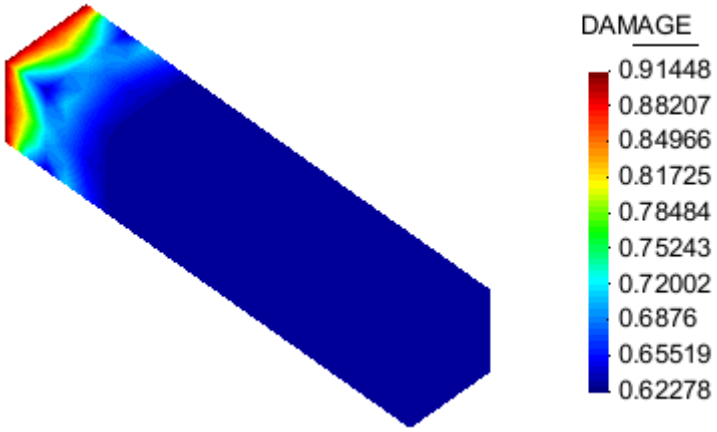
5.1 3D Beam: L = 1 m - cross-section 0.1x0.1 m. Rate independent.

```
$-------------------------------------------------------------------SET-Material
   SET=1 TYPE=1  NODES=8  NAME=Material
     ELEMENT_DATA:  INT_RULE=1  INT_POINTS=8  MODEL=16
     MATERIAL_DATA: DENSI=7800 YOUNG=20000 POISS=0.3 /
                    STREN=200  ILAWT=0  GFRAC=10
```

Figure 10: Material parameters

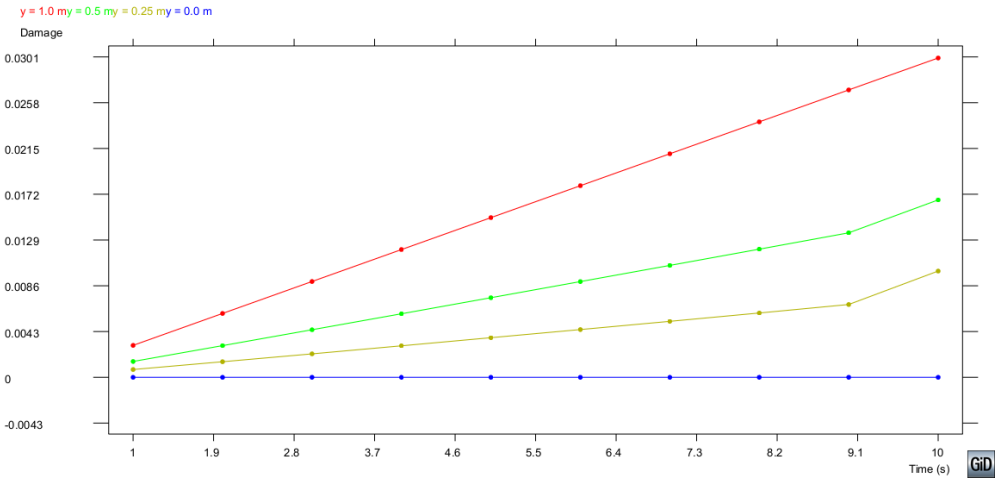


(a) Displacements in the main direction

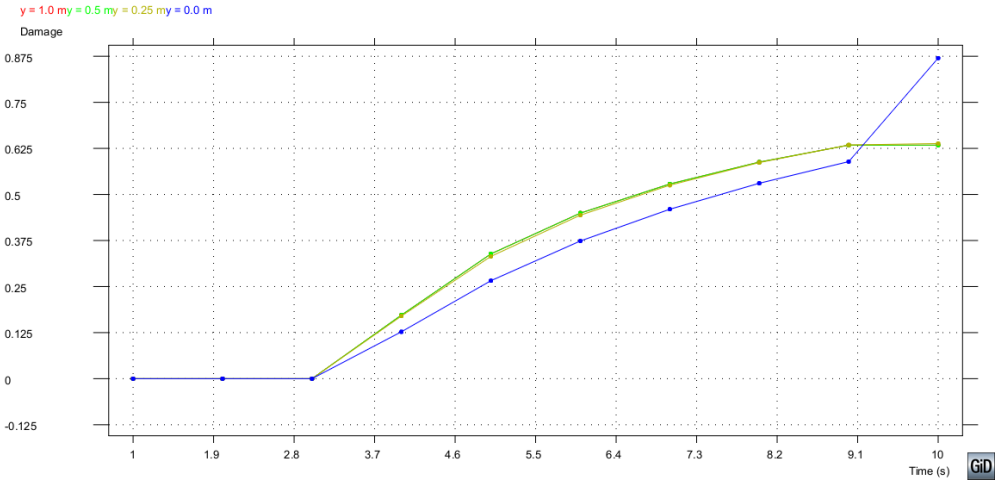


(b) Damage

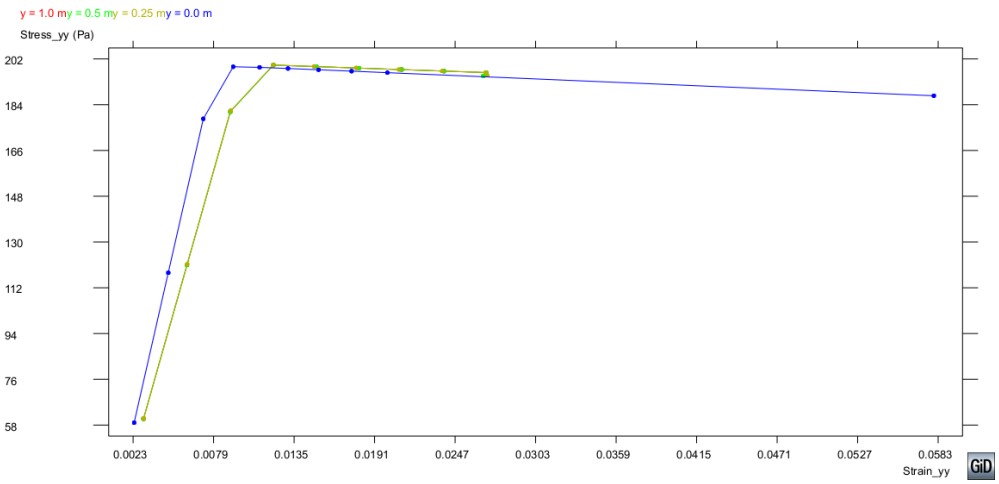
Figure 11: Results for 10 time steps



(a) Displacements

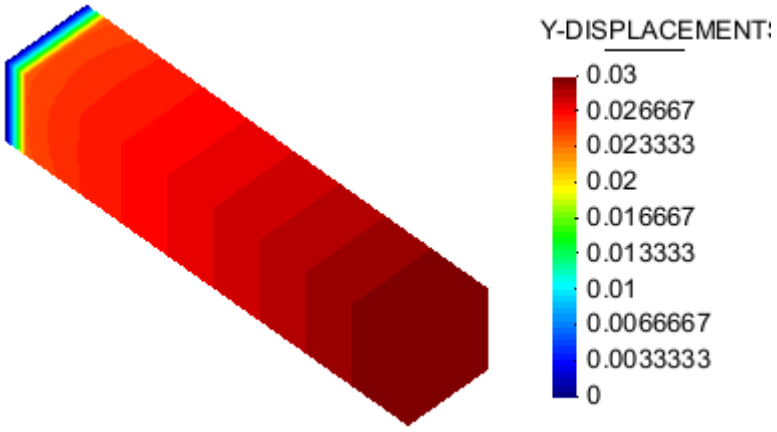


(b) Damage

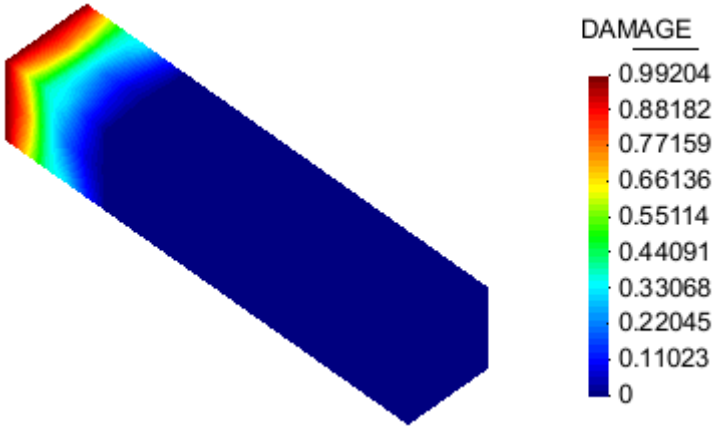


(c) Strain-stress curves

Figure 12: Results for 10 time steps at different points



(a) Displacements in the main direction

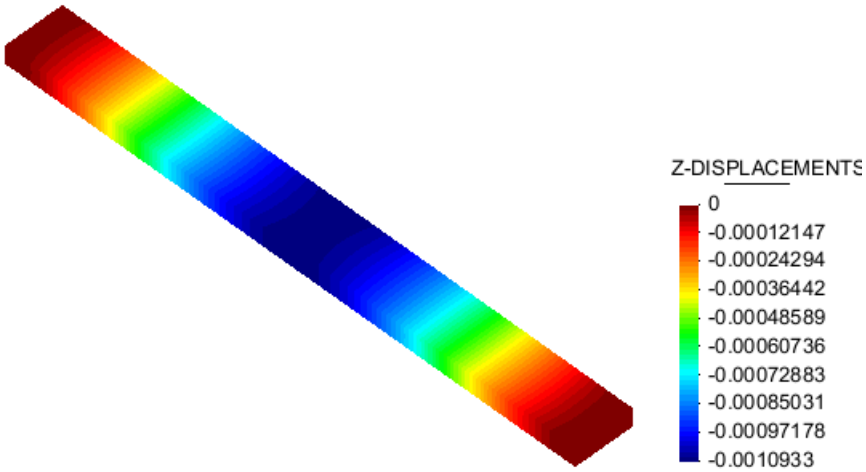


(b) Damage

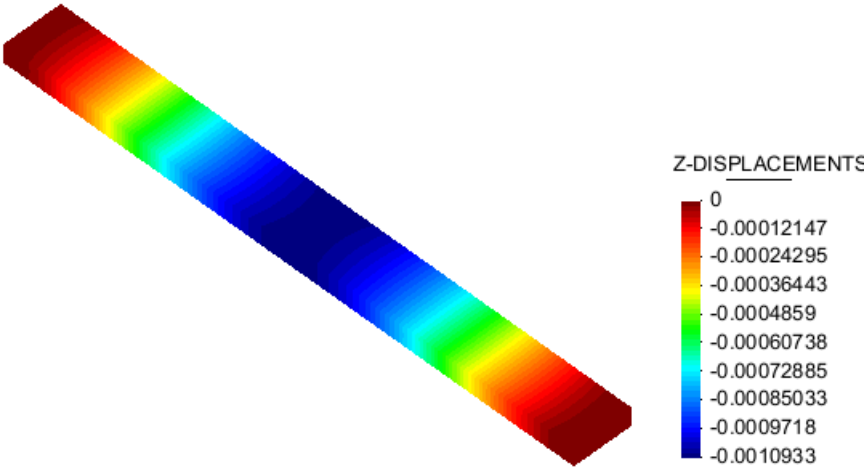
Figure 13: Results for 20 time steps

6 Dynamic

6.1 Slender beam subject to vertical pressure

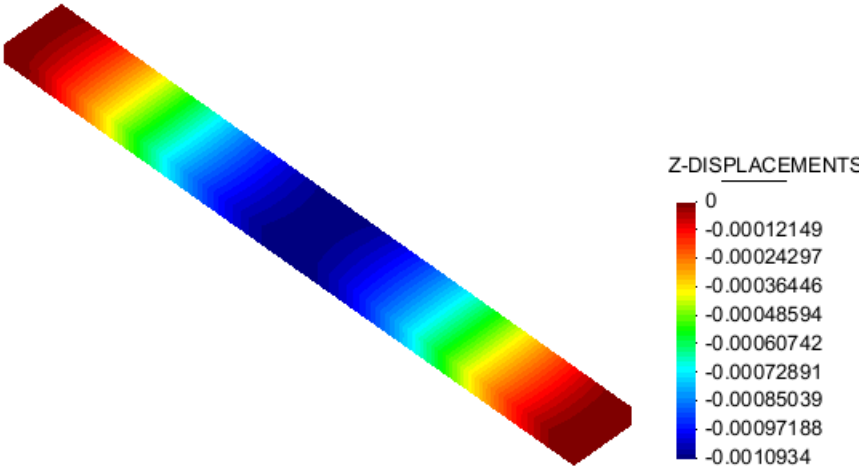


(a) Quasistatic

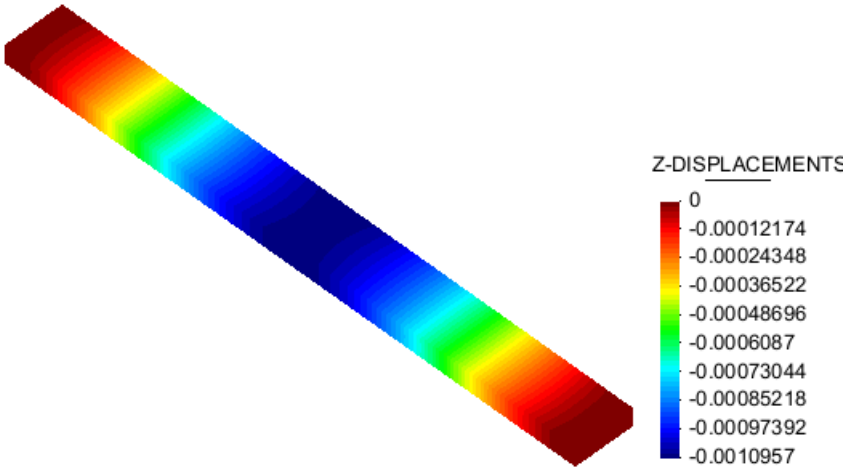


(b) Loading in 1 s

Figure 14: Results for different loading rates



(a) Loading in 0.5 s



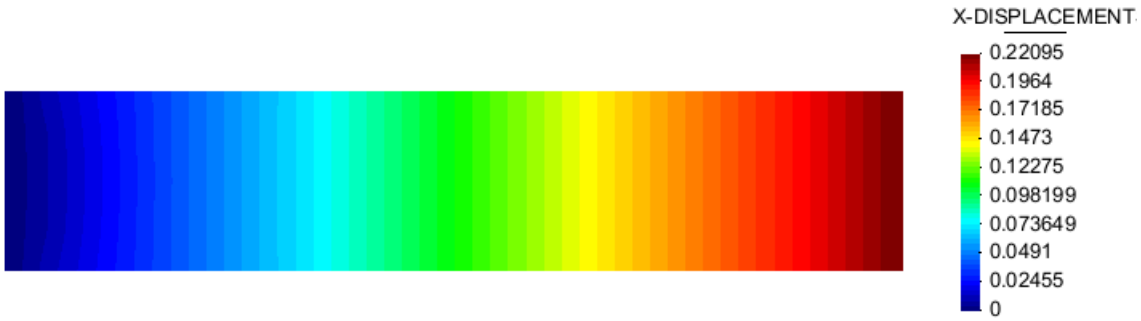
(b) Loading in 0.1 s

Figure 15: Results for different loading rates

7 Large strains

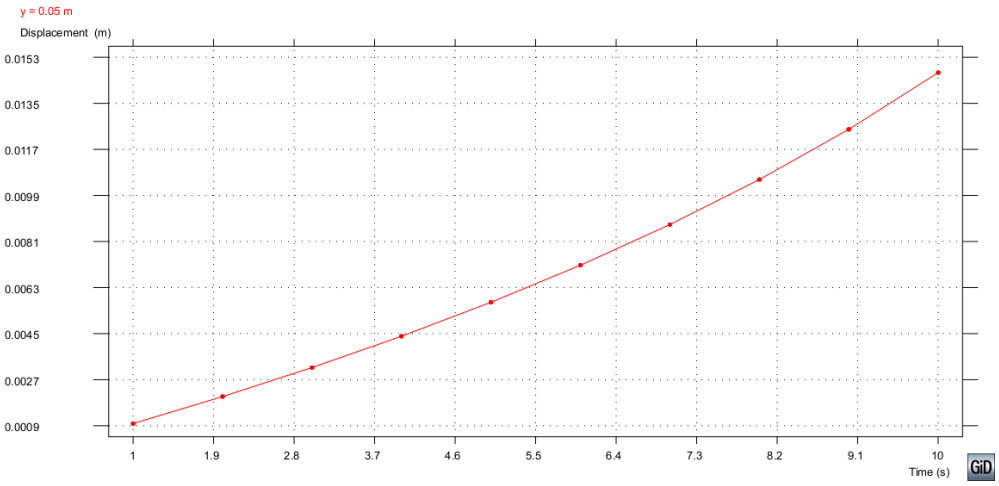
7.1 2D cantilever beam subject to a tensile load

(a) Small strains

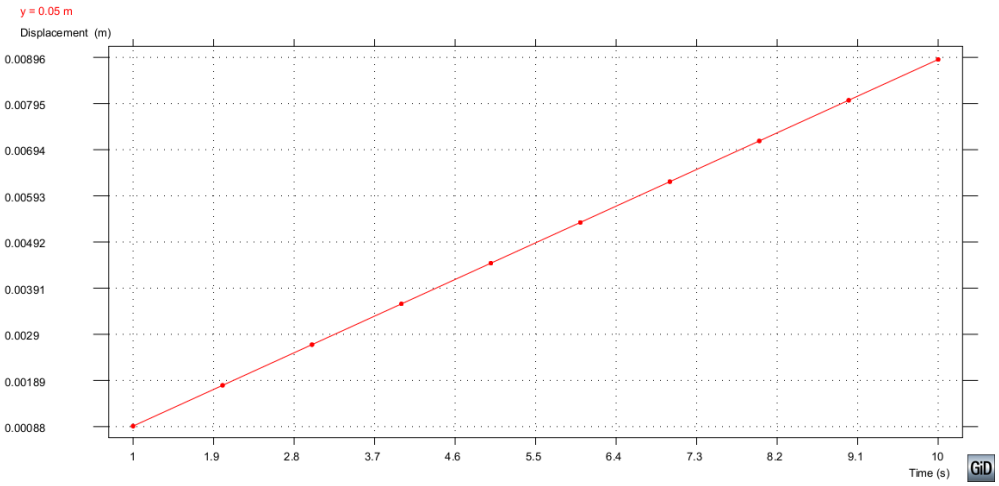


(b) Large strains

Figure 16: Displacements at last time step



(a) Small strains



(b) Large strains

Figure 17: Evolution of displacements with time at a selected point

8 Purely thermal

8.1 Square plate with different prescribed T at the edges

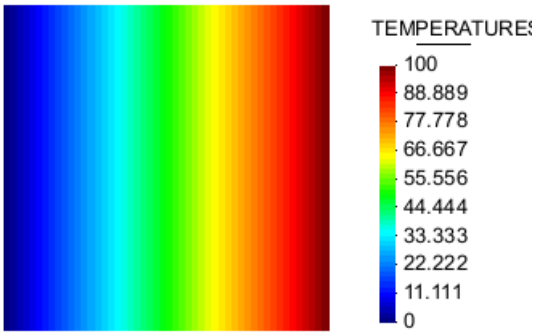


Figure 18: Temperature distribution