Finite elastic-plastic deformations (BMEGEMMDKPL)
II. Homework

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1 Data

Loading

We have an L mm $\times$ L mm $\times$ L mm brick element ($L = 1$ mm), shown in Figure 1.

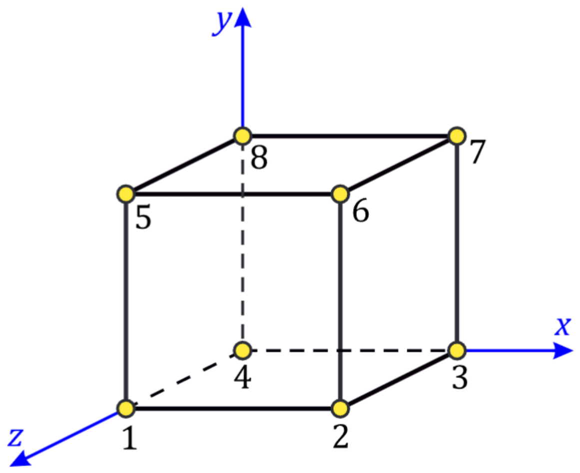

Figure 1: Nodal layout of the brick element.

We have a prescribed displacements on the upper nodes, whicg is defined in the following way

$$[\boldsymbol{U_1}] = [\boldsymbol{U_2}] = [\boldsymbol{U_3}] = [\boldsymbol{U_4}] = \begin{bmatrix} 0 & 0 & 0 \end{bmatrix}^T, \tag{1}$$

$$[\boldsymbol{U_5}] = [\boldsymbol{U_6}] = [\boldsymbol{U_7}] = [\boldsymbol{U_8}] = \begin{bmatrix} u_x & u_y & 0 \end{bmatrix}^T. \tag{2}$$

The time evolution of u_x and u_y can be observed on Figure 2

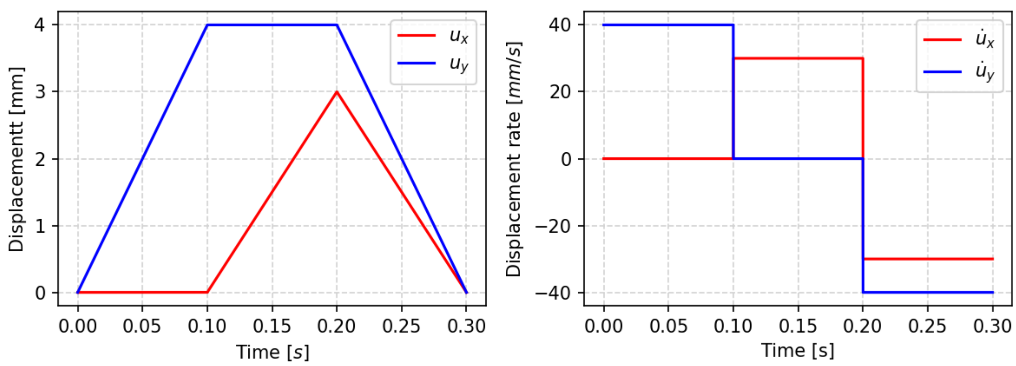

Figure 2: The parameters of the loading

From the displacement vectors we can determine the deformations gradient regarding to that motion.

$$[F] = \begin{bmatrix} 1 & \frac{u_x}{L} & 0 \\ 0 & 1 + \frac{u_y}{L} & 0 \\ 0 & 0 & 1 \end{bmatrix}. \tag{3}$$

The velocity gradient can be calculated with the help of the

Material behaviour

References

You can find the detailed code on GitHub.