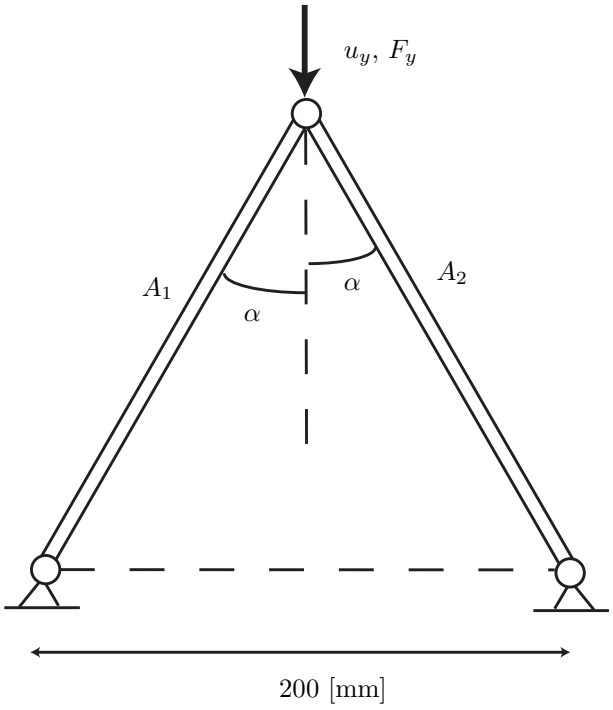
Computer assignment 1: Truss structure

Write your own code that includes load/time stepping, computation of geometrical nonlinear bar (element) force and stiffness, computation of hyperelastic and elasto-plastic stress and consistent tangent stiffness in 1D, solution of nonlinear system of equations by a Newton-Raphson scheme. Analyze the following truss structure:



- [a] Assume that the bars are equal, i.e., $A_1 = A_2 = A$, $\alpha = \pi/4$ reproduce the results given in Figure 3.8 a-d (p. 90) in Bonet & Wood (Remember that you deform 2 bars). Control the vertical displacement u_y of the initially upper joint. Also plot the constitutive behaviour in the bars for the purely elastic case.
- [b] Now assume an imperfection $A_2 = A_1 \cdot 1.05 = A \cdot 1.05$ that will cause an unsymmetric response. Otherwise assume the same conditions as in [a] and give the same type results as in [a]. Investigate the sensitivity of the imperfection by plotting how the initially upper joint will move during the loading.
- [c] Perform [b] once again but now for a smaller angle atan(α)= 1/3.