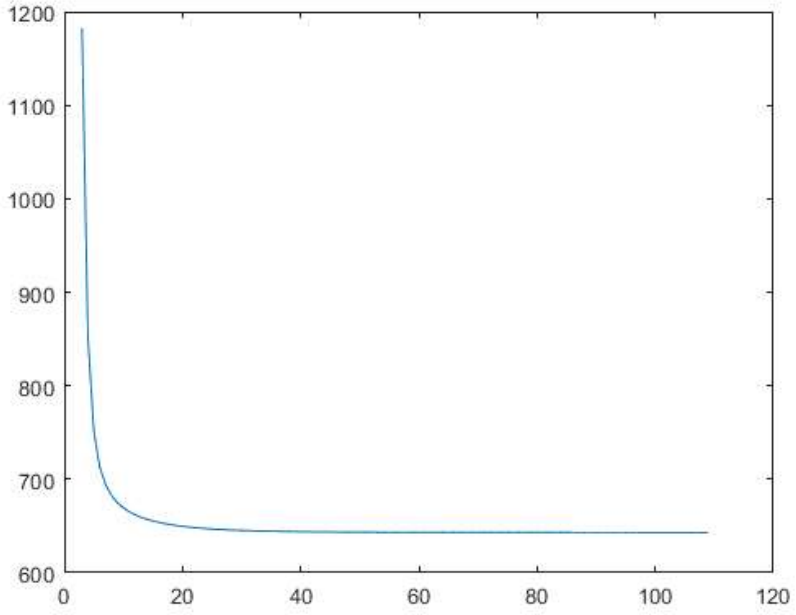
Contents


```
% Assignment 6 Q4

% Assignment 6 Q2
clear
load("ps_06_data.mat")
gamma = 0.2;
E = 70e+3;
nu = 0.3;
volfrac = 0.3;
penal = 3;
sigma_y = 325;

[nelx, nely] = size(rho);

xvals = [1:nelx] - 0.5;
yvals = -xvals;

[X,Y] = meshgrid(xvals,yvals);

stress_vm = zeros(nelx,nely);
Ae = 1;
for elx = 1:nelx
    for ely = 1:nely
        disp = [ dx(ely+1,elx) dy(ely+1,elx); dx(ely+1,elx+1) dy(ely+1,elx+1); dx(ely,elx+1) dy(ely,elx+1); dx(ely,elx) dy(ely,elx)];
        D = (rho(ely,elx)^penal)*(E/(1-nu^2))*[1 nu 0;nu 1 0;0 0 (1-nu)/2];
        strain = 0.5*[disp(2,1)+disp(3,1)-disp(4,1)-disp(1,1);
                      disp(3,2)+disp(4,2)-disp(1,2)-disp(2,2);
                      disp(2,2)+disp(3,1)+disp(3,2)+disp(4,1)-disp(1,1)-disp(1,2)-disp(2,1)-disp(4,2)];
        stress_temp = D*strain;
        stress_xx = stress_temp(1);
        stress_yy = stress_temp(2);
        stress_xy = stress_temp(3);
        stress_vm(ely,elx) = sqrt((stress_xx.^2 + stress_yy.^2) + 3*stress_xy.^2 - stress_xx.*stress_yy);
    end
end
P_norm = [];
for P = 3:500
P_norm = [P_norm (sum(sum((max(0,stress_vm)).^P)))^(1/P)];
end

plot(3:500,P_norm)
```



Comments on using Von Mises Stress for Stress Limits

Using Von-Misses stress directly will lead to a number of problems. Von-misses stress is the equivallent stress calculated after resolving the stresses in all three directions. The idea behing using the P-Norms is to calculate the one global bounding limit while applying the stress limits. In case we use the Von-Mises Stess for calculating the P-Norm and P-Mean values, it will lead to a problem of convergence.

It can be clearly seen that plot does not show up after 130 eventhough it is supposed to show up till 500(according to code), because the values after 130 become infinity. This is the key computational issue in using the Von-Mises stress directly.

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