

Contents

- [Comment on the Distribution of Gradient](#)

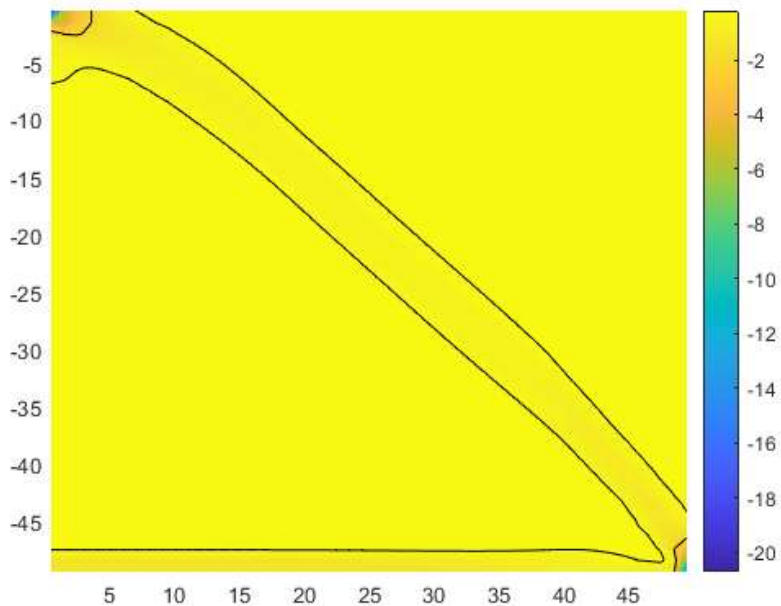
```
% Assignment 6 Q2
clear
load("ps_06_data.mat")
gamma = 0.2;
E = 70e+3; %[in MPa]
nu = 0.3;
volfrac = 0.3;
penal = 3;

[nelx, nely] = size(rho);

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

[X,Y] = meshgrid(xvals,yvals);
total_strain_energy = 0;
stress_vm = zeros(nelx,nely);
Ae = 1;
dc = zeros(nely,nelx);
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;
        strain_energy = 0.5*stress_temp'*strain;
        total_strain_energy = total_strain_energy + volfrac*strain_energy;
        dc(ely,elx) = -penal*rho(ely,elx)^(penal-1)*2*strain_energy;
    end
end

hold on
limit = [-0.25,-2];
contourf(X,Y,dc,100,'edgecolor','none')
colorbar()
contour(X,Y,dc,limit,'edgecolor','black')
hold off
```



Comment on the Distribution of Gradient

As can be clearly seen in the Contour plot that the gradient has an area that has less negative values than others. This means, that part can be made more stiff by adding very less amount of material, and thus more material will be added there. The contour has an area enclosed by black thick lines, inside which more material will be added, and at the other locations, material will be removed.

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