**2nd code challenge**

**%plotting the signal**

**x1 = csvread('a01\_3.csv');**

**%disp(data)**

**t=0:27000:1**

**x= data(:,1);**

**y= data(:,2);**

**plot(x,y)**

**%filtering of the signal**

**fc= 100;**

**fs= 1000;**

**n= 4;**

**[b,a]= butter(n,2\*fc/fs);**

**filtered = filter(b,a,data);**

**plot(filtered)**

**%using pan tompkins alg and finding out r peaks**

**y=length(x1);**

**fs = 200;**

**N = length (x1);**

**t = [0:N-1]/fs;**

**figure(1)**

**subplot(2,1,1)**

**plot(t,x1)**

**subplot(2,1,2)**

**plot(t(200:600),x1(200:600))**

**xlim([1 3])**

**x1 = x1 - mean (x1 );**

**x1 = x1/ max( abs(x1 )) ;**

**figure(2)**

**subplot(2,1,1)**

**plot(t,x1)**

**subplot(2,1,2)**

**plot(t(200:600),x1(200:600))**

**xlim([1 3])**

**b=[1 0 0 0 0 0 -2 0 0 0 0 0 1];**

**a=[1 -2 1];**

**h=filter(b,a,[1 zeros(1,12)]);**

**x2 = conv (x1 ,h);**

**x2 = x2/ max( abs(x2 ));**

**figure(3)**

**subplot(2,1,1)**

**plot([0:length(x2)-1]/fs,x2)**

**xlim([0 max(t)])**

**subplot(2,1,2)**

**plot(t(200:600),x2(200:600))**

**xlim([1 3])**

**b = [-1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 32 -32 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1];**

**a = [1 -1];**

**h1=filter(b,a,[1 zeros(1,32)]);**

**x3 = conv (x2 ,h1);**

**x3 = x3/ max( abs(x3 ));**

**figure(4)**

**subplot(2,1,1)**

**plot([0:length(x3)-1]/fs,x3)**

**xlim([0 max(t)])**

**subplot(2,1,2)**

**plot(t(200:600),x3(200:600))**

**xlim([1 3])**

**h = [-1 -2 0 2 1]/8;**

**x4 = conv (x3 ,h);**

**x4 = x4 (2+[1: N]);**

**x4 = x4/ max( abs(x4 ));**

**figure(5)**

**subplot(2,1,1)**

**plot([0:length(x4)-1]/fs,x4)**

**subplot(2,1,2)**

**plot(t(200:600),x4(200:600))**

**xlim([1 3])**

**x5 = x4 .^2;**

**x5 = x5/ max( abs(x5 ));**

**figure(6)**

**subplot(2,1,1)**

**plot([0:length(x5)-1]/fs,x5)**

**subplot(2,1,2)**

**plot(t(200:600),x5(200:600))**

**xlim([1 3])**

**h = ones (1 ,31)/31;**

**Delay = 15;**

**x6 = conv (x5 ,h);**

**x6 = x6 (15+[1: N]);**

**x6 = x6/ max( abs(x6 ));**

**figure(7)**

**subplot(2,1,1)**

**plot([0:length(x6)-1]/fs,x6)**

**subplot(2,1,2)**

**plot(t(200:600),x6(200:600))**

**xlim([1 3])**

**figure(7)**

**subplot(2,1,1)**

**max1 = max(x6);**

**thresh = mean (x6 );**

**k=thresh\*max1;**

**y =(x6>k)';**

**figure,plot(y,t)**

**figure (8)**

**subplot(2,1,1)**

**plot (t(200:600),x1(200:600)/max(x1))**

**box on**

**xlim([1 3])**

**subplot(2,1,2)**

**plot (t(200:600),x6(200:600)/max(x6))**

**xlim([1 3])**

**left = find(diff([0 y])==1);**

**right = find(diff([y 0])==-1);**

**left=left-20;**

**for i=1:length(left)**

**[Rv(i) Rl(i)] = max( x1(left(i):right(i)) );**

**Rl(i) = Rl(i)+left(i) ;**

**for j=1:20**

**x(j)=left(j);**

**for l=1:20;**

**k(l)=left(j)-left(j+1);**

**y=-1\*mean2(k(l));**

**end**

**end**

**end**

**figure**

**plot (t,x1/max(x1) , t(Rl) ,Rv , 'r\*');**

**xlim([1 3])**

**heartrate=(fs\*60)/y;**

**tx=0:N-1/fs;**

**figure,plot(tx(200:600),x1(200:600))**

**disp('HEART RATE IS:::')**

**fprintf('%d\n', round(heartrate));**

**if (heartrate==72)**

**disp('HEART RATE OF THE SUBJECT IS NORMAL');**

**end**

**if(heartrate<72)**

**disp('HEART RATE BELOW NORMAL, SUFFERING FROM BRADYCARDIA');**

**else**

**disp('ABOVE NORMAL, SUFFERING FROM TRACHYCARDIA');**

**end**