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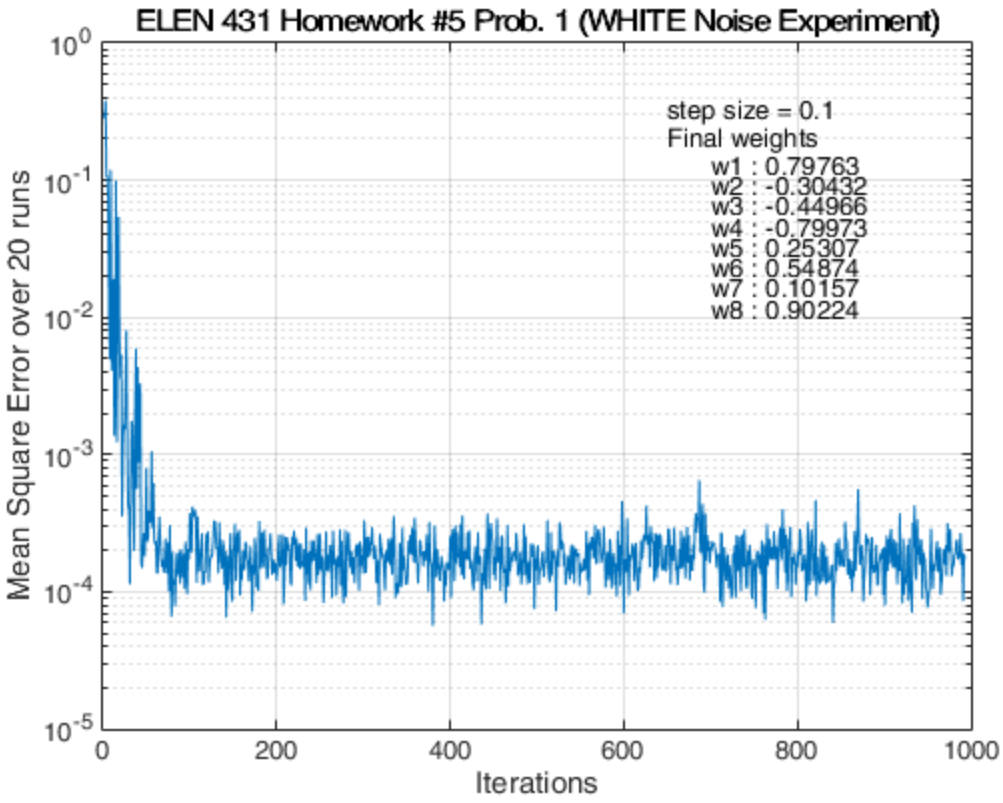
ELEN 431

HW 5

Problem 1

```
figure;
itr = 1000;
rns = 20;
mu = 0.1;

sign2 = 0.0001;
sigx2 = 1.0;
M = 8;
w = zeros(M,1);
num = [0.8 -.31 -.45 -.8 .25 .55 .1 .9]';
den = [1];
WM = [];
JM = [];


for j=1:rns
    x = sqrt(sigx2)*randn(itr+2*M, 1);
    n = sqrt(sign2)*randn(itr, 1);

    g1=filter(num,den,x);
    g2=g1(M:itr+M-1,1);
    d = g2 + n;
        for i = 1:(itr-M+1)
            u = x(i+M-1:-1:i,1);
            y(i,1) = w'*u;
            e(i,1) = d(i,1)-y(i,1);
            J(i,1) = e(i,1)*conj(e(i,1));
            w = w+mu*u*e(i,1);
        end
        WM = [WM w];
        JM = [JM J];
```

```
end

W = mean(WM');
[num W' W'-num]
Y = mean(JM');


tstr='ELEN 431 Homework #5 Prob. 1 (WHITE Noise Experiment)';
ystr=['Mean Square Error over ',num2str(rns),' runs'];
xstr='Iterations';


semilogy(Y)
text(0.65,0.90,['step size = ',num2str(mu)],'sc');
text(0.65,0.86,['Final weights'],'sc');
for i = 1:M
    text(0.7,(0.85-i*0.03),['w',num2str(i),' : ',num2str(w(i))],'sc')
end
title(tstr)
xlabel(xstr)
ylabel(ystr)
grid
%print hw5_p1
save hw5_p1.mat;


ans =

    0.8000    0.7999   -0.0001
   -0.3100   -0.3098    0.0002
   -0.4500   -0.4507   -0.0007
   -0.8000   -0.7997    0.0003
    0.2500    0.2507    0.0007
    0.5500    0.5516    0.0016
    0.1000    0.1005    0.0005
    0.9000    0.9000   -0.0000
```

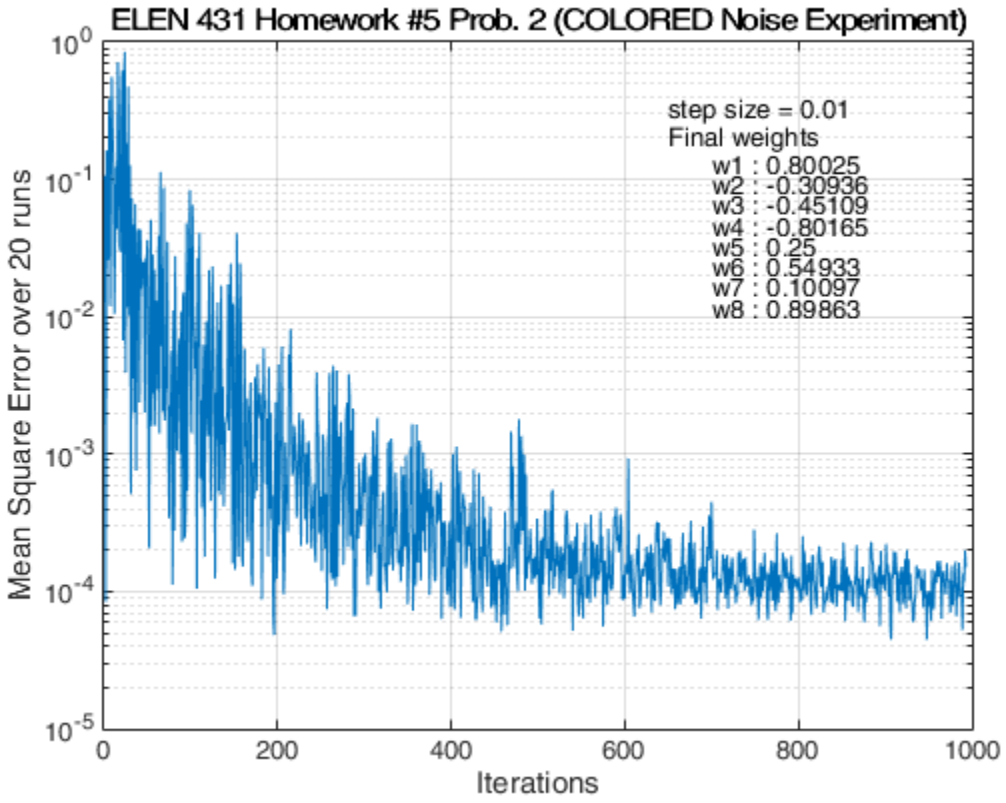


Problem 2

```
figure;
iter = 1000;
num = 20;
mu = 0.01; %Mu must be decrease to account for the coloration or it
 will not converge

xpower = 1.0;
npower = 0.0001;
M = 8;

w = zeros(M,1);
y = zeros(iter,1);
e = zeros(iter,1);
G=[1 0 -0.9375 0 0.3281 0 0.0244];
B=[0.8 -0.31 -0.45 -0.8 0.25 0.55 0.1 0.9]';
A=[1];
WM = [];
JM = [];

for j = 1:num;

x1 = sqrt(xpower) * randn(iter+2*M, 1);
n = sqrt(npower) * randn(iter, 1);
```

```
x = filter(G,A,x1);
g = filter(B,A,x);
g = g(M:iter+M-1, 1);
d = g + n;
 for n = 1:(iter-M+1)
  u = x(n+M-1:-1:n,1);
  y(n,1) = w' * u;
  e(n,1) = d(n,1) - y(n,1);
  J(n,1) = e(n,1) * conj(e(n,1));
  w = w + mu * u * e(n,1);
 end
 WM = [WM w];
 JM = [JM J];
end
W = mean(WM');
[B  W'  W'-B]
Y = mean(JM');
tstr='ELEN 431 Homework #5 Prob. 2 (COLORED Noise Experiment)';
ystr=['Mean Square Error over ',num2str(num),' runs'];
xstr='Iterations';

semilogy(Y)
text(0.65,0.90,['step size = ',num2str(mu)],'sc');
text(0.65,0.86,['Final weights'],'sc');
for i = 1:M
   text(0.7,(0.85-i*0.03),['w',num2str(i),' : ',num2str(w(i))],'sc')
end
title(tstr)
xlabel(xstr)
ylabel(ystr)
grid
%print hw5_p2
save hw5_p2.mat;

disp('the final weight vector is very close in both cases, but that
 is due to decreasing the step size to accommadate the coloration of
 the noise. When run with the same parameters as white, the answer is
 nonconvergent.')


ans =

    0.8000    0.7998   -0.0002
   -0.3100   -0.3102   -0.0002
   -0.4500   -0.4506   -0.0006
   -0.8000   -0.8004   -0.0004
    0.2500    0.2494   -0.0006
    0.5500    0.5494   -0.0006
    0.1000    0.0995   -0.0005
    0.9000    0.9000   -0.0000

the final weight vector is very close in both cases, but that is due
 to decreasing the step size to accommadate the coloration of the
```

noise. When run with the same parameters as white, the answer is nonconvergent.



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