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```
clc;
clear;
close all;
```

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definition

```
% d : desired signal
% N :length of filter
% M : length of input signal
% alpha : mu tilde
% e : errors
% w : weights of filter
% p : power of input signal
% v : noise
% l : noise amplitude
% d_t : corrupted desired signal
a=1;
b=[1,1.8,0.81];          % impulse response
inputs=randn(1,100);
d=filter(b,a,inputs);
M=length(inputs);
```

part a

```
l = 1;
alpha = 0.5;
N = 4;

v = randn(1,100);
d_t=d+l*v;


% N=4 and mu mu tilde=0.5

[w,~]=NLMS(inputs,d_t,N,alpha,M);
disp("weights for mu tilde=0.5 , N=4 and l=1  :");
disp(w');

%N=5 and mu tilde = 0.5
```

```
N=5;

[w,~]=NLMS(inputs,d_t,N,alpha,M);
disp("weights for mu tilde=0.5 , N=5 and l=1 :");
disp(w');
disp("if the algorithm not converged must increase the tap of filter ")
```

part b

```
l = 0.1;
N = 4;

v = randn(1,100);
d_t=d+l*v;


% M=4 and mu tilde=0.5 and l=0.1
[w,~]=NLMS(inputs,d_t,N,alpha,M);
disp("weights for mu tilde=0.5 , N=4 and l=0.1  :");
disp(w');

%N=5 and mu tilde = 0.5 l=0.1
N=5;

[w,~]=NLMS(inputs,d_t,N,alpha,M);
disp("weights for mu tilde=0.5 , N=5 and l=0.1 :");
disp(w');

disp('in the best practice noise of desired signal not eliminate and if noise
 amplitude is lower, the output of system is more accurate ')
```

NLMS algorithms

```
function[w,cost,J_min,J_inf]=NLMS(inputs,d,N,alpha,M)
% e : error
% u_temp : because LMS run when the first sample arrive, we put M-1 zeros in
 beging of inputs, if whe don't put this zeros we must wait to m sample arrive
    u_temp=[zeros(1,N-1),inputs];
    e=zeros(1,M);
    w=zeros(1,N);
    for i=N:M
        u=u_temp(i:-1:i-N+1);
        y=dot(w,u);
        e(i-N+1)=d(i-N+1)-y;
        w =  w + (alpha/(norm(u)^2))*e(i-N+1)*u;
    end
    cost=e.^2;
    J_min=min(cost);
    J_inf=sum(cost(M-19:M))/20;

end
```

weights for mu tilde=0.5 , N=4 and l=1 :

```
    1.4207
    1.6784
    1.0633
    0.0398

weights for mu tilde=0.5 , N=5 and l=1 :
    1.3041
    1.5875
    1.1443
   -0.0190
    0.0834

if the algorithm not converged must increase the tap of filter
```

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