Individual Activity

Activity Title: Noise Cancellation Using Adaptive Filter

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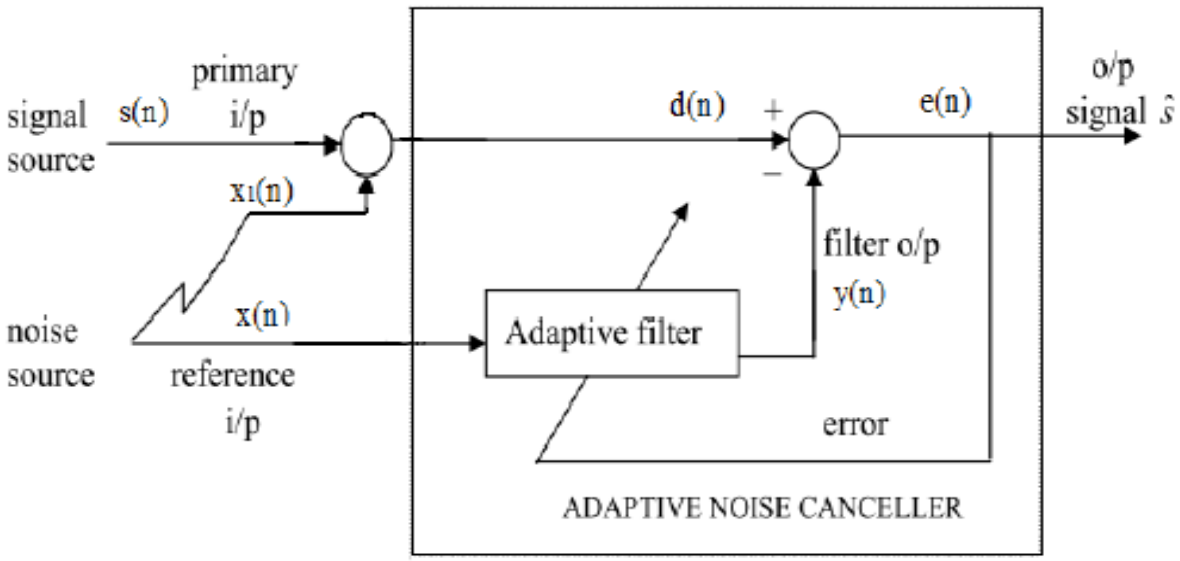
Activity Details

- Abstract:

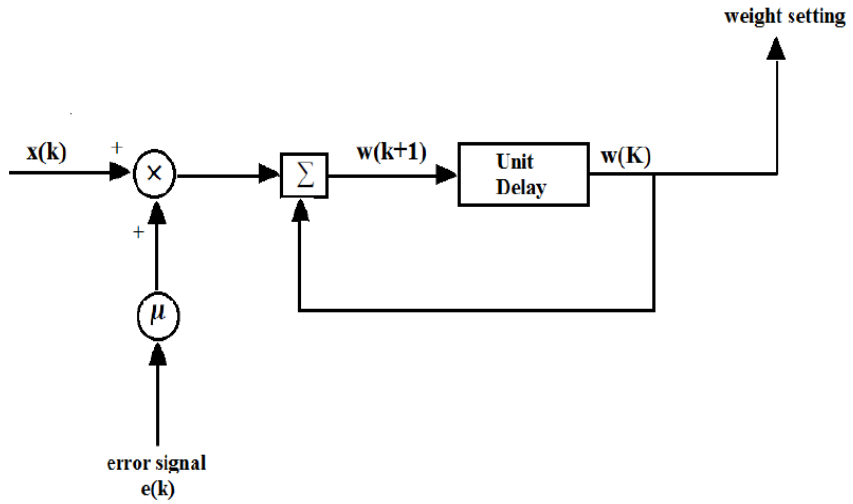
Adaptive noise cancellation is an approach used for noise reduction in speech signal. As received signal is continuously corrupted by noise where both received signal and noise signal both changes continuously, then this arise the need of adaptive filtering. Adaptive filter adjust their coefficients to minimize an error signal and can be realized as finite impulse response (FIR), infinite impulse response (IIR), lattice and transform domain filter. The most common form of adaptive filter is the transversal filter using least mean square (LMS) algorithm .

Adaptive noise cancellation (ANC) efficiently attenuates low frequency noise for which passive methods are ineffective. Although both FIR and IIR filters can be used for adaptive filtering, the FIR filter is by far the most practical and widely used. The reason being that FIR has adjustable zeros, and hence it is free of stability problems associated with adaptive IIR filters that have adjustable poles as well as zeros.

Block Diagram:



Block diagram of LMS algorithm:



MATLAB Code:

```
% Activity "Noise Cancellation using LMS Algorithm.."
clear;close;clc;
%Generating Desired Signal
t = 0.001:0.001:1;
fm = 50;
D = 2*sin(2*pi*fm*t);
% Generating Signal Corrupted with Noise
n = numel(D);
A = D(1:n)+0.9*randn(1,n);      % desired signal + 90% noise signal
%LMS Algorithm
M = 25;
w = zeros(1,M);
wi = zeros(1,M);
E = [];
u = 0.0005;   %for conversion of LMS algorithm (Step size)
%den = A(1,:)*A(1,:)'+0.0001;
for i = M:n
```

```
E(i) = D(i)-wi*A(i:-1:i-M+1)';
 wi = wi+ 2*(u)*E(i)*A(i:-1:i-M+1);
end
%Estimation of the signal
 Est = zeros(n,1);
for i = M:n
j = A(i:-1:i-M+1);
Est(i) = ((wi)*(j)');
end
 % Computing the error signal
 Err = Est'-D;
%singal Output
subplot(4,1,1),plot(D);
title('Desired Signal');
subplot(4,1,2),plot(A);
title('Signal Corrupted with Noise');
subplot(4,1,3),plot(Est);
 title('Estimation Signal');
subplot(4,1,4),plot(Err);
title('Error Signal');
```

Output:

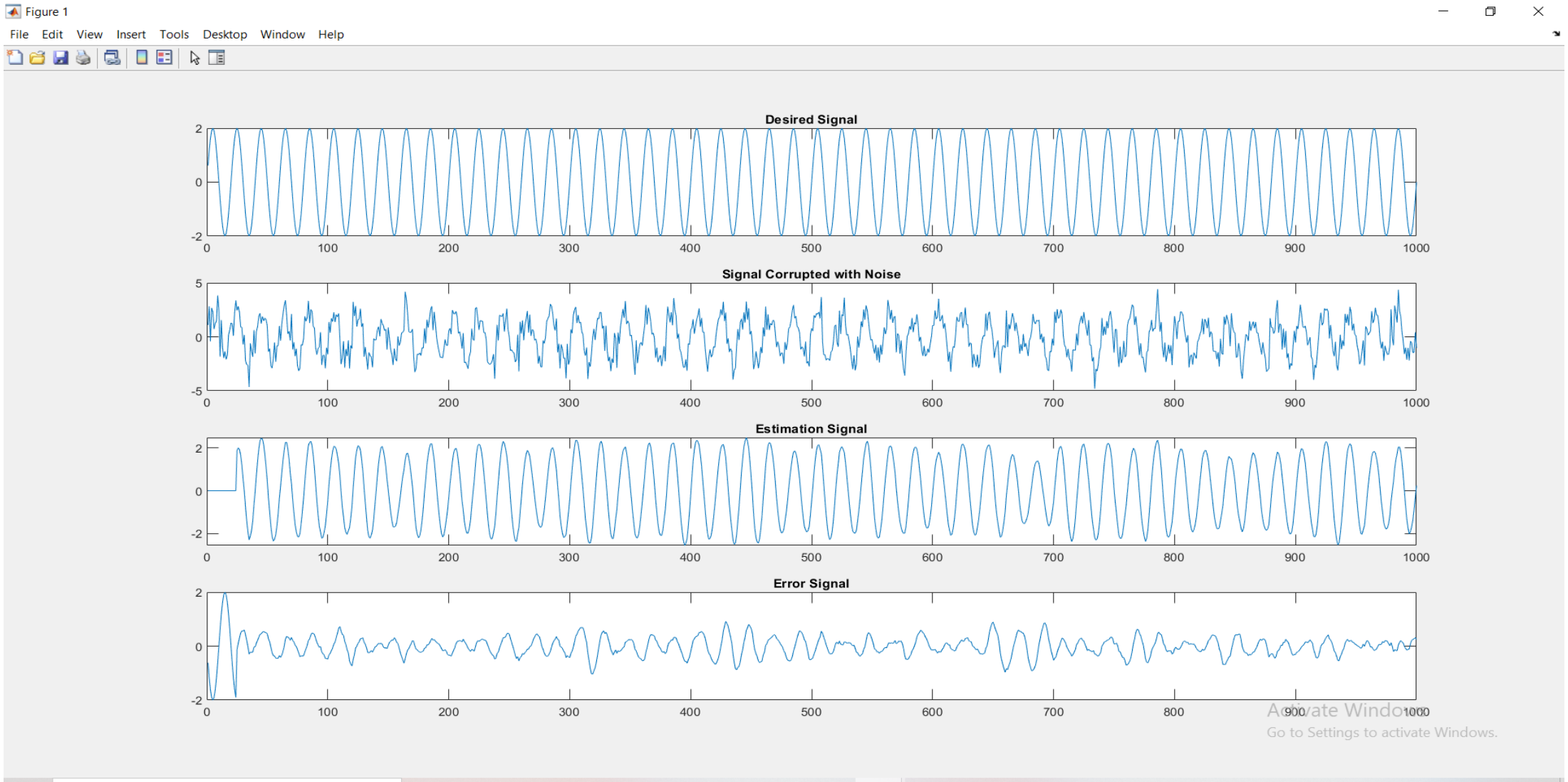


Figure 1
File Edit View Insert Tools Desktop Window Help
Desired Signal
Signal Corrupted with Noise
Estimation Signal
Error Signal
Activate Windows
Go to Settings to activate Windows.
Type here to search
37°C Sunny
ENG
19:49
08-04-2022

THANK YOU