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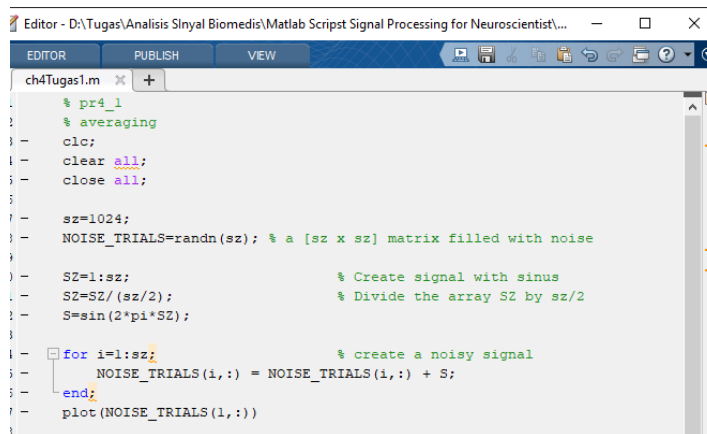
NIM : 081711733002

TUGAS ANALISIS SINYAL BIOMEDIS

Source : Signal Processing for Neuroscientist 2nd (chapter 4)

Answer:

1. Modify program with $n = 1, 2, 3, \dots, 1024$ repetitions



```
ch4Tugas1.m
% pr4_1
% averaging
clc;
clear all;
close all;

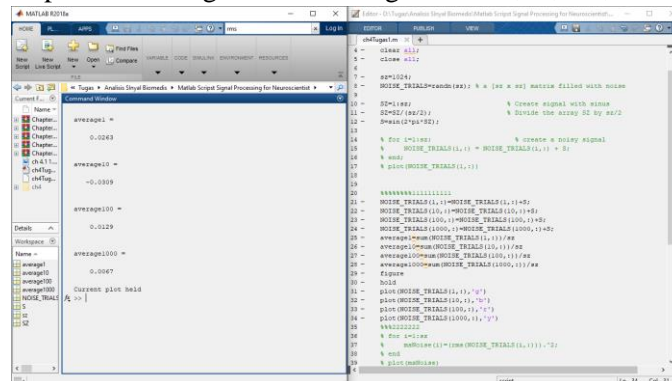
sz=1024;
NOISE_TRIALS=randn(sz); % a [sz x sz] matrix filled with noise

SZ=1:sz; % Create signal with sinus
SZ=SZ/(sz/2); % Divide the array SZ by sz/2
S=sin(2*pi*SZ);

for i=1:sz; % create a noisy signal
    NOISE_TRIALS(i,:) = NOISE_TRIALS(i,:) + S;
end;
plot(NOISE_TRIALS(1,:))
```

Plot result :

- a. Depict the average and \pm average for $n=1, 10, 100, 1000$



```
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% pr4_1
% averaging
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sz=1024;
NOISE_TRIALS=randn(sz); % a [sz x sz] matrix filled with noise

SZ=1:sz; % Create signal with sinus
SZ=SZ/(sz/2); % Divide the array SZ by sz/2
S=sin(2*pi*SZ);

for i=1:sz; % create a noisy signal
    NOISE_TRIALS(i,:) = NOISE_TRIALS(i,:) + S;
end;

% Averaging
n=1;
average1 = mean(NOISE_TRIALS(1:n,:), 'r');
std1 = std(NOISE_TRIALS(1:n,:), 'r');

n=10;
average10 = mean(NOISE_TRIALS(1:n,:), 'r');
std10 = std(NOISE_TRIALS(1:n,:), 'r');

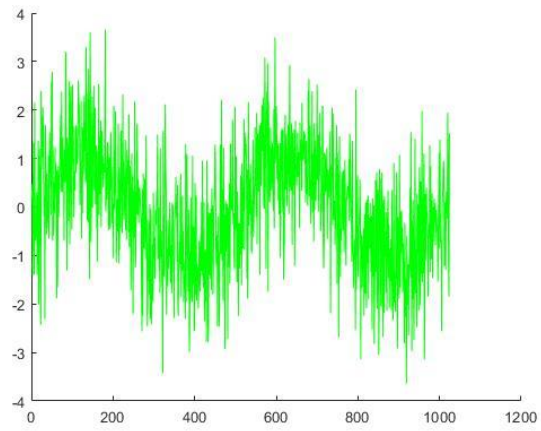
n=100;
average100 = mean(NOISE_TRIALS(1:n,:), 'r');
std100 = std(NOISE_TRIALS(1:n,:), 'r');

n=1000;
average1000 = mean(NOISE_TRIALS(1:n,:), 'r');
std1000 = std(NOISE_TRIALS(1:n,:), 'r');

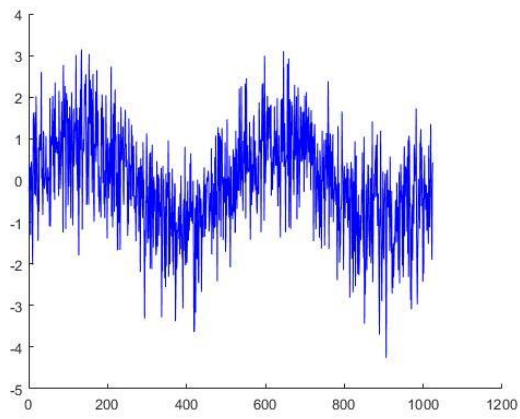
% Plot
figure;
plot(average1, 'r');
hold on;
plot(average10, 'b');
hold on;
plot(average100, 'g');
hold on;
plot(average1000, 'm');
hold on;
plot(std1, 'r');
hold on;
plot(std10, 'b');
hold on;
plot(std100, 'g');
hold on;
plot(std1000, 'm');
hold on;
plot(1:sz, S, 'k');
axis([0 1024 -1 1]);
legend('n=1', 'n=10', 'n=100', 'n=1000', 'S');
title('Average and Standard Deviation for n=1, 10, 100, 1000');
xlabel('Index');
ylabel('Value');
grid on;
```

Plot

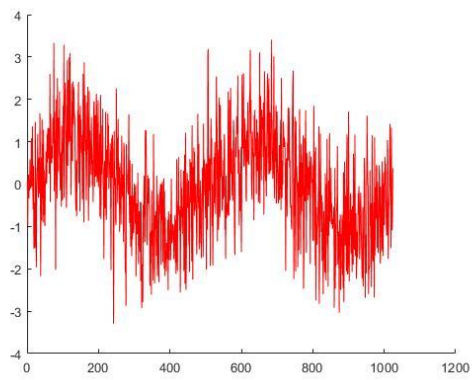
1. $n=1$



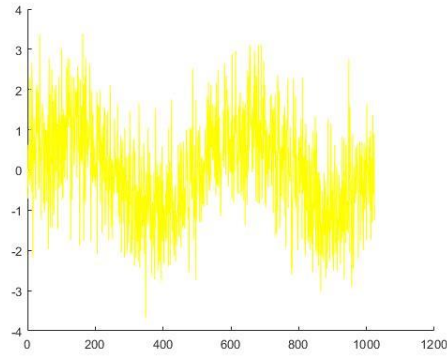
2. $n=10$



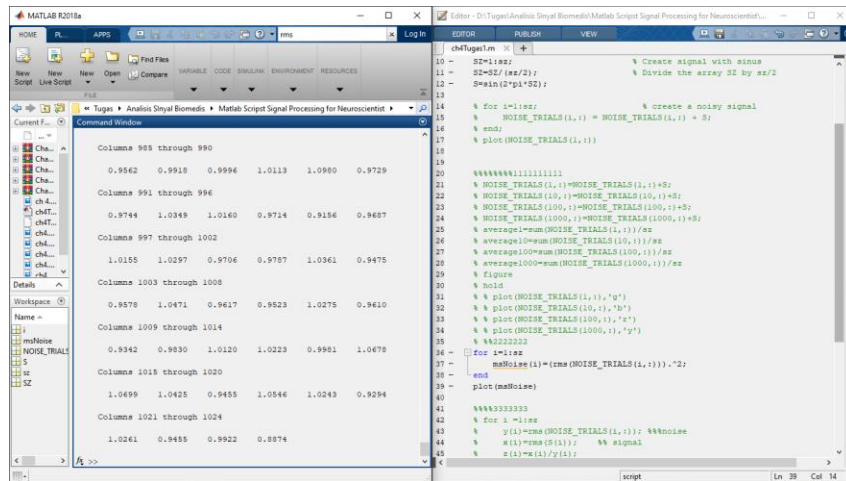
3. $n=100$



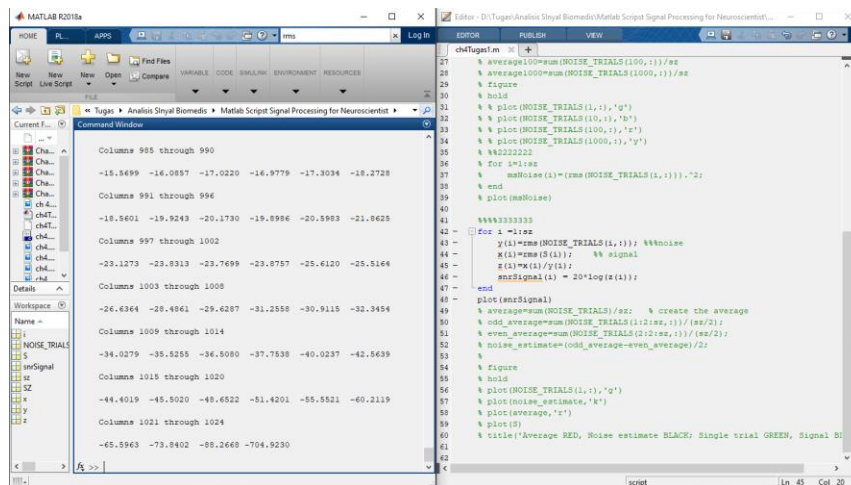
4. $n=1000$



b. Calculate the ms of noise each n

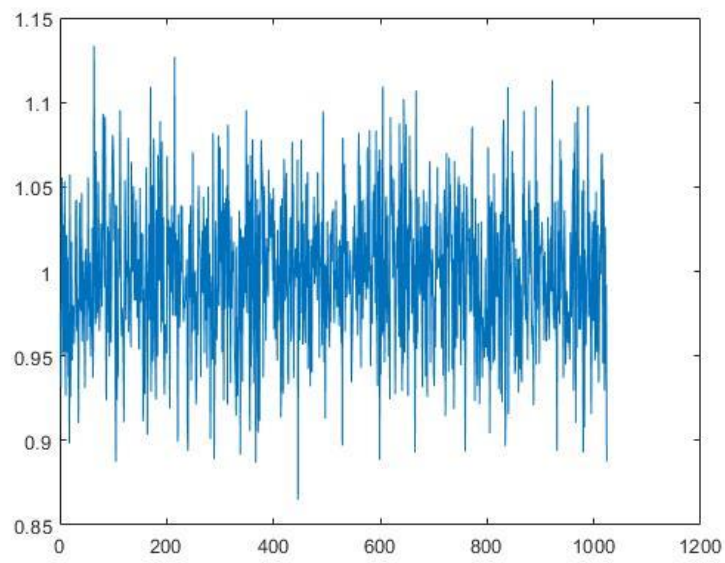


c. Calculate SNR for each n

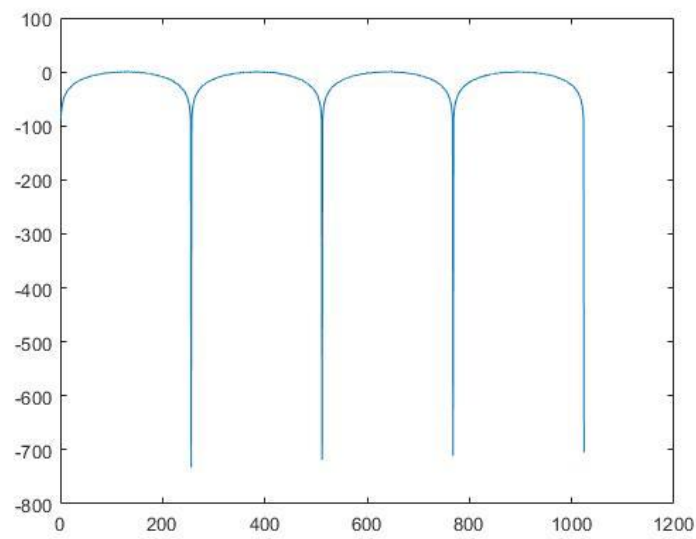


d. Plot (b) and (c) against n

1. Plot b



2. Plot c



- e. Relate finding Eq 4.13
- f. Comment on the noise reduction