**MATLAB Code**

%Experiment 4: Date: 19/02/2020

%Overlap Save and Overlap Add Approach

%overlap\_add.m

function out = overlap\_add(x,h)

m = length(h);

l = power(2,m);

n = l-m+1;

h = [h zeros(1,n-1)];

N = length(x);

a = mod(N,l);

if(a~=0)

x = [x zeros(1,l-a)];

end

N = length(x);

y = [];

for i = 1:l:N

if(i==1)

xi = [x(i:n) zeros(1,m-1)];

else

xi = [x(i-(m-1):i+n-m) zeros(1,m-1)];

end

Xi = fft(xi);

H = fft(h);

Yi = Xi.\*H;

yi = ifft(Yi);

if(i==1)

y = [y yi];

else

y = [y(1:length(y)-(m-1)) y(length(y)-(m-1)+1:length(y))+yi(1:m-1) yi(m:length(yi))];

end

end

out = y(1:length(y)-(m-1));

%overlap\_save.m

function out = overlap\_save(x,h)

m = length(h);

l = power(2,m);

n = l-m+1;

h = [h zeros(1,n-1)];

N = length(x);

a = mod(N,l);

if(a~=0)

x = [x zeros(1,l-a)];

end

N = length(x);

y = [];

x = [zeros(1,m-1) x];

for i=1:l:N

if(i==1)

xi = x(1:l);

else

xi = x(i-(m-1):n+i-1);

end

Xi = fft(xi);

H = fft(h);

Yi = Xi.\*H;

yi = ifft(Yi);

y = [y yi(m:length(yi))];

end

out = y;

%main.m

clc;

clear all;

close all;

x = [3 0 -2 0 2 1 0 -2 1 0 3 0 -2];

h = [2 2 1];

y1 = overlap\_save(x,h)

y2 = overlap\_add(x,h)

y3 = cconv(x,h);

y3 = y3(1:length(x)-1)

figure();

subplot(121);

stem(x);title "Signal";xlabel n;ylabel x[n]

subplot(122);

stem(h);title("Impulse Response");xlabel n;ylabel h[n]

figure();

subplot(131);

stem(y1);title("Circular Convolution using Overlap Save");xlabel n; ylabel y[n];

subplot(132);

stem(y2);title("Circular Convolution using Overlap Add");xlabel n; ylabel y[n];

subplot(133);

stem(y3);title("Circular Convolution using CCONV Function");xlabel n; ylabel y[n];

if(round(y1) == round(y2))

if(round(y2) == round(y3))

if(round(y3) == round(y1))

disp("Circular Convolution correct")

end

end

end

**RESULT**

y1 =

Columns 1 through 5

6.0000 6.0000 -1.0000 -4.0000 2.0000

Columns 6 through 10

6.0000 4.0000 -3.0000 -2.0000 -0.0000

Columns 11 through 12

7.0000 6.0000

y2 =

Columns 1 through 5

6.0000 6.0000 -1.0000 -4.0000 2.0000

Columns 6 through 10

6.0000 4.0000 -3.0000 -2.0000 -0.0000

Columns 11 through 12

7.0000 6.0000

y3 =

Columns 1 through 5

6.0000 6.0000 -1.0000 -4.0000 2.0000

Columns 6 through 10

6.0000 4.0000 -3.0000 -2.0000 0.0000

Columns 11 through 12

7.0000 6.0000

Circular Convolution correct