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Experiment 5a	
AIM	To perform filtering of Long Data Sequence using Overlap Add Method.
OBJECTIVE:	To Develop a function to implement Fast Overlap Add Algorithm .
INPUT SPECIFICATIONS :	1. Length of first Signal L and Signal values 2. Length of impulse response of FIR filter Signal M and Signal values.
PROBLEM DEFINITION:	Take long input sequence x[n] and short length sequence h[n] Find y[n] = x[n] * h[n] using FFT based Overlap Add method
RESULT:	**Input:** x[n] = { 1 , 2, 3, 4, 5, 6, 1, 1, 1, 1, 1 , 1, 0, 1, 2, 3, 4, 5 } h[n] = { 1 , 1, 1 } Length M=3 Overlap Add Method For N=8, and M=3, Let L = 6 Then, x 1 [n] = { 1,2,3,4,5,6, 0, 0} x 2 [n] ={ 1,1,1,1,1,1, 0 ,0 } x 3 [n] ={ 0, ,1,2,3,4,5,0,0 } **Output :** y[n] = { 1, 3, 6, 9, 12, 15, 12, 8, 3, 3, 3, 2, 2, 3, 6, 9, 12, 9, 5 }

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aspur@LAPTOP-LG4IQEFB MINGW64 ~/OneDrive/FOSIP/EXPERIMENTS/05. Linear Filtering using OAM and OSM
$ ./a.exe

 Enter the length of x[n] = : 18

 Enter the values of x[n] : 1 2 3 4 5 6 1 1 1 1 1 1 0 1 2 3 4 5


 Enter the length of h[n] M = : 3

 Enter the values of h[n] : 1 1 1


 x[n] =   1.00    2.00    3.00    4.00    5.00    6.00    1.00    1.00    1.00    1.00    1.00    1.00    0.00    1
.00    2.00    3.00    4.00    5.00

 h[n] =   1.00    1.00    1.00

 length of decomposed input Signal  : L = 5

 length of decomposed output Signal : N = 8


 x1[n] =   1.00    2.00    3.00    4.00    5.00    0.00    0.00    0.00

 y1[n] =   1.00    3.00    6.00    9.00    12.00    9.00    5.00    -0.00

 x2[n] =   6.00    1.00    1.00    1.00    1.00    0.00    0.00    0.00

 y2[n] =   6.00    7.00    8.00    3.00    3.00    2.00    1.00    -0.00


 x3[n] =   1.00    1.00    0.00    1.00    2.00    0.00    0.00    0.00

 y3[n] =   1.00    2.00    2.00    2.00    3.00    3.00    2.00    -0.00


 x4[n] =   3.00    4.00    5.00    0.00    0.00    0.00    0.00    0.00

 y4[n] =   3.00    7.00    12.00    9.00    5.00    -0.00    -0.00    -0.00

 Linear Convolution Output using Over Add Method
 y[n] =   1.00    3.00    6.00    9.00    12.00    15.00    12.00    8.00    3.00    3.00    3.00    3.00    2.00
  2.00    3.00    6.00    9.00    12.00    9.00    5.00


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Experiment 5b	
AIM	To perform filtering of Long Data Sequence using Overlap Save Method
OBJECTIVE:	To Develop a function to implement Fast Overlap Save Algorithm .
INPUT SPECIFICATIONS :	1. Length of first Signal L and Signal values 2. Length of impulse response of FIR filter Signal M and Signal values.
PROBLEM DEFINITION:	Take long input sequence x[n] and short length sequence h[n] Find y[n] = x[n] * h[n] using FFT based Overlap Save method
RESULT:	**Input:**

x[n] = { 1 , 2, 3, 4, 5, 6, 1, 1, 1, 1, 1 , 1, 0, 1, 2, 3, 4, 5 }
h[n] = { 1 , 1, 1 } Length M = 3
Overlap Save Method : For N = 8, and M = 3 Let L = 6
Then, x 1 [n] ={ 0, 0, 1, 2, 3, 4, 5, 6}
x 2 [n] ={ 5, 6, 1, 1, 1, 1, 1, 1 }
x 3 [n] ={ 1, 1, 0, 1, 2, 3, 4, 5 }
x 4 [n] ={ 4, 5, 0, 0, 0, 0, 0, 0 }

Output :

y[n] = { 1, 3, 6, 9, 12, 15, 12, 8, 3, 3, 3, 2, 2, 3, 6, 9, 12, 9, 5 }

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aspur@LAPTOP-LG4IQEFB MINGW64 ~/OneDrive/FOSIP/EXPERIMENTS/05. Linear Filtering using OAM and OSM
$ gcc OSM.c -lm

aspur@LAPTOP-LG4IQEFB MINGW64 ~/OneDrive/FOSIP/EXPERIMENTS/05. Linear Filtering using OAM and OSM
$ ./a.exe

 Enter the length of x[n] = : 18

 Enter the values of x[n] : 1 2 3 4 5 6 1 1 1 1 1 1 0 1 2 3 4 5


 Enter the length of h[n] M = : 3

 Enter the values of h[n] : 1 1 1


 x[n] =   1.00    2.00    3.00    4.00    5.00    6.00    1.00    1.00    1.00    1.00    1.00    1.00    0.00    1
.00    2.00    3.00    4.00    5.00

 h[n] =   1.00    1.00    1.00

 length of decomposed input Signal  : L = 6

 length of decomposed output Signal : N = 8
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```
x1[n] =   0.00    0.00    1.00    2.00    3.00    4.00    5.00    6.00

y1[n] =   11.00    6.00    1.00    3.00    6.00    9.00    12.00    15.00


x2[n] =   5.00    6.00    1.00    1.00    1.00    1.00    1.00    1.00


x3[n] =   1.00    1.00    0.00    1.00    2.00    3.00    4.00    5.00

y3[n] =   10.00    7.00    2.00    2.00    3.00    6.00    9.00    12.00


x4[n] =   4.00    5.00    0.00    0.00    0.00    0.00    0.00    0.00

y4[n] =   4.00    9.00    9.00    5.00    -0.00    -0.00    -0.00    -0.00

Linear Convolution Output using Over Save Method
y[n] =   1.00    3.00    6.00    9.00    12.00    15.00    12.00    8.00    3.00    3.00    3.00    3.00    2.00
 2.00    3.00    6.00    9.00    12.00    9.00    5.00
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Conclusion:

1. The Overlap-Add and Overlap-Save Method is an efficient practical way to evaluate the discrete convolution of long input signal x[n] and finite length signal h[n].
2. The Overlap-Add and Overlap-Save Method can be implemented using FIR filters and can not be implemented using IIR filters.
3. The Overlap-Add and Overlap-Save Method is a Block Processing Technique.