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| **Experiment 1** | |
| **AIM :** | The aim of this experiment is to study mathematical operation such as :  Linear Convolution, Circular Convolution, and Linear Convolution using Circular Convolution. |
| **OBJECTIVE:** | To Develop a function to find Linear Convolution and Circular Convolution  To Calculate Linear convolution, Circular convolution, Linear Convolution using Circular Convolution and verify the results using mathematical formulation.  To Conclude on aliasing effect in Circular convolution |
| **PROBLEM DEFINITION:** | 1. Find Linear Convolution and Circular Convolution of L point sequence x[n] and M point sequence h[n]. 2. Find Linear Convolution of L point sequence x[n] and M point sequence h[n] using Circular convolution. 3. Give your conclusion about No of values in Linearly Convolved signal, Aliasing effect in Circular Convolution. |
| **INPUT SPECIFICATION:** | 1. Length of first Signal L and signal values.  2. Length of second Signal M and signal values. |
| **RESULT:** | **Case 1:Linear Convolution To find y[n]=x[n]\*h[n]**  Input: x[n]={1,2,3,4} Length L=4  h[n]={5,6,7} Length M=3  Output: y[n]={5,16,34,52,45,28} Length N=6    Length of Linear Convolution output signal is N=4+3-1==6  That means, length of Length of Linear Convolution output signal is N=L+M-1  **Case 2: Circular Convolution y[n]=x[n] \* h[n]**  Input: x[n]={1,2,3,4} Length L=4  h[n]={5,6,7} Length M=3  Output: y[n]={50,44,34,52} Length N=4    L=4  M=3  Linear Convolution output: y[n]={5,16,34,52,45,28 }Length N=6  Circular Convolution output: y[n]={50,44,34,52} Length N=4  Here, last 2 values aliased with first two values of y[n]  y[n]={5+45,16+28,34,52}  Length of circular convolution is Max(L,M)=Max(4,3)==4  **Case 3: Linear using Circular Convolution**  Input: x[n]={1,2,3,4} Length L=4  h[n]={5,6,7} Length M=3  Output: y[n]={5,16,34,52,45,28} Length N=6 |
| **CONCLUSION:**   1. **Length of Linear Convolution Output (N)**: The length of the output signal from a linear convolution, denoted as N, is calculated as N = L + M - 1. Here, L represents the length of the first input signal and M represents the length of the second input signal. 2. **Causality in Linear Convolution**: In the context of linear convolution, if both input signals are causal, the output signal that results will also be causal. 3. **Determining Length for Circular Convolution**: To perform circular convolution, choose N = MAX (L, M). In this equation, L is the length of the first input signal and M is the length of the second input signal. 4. **Performing Linear Convolution using Circular Convolution**: To achieve linear convolution through circular convolution, select N such that N >= L + M - 1. Here, L is the length of the first input signal and M is the length of the second input signal. 5. **Aliasing in Circular Convolution**: An aliased output is produced when performing circular convolution. | |