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| **Experiment 2** | |
| **AIM:** | The aim of this experiment is to study mathematical operation Correlation and measure degree of similarity between two signals. |
| **OBJECTIVE:** | 1. Write a function to find Correlation Operation  2. Calculate correlation of a DT signals and verify the results using mathematical formula |
| **PROBLEM DEFINITION:** | 1. Find auto correlation of input signal and find the significance of value of output signal at n=0.  Let y[n] = x[n] O x[n]  Classify the resultant signal( Even / Odd ). Calculate the energy of the signal .  Q. What is the significance of value of y[0].  2. Find auto correlation of delayed input signal.  Let p[n]= x[n-1] O x[n-1].  Compare the resultant signal p[n] with y[n]. Give your conclusion.  3. Find cross correlation of input signal and delayed input signal  q[n] = x[n] 0 x[n-1].  Compare the resultant signal q[n] with p[n] and y[n]  Give your conclusion.    4. Find cross correlation of input signal and scaled input signal.  Let s[n] = x[n] O a x[n-2] where “a” is any constant.  Compare the resultant signals.  Give your conclusion. |
| **INPUT SPECIFICATIONS** | 1. Length of first Signal L and signal values.  2. Length of second Signal M and signal values. |
| **EXPERIMENTATION AND RESULT ANALYSIS** | |
| **CASE 1: To find y[n] = x[n] \* h[n]**  Input x[n] = { 5,6,7,8 } Length L= 4  h[n] = { 9, 10, 11 } Length M= 3    **Result Analysis:** Length of Linear Convolution output signal is  N = 4+3-1 == 6  That means, Length of Linear Convolution  output signal is N = L + M –1  **CASE 2: To find y[n] = x[n]** ⊛ **h[n]**  Input x[n] = { 5,6,7,8 } Length L= 4  h[n] = { 9, 10, 11 } Length M= 3    **Result Analysis:** The first few values of Circular Convolution output signal are aliased with the values beyond N.  For ex. Let x[n] = { 5,6,7,8 } Length L = 4  h[n] = { 9, 10, 11 } Length M = 3  Then linear convolution output : Length N = 6  {45,104,178,208,157,88}  The circular convolution output : Length N = 4  {202,192,178,208}  **CASE 3: To find y[n] = x[n] \* h[n]**  Input x[n] = { 5,6,7,8 } Length L= 4  h[n] = { 9, 10, 11 } Length M= 3    **Result Analysis:** We must select a value N >= L + M - 1 and use L = N and M = N with L  values in signal x being its initial values and N - L being 0's. Similarly,  for the signal y. Using this, we get the linear convolution of signals using  the circular convolution technique. | |
| **CONCLUSION:**  1. Length of Linear Convolution output signal is N = L + M -1  • Where L is the length of first input signal  • M is the length of second input signal  • N is the length of linear convolution output signal.  2. In Linear convolution if both the input signals are causal, then resultant output signal is also causal  3. To find Circular Convolution Select N = MAX(L,M)  Where L is the length of first input signal  M is the length of second input signal  4.To find Linear Convolution using Circular Convolution  Select N >= L + M -1  Where L is the length of first input signal and  M is the length of second input signal.  5. Circular Convolution gives aliased output | |