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| **Experiment 2** | |
| **Title** | Discrete Convolution |
| **Aim** | The aim of this experiment is to study mathematical operation such as Linear convolution, Circular convolution, Linear convolution using circular convolution. |
| **Objective** | 1. Develop a function to find Linear Convolution and Circular Convolution 2. Calculate Linear Convolution, Circular Convolution, Linear Convolution using Circular Convolution and verify the results using mathematical formulation. 3. Conclude on aliasing effect in Circular convolution |
| **Input Specifications** | 1.Length of first Signal L and signal values. 2.Length of second Signal M and signal values. |
| **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, and Aliasing effect in Circular Convolution. |
| **Program** | 1)Linear Convolution  h=list(map(int,input().split()))  x=list(map(int,input().split()))  n=len(h)+len(x)-1  def getVal(a,idx):      return a[idx] if 0<=idx<len(a) else 0  ol=[]  for i in range(n):      temp=0      for k in range(len(h)):          temp+=getVal(x,k)\*getVal(h,i-k)      ol.append(temp)  print(ol)  2) Circular Convolution  x1=[0,0,3,-1,0]  x2=[1,1,1,0,0]  print("Enter Inputs")  # x1=list(map(int,input().split(",")))  # x2=list(map(int,input().split(",")))  x1.extend([0 for i in range(len(x2)-len(x1))])  x2.extend([0 for i in range(len(x1)-len(x2))])  id1=[i for i in range(len(x1))]  id2=[i for i in range(len(x1))]  # initial  id2.reverse()  print("len of output seq",len(x1))  print()  for ik in range(len(id1)):    temp=id2[-1]    id2.pop()    id2.insert(0,temp)    temp=0    print("y{}=".format(ik),end=" ")    for i,j in zip(id1,id2):      print("{}\*{}".format(x1[i],x2[j]),end=" + ")      temp+=x1[i]\*x2[j]    print(" = {}".format(temp))  3)Linear with Circular Convolution  x1=[2,1,-2]  x2=[1,2,-1]  print("Enter Inputs")  # x1=list(map(int,input().split(",")))  # x2=list(map(int,input().split(",")))  n=len(x1)+len(x2)-1  x1.extend([0 for i in range(n-len(x1))])  x2.extend([0 for i in range(n-len(x2))])  id1=[i for i in range(len(x1))]  id2=[i for i in range(len(x1))]  # initial  id2.reverse()  print("len of output seq",n)  print()  for ik in range(n):    temp=id2[-1]    id2.pop()    id2.insert(0,temp)    temp=0    print("y{}=".format(ik),end=" ")    for i,j in zip(id1,id2):      print("{}\*{}".format(x1[i],x2[j]),end=" + ")      temp+=x1[i]\*x2[j]    print(" = {}".format(temp)) |
| **Output** | 1. Linear Convolution      1. Circular Convolution      1. Linear with Circular Convolution |
| **Outcome** | Thus, we could implement linear convolution, circular convolution and linear convolution using circular convolution with the help of python. |