Al-Mustaqbal University

College of Engineering and Technology

Department of Biomedical Engineering

Stage: three

Signal Processing

2023-2024

Lecture (5): Discrete convolution/ Tabular method.

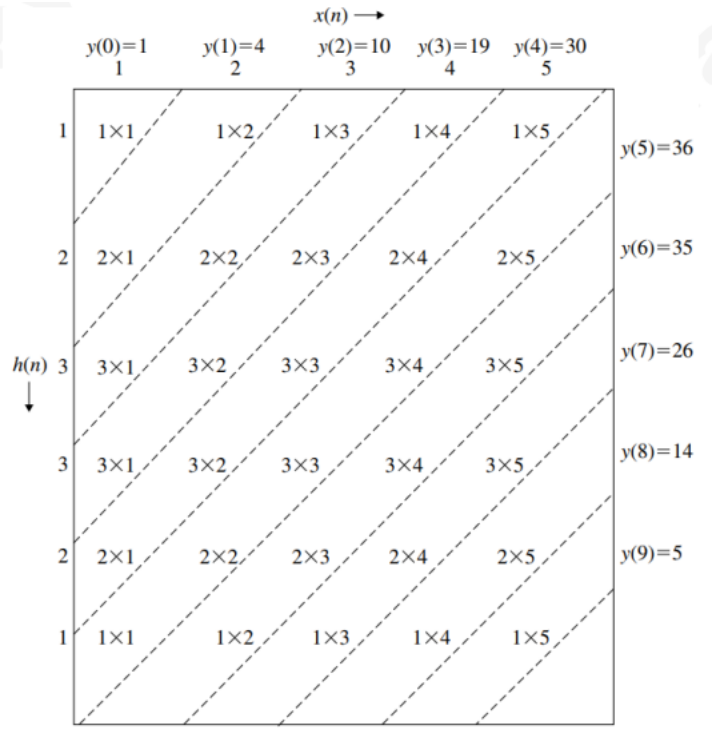
Tabular Method

this is a very simple method used for FIR systems with finite number of samples x(n). A rectangular table with N_1 rows (number of elements in h(n)) and N_2 columns (number elements of x(n)), or visa versa, is arranged. Then the cross multiplications are carried out. The sum of the multiplications diagonally will give the value of y(n).

Example/ Use Tabular method to find the convolution between

$x(n) = \{1, 2, 3, 4, 5\}$
$h(n) = \{1, 2, 3, 3, 2, 1\}$

Solve/ y(n)=x(n)*h(n)



y(0)=1×1=1

y(1)=1×2 +2×1=4

y(2)=1×3 +2×2 +3×1=10

y(3)=1×4 +2×3 +3×2 +3×1=19

y(4)=1×5 +2×4+ 3×3+ 3×2+ 2×1=30

y(5)=2×5+ 3×4+ 3×3+ 2×2+ 1×1=36

y(6)=3×5+ 3×4+ 2×3+ 1×2=35

y(7)=3×5+ 2×4+ 1×3=26

y(8)=2×5+ 1×4=14

y(9)=1×5=5

y(n)=[1,4,10,19,30,36,35,26,14,5]

Example/ if we have h(n)=[1, -1, 2] and x(n)=[2, 1, -1, 3]

The convolution between h(n) and x(n) can be computed as shown below:

	2	1	-1	3
1	2	1	-1	3
-1	-2	-1	1	-3
2	4	2	-1	6

y(n)=[2, -1, 2, 6, -4, 6]

Example: x(n)=[4,2,1,3] and h(n)=[1, 2, 2, 1] the convolution will be

	4	2	1	3
1	4	2	1	3
2	8	4	2	6
2	8	4	2	6
1	4	2	1	3

y(n)=[4, 10, 13, 13, 10, 7, 3]