

Experiment 3

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BE Comps (22

Aim : Discrete convolution (linear & circular)

Theory : Convolution is a mathematical operation that describes the two-way signal combine.

→ Linear Convolution,

This combines two signals to form a new signal considering the total length of both signals.

The discrete linear convolution of two signals $x(n)$ and $h(n)$ is given by - $y(n) = \sum_{k=-\infty}^{\infty} x(k) \cdot h(n-k)$

→ Circular Convolution

Circular convolution treats signals as if they are periodic wrapping around when they exceed a certain length. The formula is similar to linear convolution but includes modulo operation to handle periodicity.

$$y(n) = x(n) \otimes h(n)$$

Conclusion : By applying these methods, we observed how linear convolution extends the length of the output signal, while the circular convolution wraps the signal due to periodicity, producing a result of the same length as the input sequences.

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DIGITAL SIGNAL PROCESSING (DSP) EXPERIMENT 03

CODE:

```
x = [1 2 3 5];  
y = [1 1];  
linear_c = conv(x,y);  
  
xpad = [x zeros(1,6-length(x))];  
ypad = [y zeros(1,6-length(y))];  
  
subplot(2,1,1) stem(linear_c,'filled')  
ylim([0 11])  
title('Linear Convolution')  
  
x1 = [1 2 0 -3];  
x2 = [2 3 1];  
x1pad = [x1 zeros(1,6-length(x1))]; x2pad = [x2  
zeros(1,6-length(x2))];  
circular_c = ifft(fft(x1pad).*fft(x2pad));  
  
subplot(2,1,2) stem(circular_c,'filled')  
ylim([-10 11]) title('Circular  
Convolution')
```

OUTPUT:

