

Experiment No.: 09

Experiment Name: Time Shifting (Advance) of a Discrete-Time Signal using MATLAB

Description of the Problem:

The objective of this experiment is to **perform time advance** of a discrete-time signal $x[n]$.

In **Digital Signal Processing (DSP)**, **time shifting** involves moving a signal along the time axis:

- **Advance** by n_0 samples: $x[n + n_0]$
- **Delay** by n_0 samples: $x[n - n_0]$

This experiment demonstrates how advancing a signal shifts it to the left along the time axis. It is a fundamental operation for **signal manipulation, convolution, and system analysis**.

Source Code Sample:

```
clc;
close all;
clear all;

% Input for shift, time indices, and signal
n1 = input('Enter the required amount of shift: ');
n = input('Enter time indices: ');
x = input('Enter the signal sequence: ');

% Plot original signal
subplot(2,1,1);
stem(n, x);
xlabel('Time sample');
ylabel('Amplitude');
title('Original Signal');

% Compute advanced signal
m = n - n1;

% Plot advanced signal
subplot(2,1,2);
stem(m, x);
xlabel('Time sample');
ylabel('Amplitude');
title('Advanced Signal');
```

Sample Input:

Example:

```
Enter the required amount of shift: 2
Enter time indices: [-3 -2 -1 0 1 2 3]
Enter the signal sequence: [1 2 3 4 5 6 7]
```

- $n_1 \rightarrow$ Amount of shift (positive \rightarrow advance, negative \rightarrow delay)
 - $n \rightarrow$ Original time indices
 - $x \rightarrow$ Original signal sequence
-

Sample Output:

After running the code:

1. **Original Signal** $x[n] \rightarrow$ first subplot
 2. **Advanced Signal** $x[n + n_0] \rightarrow$ second subplot
- The advanced signal is shifted **left** along the time axis by the specified amount.
 - This visually demonstrates the concept of signal advance in DSP.
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Screenshot:

Figure 9.1: Original and Advanced Signal in MATLAB

