Heaven's Light is Our Guide

Rajshahi University of Engineering & Technology

Sessional Course Code: ECE 4124

Course name: Digital Signal Processing Sessional

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Experiment No: 05

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Experiment Name: Study of Causal, Non-causal and Anti causal Signals

Objective:
- Familiar with the causal, anti-causal and non-causal signal.
- Practically implement it with a function.

Theory: A causal system is the one in which the output y(n) at time n depends only on the current input x(n) at time n, and its past input sample values such as x(n−1), x(n−2),…. it does not exist for negative time.
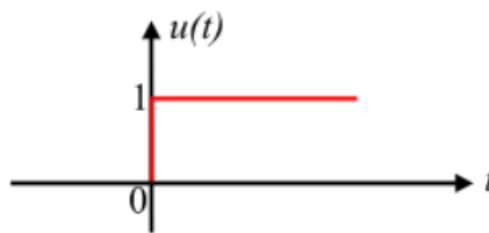
 If a system output depends on future input values such as x(n+1), x(n+2), …, the system is anti-causal. It is equal to zero for all positive time values.

.
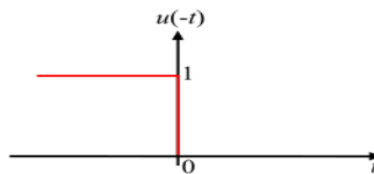
It contains both positive and negative time values. The noncausal system cannot be realized in real time.
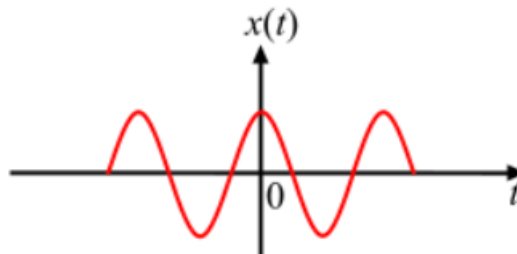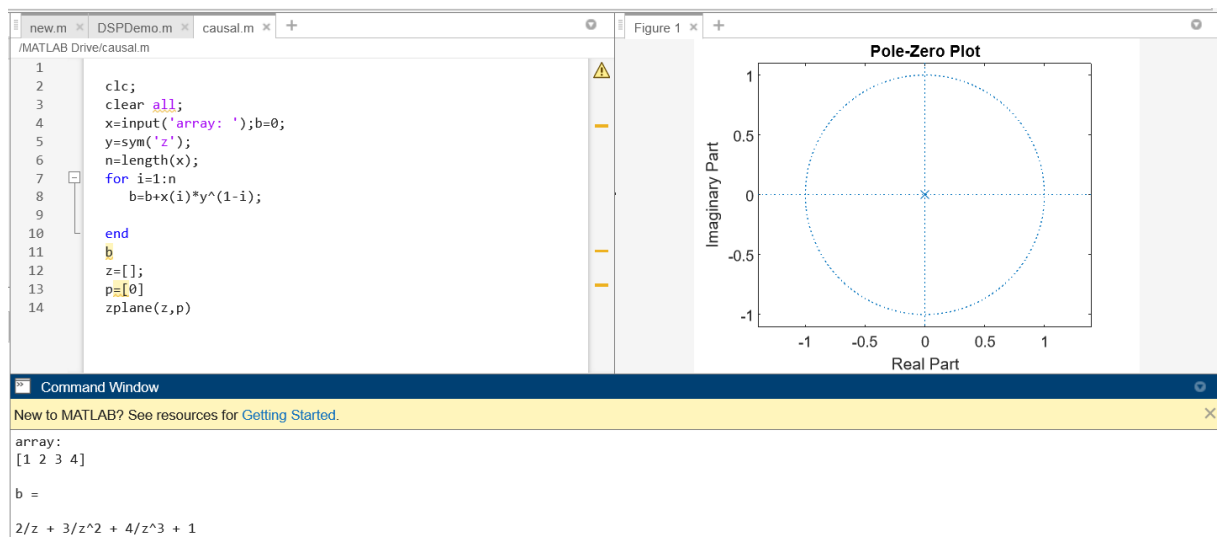

Required Tools: MATLAB 2015a.

Code & Output:

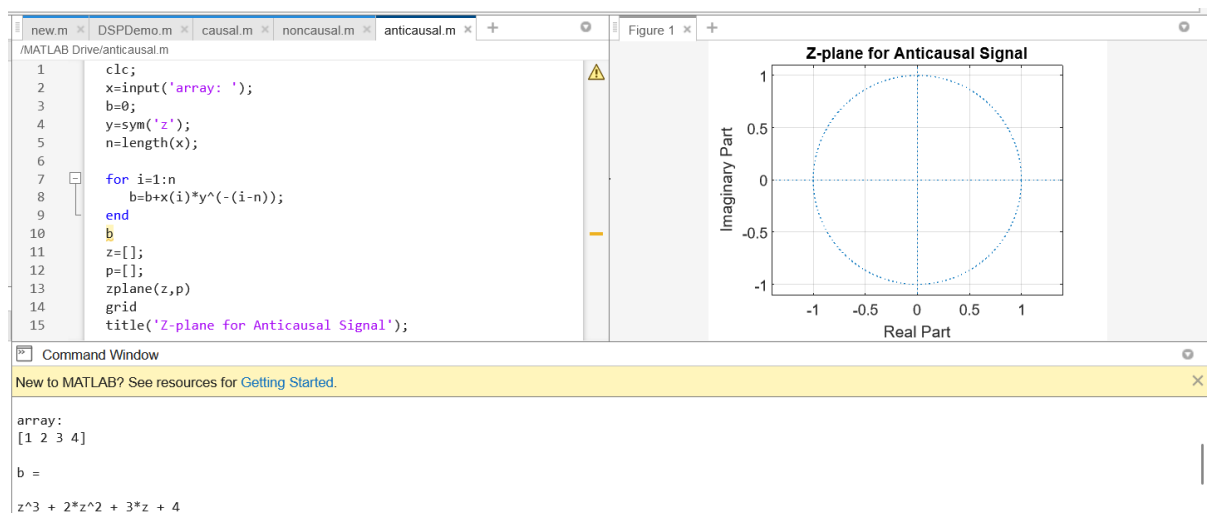Fig1: Implementation of causal signals

```
1
2    clc;
3    clear all;
4    x=input('array: ');b=0;
5    y=sym('z');
6    n=length(x);
7    for i=1:n
8        b=b+x(i)*y^(1-i);
9
10   end
11   b
12   z=[];
13   p=[0]
14   zplane(z,p)
```

Command Window

New to MATLAB? See resources for Getting Started.

```
array:
[1 2 3 4]

b =

2/z + 3/z^2 + 4/z^3 + 1
```


Fig2: Implementation of anti-causal signals

```
1    clc;
2    x=input('array: ');
3    b=0;
4    y=sym('z');
5    n=length(x);
6
7    for i=1:n
8        b=b+x(i)*y^(-(i-n));
9    end
10   b
11   z=[];
12   p=[];
13   zplane(z,p)
14   grid
15   title('Z-plane for Anticausal Signal');
```

Command Window

New to MATLAB? See resources for Getting Started.

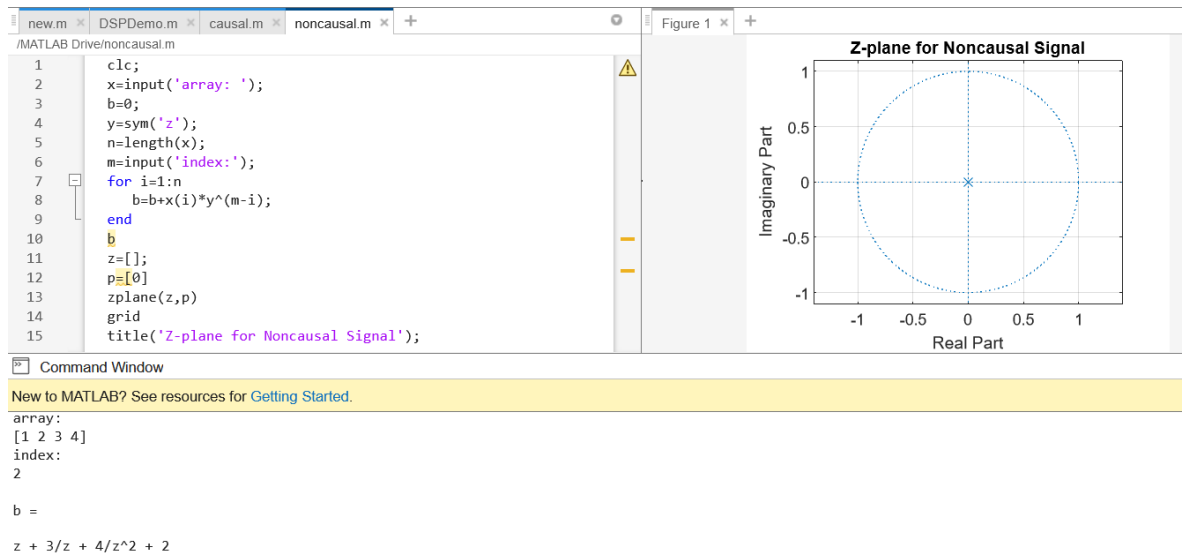```
array:
[1 2 3 4]

b =

z^3 + 2*z^2 + 3*z + 4
```

Fig3: Implementation of non-causal signals

Discussion: This experiment is mainly focused on implementation of causal, anti-causal and non-causal system. The code gave the desired output. Later the position of X value is calculated.

Conclusion: We tried to plot the poles and zeros of causal, anti-causal and non-causal signals. The output resembles our theory.

References:

1. Causal, Noncausal and Anti-causal signals
https://www.tutorialspoint.com/signals-and-systems-causal-non-causal-and-anti-causal-signals
[Online]. [Accessed August 18, 2023]