Heaven's Light is Our Guide

Rajshahi University of Engineering& Technology

Department of Electrical & Computer Engineering

Course No: ECE 4124
Course Name: Digital Signal Processing Sessional

Submitted by:
Name: Tanvir Rahman Meraz
Roll: 1810046

Submitted to:
Hafsa Binte Kibria
Lecturer
Dept of ECE,RUET

Experiment No: 05

Experiment Name:
Study of Z-Transformation & Plotting of Zeros-Poles for a Given Causal Signal in Time Domain

Theory:

A continuous time signal $x(t)$ is called causal signal if the signal $x(t) = 0$ for $t < 0$. Therefore, a causal signal does not exist for negative time. The unit step signal u(t) is an example of causal signal.

Similarly, a discrete time sequence x(n) is called the causal sequence if the sequence x(n) = 0 for n < 0.

The Z-transform is a mathematical tool used to analyze and design discrete-time systems. It is a generalization of the Fourier transform to the discrete-time domain. The Z-transform of a discrete-time signal is a complex function of the variable z, which is a complex number.

The poles and zeros of the Z-transform are important in understanding the properties of the discrete-time system. The poles of the Z-transform are the values of z that make the Z-transform equal to zero. The zeros of the Z-transform are the values of z that make the Z-transform infinite.

The location of the poles and zeros of the Z-transform in the complex plane can be used to determine the stability, causality, and frequency response of the discrete-time system.

Code:

```
clc

x= [1 2 3 4];

syms z
y=0;
for i=1:length(x)
  y = y + x(i)*z^-(i-1);
end

disp(y);

p = poles(y,z);
```

```
zplane([],p);
title('plot of causal signal');
```

Output

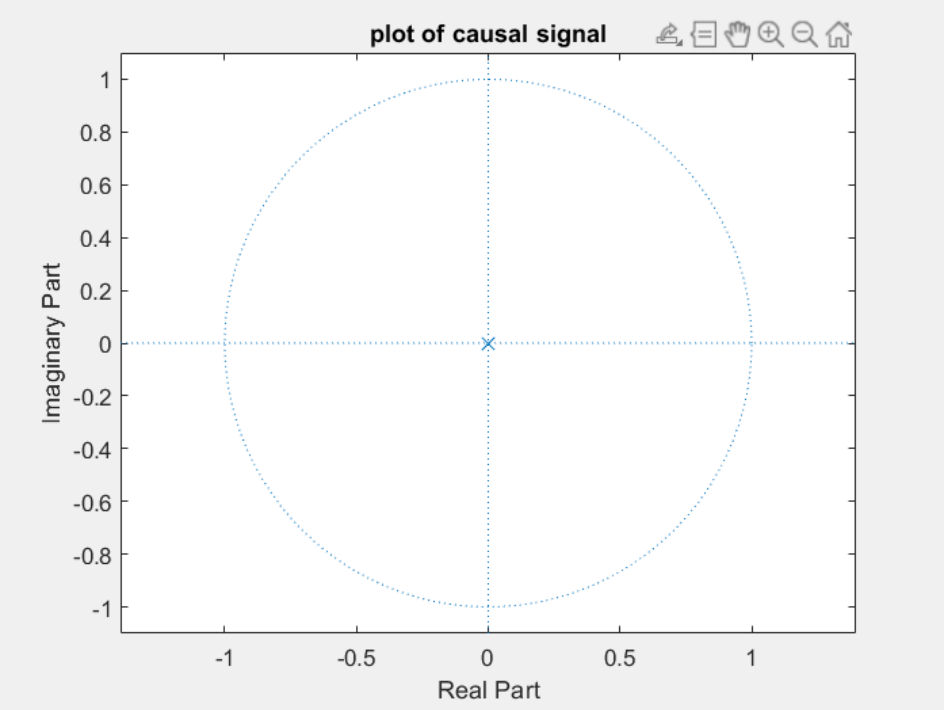

Fig. 1 Output of z-transform of signal

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

fx >>
```

Fig. 2 Plot of zeros-poles for a causal signal

Discussion

An expanded version of a causal signal might be obtained from figure 1. Figure 2 shows the lone pole of this statement. This expression also doesn't have a zero value. It was also depicted in figure 2's plan.

Conclusion

In this experiment, I learnt about the z-transform, how to determine the zeros and poles of a causal signal, and how to visualize those zeros and poles in Matlab.