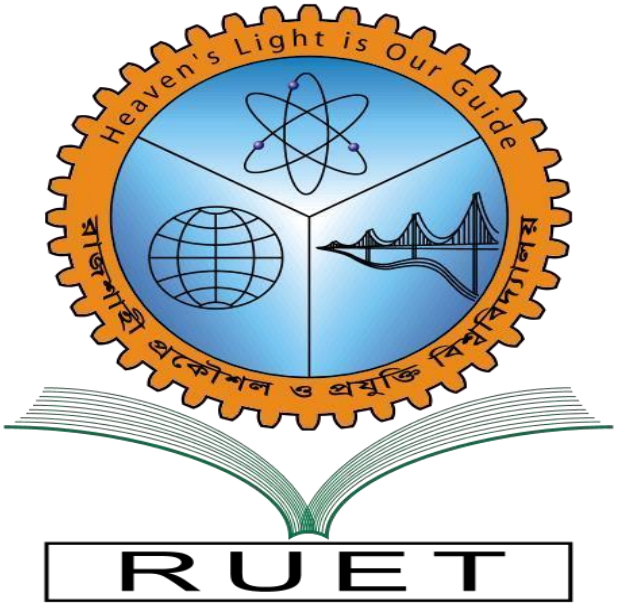
Rajshahi University of Engineering & Technology



Department of Electrical & Computer Engineering

LAB REPORT

Course No: ECE 4124

Course Title: Digital Signal Processing Sessional

Submitted To:
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Experiment Date: March 20,2023

Experiment No: 01

Name of the Experiment:

1. Plot unit step, unit ramp, unit impulse signal using MATLAB.
2. Plot discrete signal using MATLAB.
3. Plot two different discrete signal and show their addition and subtraction using MATLAB.
4. Plot two different continuous signal using MATALB.

Theory:

Continuous Signal:

Continuous refers to a variable that can take on any value within a range or interval. In other words, the variable can be measured at any point in time and is not limited to specific values. A common example of a continuous variable is time.

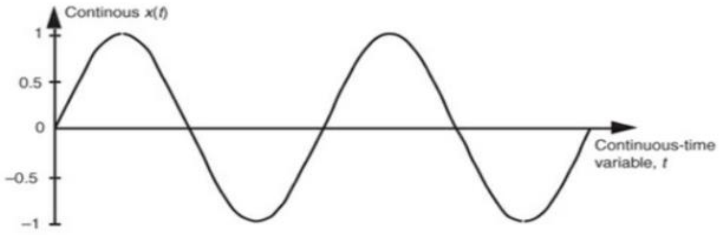

Fig: Continuous signal

Discrete:

Discrete refers to a variable that can only take on specific values within a range or interval. In other words, the variable is limited to certain values and cannot be measured at any point in time. A common example of a discrete variable is the number of people in a room.

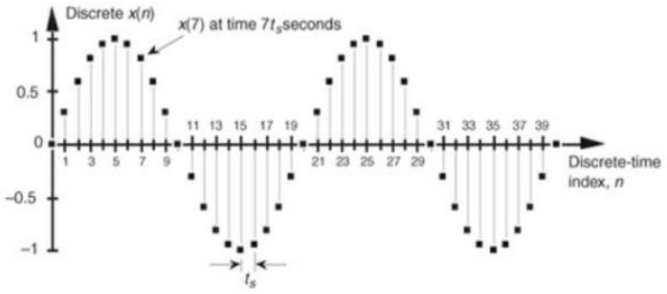

Fig: Discrete signal

Unit Step:

A unit step function is a function that is zero for negative values and one for non-negative values. It is commonly used in signal processing to represent a sudden change in a system.

Mathematical Definition: u(t) = {0, t < 0; 1, t >= 0}

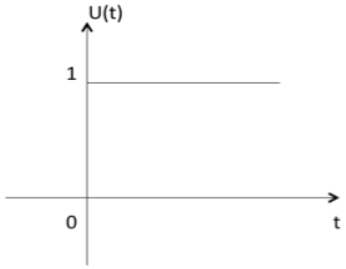

Fig: Unit step signal

Unit Ramp:

A unit ramp function is a function that increases linearly with time. It is commonly used in signal processing to represent a gradual change in a system. Mathematical Definition: r(t) = {0, t < 0; t, t >= 0}

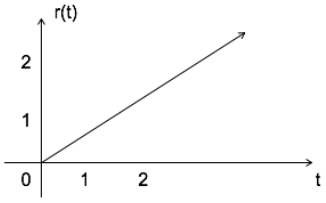

Fig: unit Ramp signal

Unit Impulse:

A unit impulse function is a function that is zero for all values except at t=0 where it is infinite. It is commonly used in signal processing to represent an instantaneous change in a system. Mathematical Definition: d(t) = {0, t! = 0; infinity, t = 0}

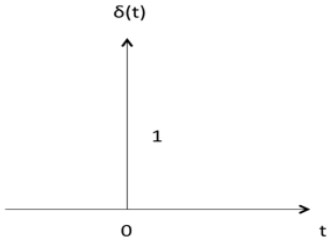

Fig: unit impulse signal

Code:

Code for plotting unit step, unit ramp, unit impulse signal:

```
clc
clear all
close all
t = -10:0.01:10
step = t>=0
subplot(3,1,1);
plot(t,step);
xlabel('time');
ylabel('amplitude');
title('unit step');
ramp = t.*step
subplot(3,1,2);
plot(t,ramp);
xlabel('time');
ylabel('amplitude');
title('unit ramp');
impulse = t==0
subplot(3,1,3);
plot(t,impulse);
xlabel('time');
ylabel('amplitude');
title('unit impulse');
```

Output:

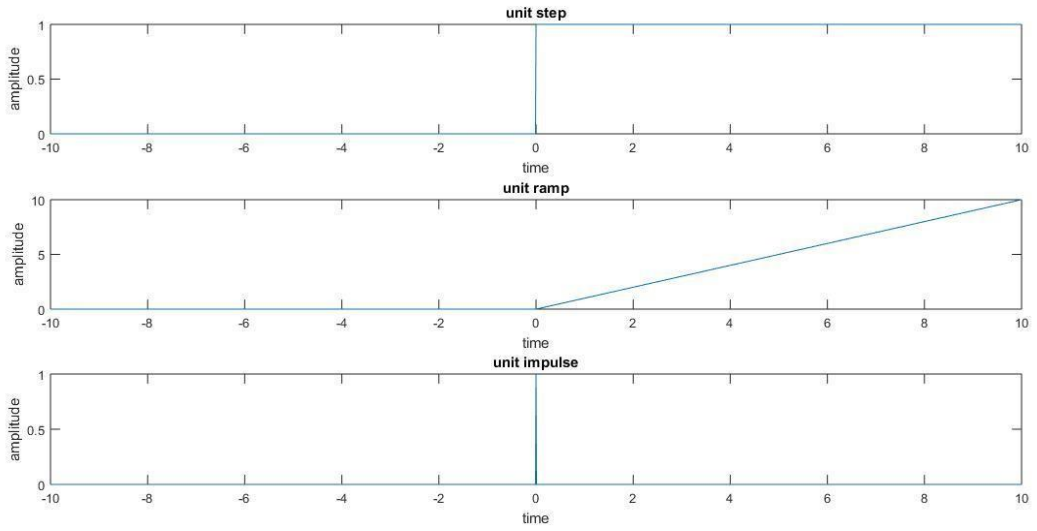

Fig: Output for plotting unit step, unit ramp, unit impulse signal

Code for plotting discrete signal:

```
x = -4:3

y = [1,2,3,3,2,1,4,1]

stem(x,y);
```

Output:

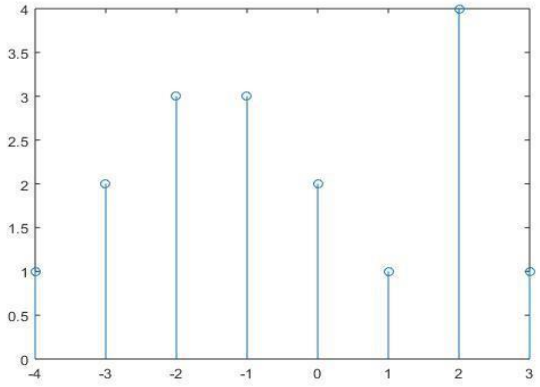

Fig: Output for plotting discrete signal:

Code for plotting two different discrete signal and show their addition and subtraction:

```
clc
clear all
close all
t = -10:2:20
n1 = t>=0 & t<=10 subplot(4,1,1);
stem(t,n1);
xlabel('time');
ylabel('amplitude');
title('1st Signal');
n2 = t>=5 & t<=15 subplot(4,1,2);
stem(t,n2);
xlabel('time');
ylabel('amplitude');
title('2nd Signal');
add = n1+n2 subplot(4,1,3);
stem(t,add);
xlabel('time');
ylabel('amplitude');
title('Addition');
sub = n1-n2 subplot(4,1,4);
stem(t,sub);
xlabel('time');
ylabel('amplitude');
title('Subtraction');
```

Output :

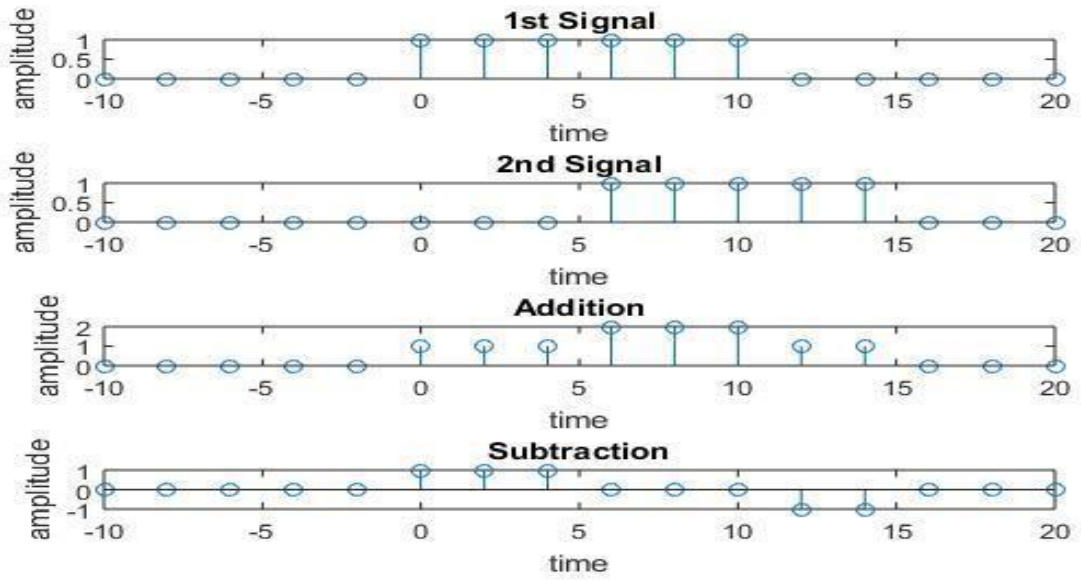

Fig: Output for plotting two different discrete signal and show their addition and subtraction:

Code for plotting two different continuous signals:

```
clc
clear all
close all.
t = -10:0.01:20
n1 = t>=0 & t<=7
n2 = t>=1 & t<=6
n3 = t>=2 & t<=5
s1 = n1+n2+2*n3;
subplot(4,1,1);
plot(t,s1);
xlabel('time');
ylabel('amplitude');
title('1st signal');
t1 = -3:0.01:3
impulse = t1>=0
n11 = t1.*impulse
n22 = t1>=3 & t1<=5
s2 = n11+n22;
subplot(4,1,2);
plot(t1,s2);
xlabel('time');
ylabel('amplitude');
title('2nd signal');
```

Output:

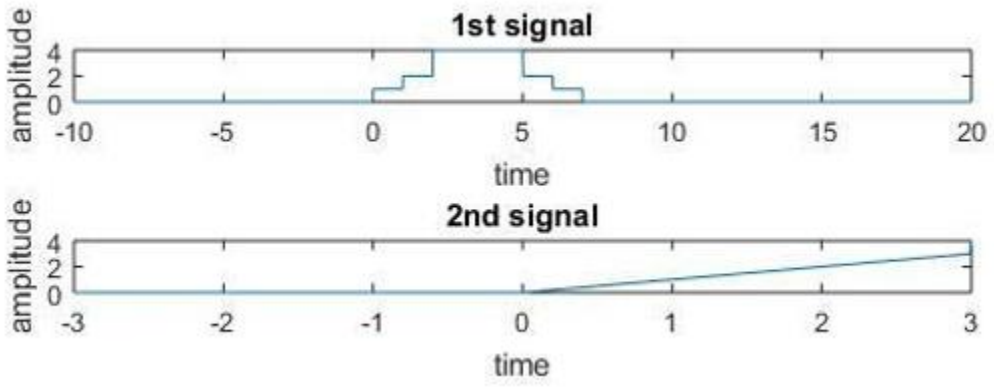

Fig: Output for plotting two different continuous signals:

Discussion:

In this experiment, we have learned about different types of signals such as continuous and discrete signals, and their characteristics like unit step, unit ramp, and unit impulse. We have also learned how to plot these signals using MATLAB. Firstly, we plotted unit step, unit ramp, and unit impulse signals. These signals are commonly used in signal processing to represent sudden, gradual, and instantaneous changes in a system, respectively. We used the mathematical definitions of these signals to plot them in MATLAB. The resulting plots showed the expected behavior of each signal, where the unit step had a sudden change at t=0, the unit ramp had a gradual increase, and the unit impulse had a spike at t=0. Next, we plotted a discrete signal. Discrete signals are used to represent data that is only available at specific points in time or space. We used the stem function in MATLAB to plot the given discrete signal, which showed the amplitude values at specific points in time. We then plotted two different discrete signals and showed their addition and subtraction. We used the logical operators and functions in MATLAB to create the required signals and then plotted them using the stem function. The resulting plots showed how the signals added and subtracted from each other. Finally, we plotted two different continuous signals. We used the logical operators and functions to create the required signals and then plotted them using the plot function in MATLAB. The resulting plots showed the expected behavior of each signal, where the first signal had three different linear sections, and the second signal had a step change followed by a ramp.

Conclusion:

In conclusion, this experiment has taught us the basics of signals and their characteristics, as well as how to plot them using MATLAB. We have learned how to plot different types of signals such as unit step, unit ramp, unit impulse, and discrete and continuous signals. We have also learned how to perform simple operations on these signals such as addition and subtraction. The practical experience gained from this experiment will help us better understand and analyze signals in various applications.