Heaven's Light is Our Guide

Rajshahi University of Engineering & Technology

Department of Electrical & Computer Engineering

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

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Experiment No: 01

Experiment Name: Presentation of some signals using MATLAB.

i) Plot unit step, unit ramp, unit impulse signal using MATLAB.
ii) Plot discrete signal using MATLAB.
iii) Plot two different discrete signal and show their addition and subtraction using MATLAB.
iv) Plot two different continuous signal using MATALB.

Theory:

A continuous signal or a continuous-time signal is a varying quantity whose domain, which is often time, is a continuum. That is, the function's domain is an uncountable set. The function itself need not to be continuous.

A discrete signal or discrete-time signal is a time series consisting of a sequence of quantities. Unlike a continuous-time signal, a discrete-time signal is not a function of a continuous argument; however, it may have been obtained by sampling from a continuous-time signal.

If a step signal has unity magnitude, then it is known as unit step signal or unit step function. It is denoted by u(t). The step signal is equivalent to applying a signal to a system whose magnitude suddenly changes and remains constant forever after application.
Unit step function is denoted by u(t). It is defined as $u(t) = \begin{cases} 1 & t \geq 0 \\ 0 & t < 0 \end{cases}$

An ideal impulse signal is a signal that is zero everywhere but at the origin (t = 0), it is infinitely high. Although, the area of the impulse is finite. The unit impulse signal is the most widely used standard signal used in the analysis of signals and systems.
Impulse function is denoted by δ(t). and it is defined as $\delta(t) = \begin{cases} 1 & t = 0 \\ 0 & t \neq 0 \end{cases}$

A ramp function or ramp signal is a type of standard signal which starts at $t = 0$ and increases linearly with time. The unit ramp function has unit slop.
Ramp signal is denoted by r(t), and it is defined as $r(t) = \begin{cases} t & t \geq 0 \\ 0 & t < 0 \end{cases}$

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');
```

Code for plotting discrete signal:

```
x = -4:3
y = [1,2,3,3,2,1,4,1]
stem(x,y);
```

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
```

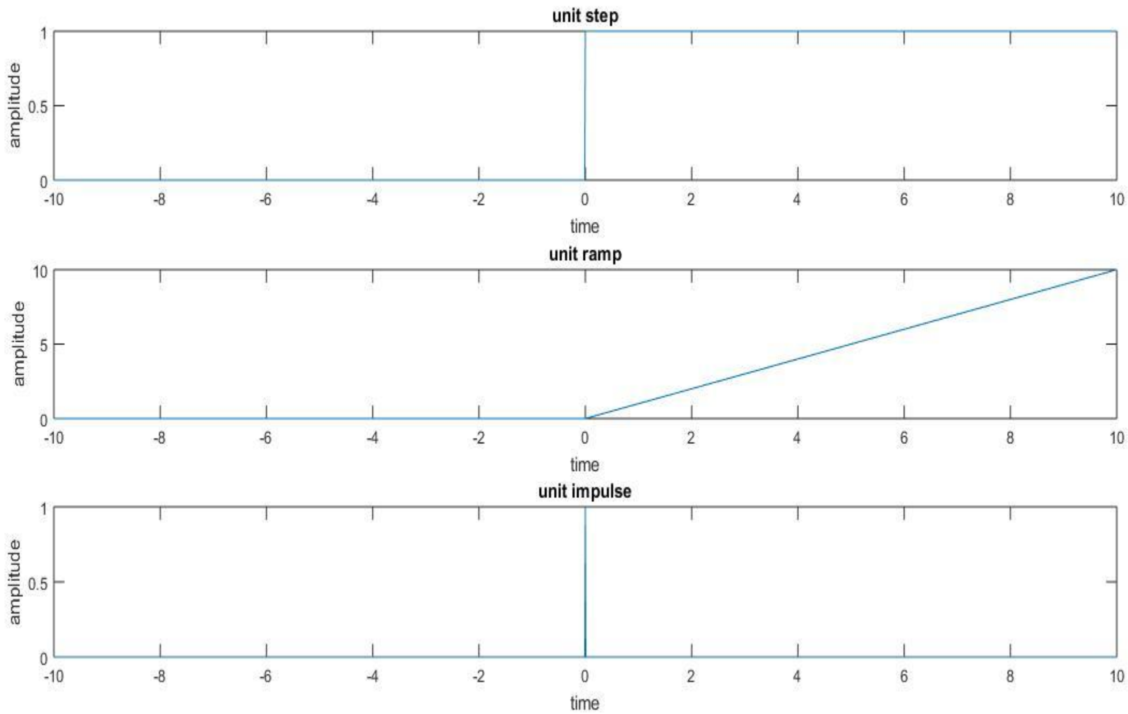
```
subplot(4,1,2);
stem(t,n2);
xlabel('time');
ylabel('amplitude');
title('2nd Signal');
add = n1+n2
subplot(4,1,3);
stem(t,add);
xlabel('time');
ylabel('amplitude');
title('Addition');
sub = n1-n2
subplot(4,1,4);
stem(t,sub);
xlabel('time');
ylabel('amplitude');
title('Subtraction');
```

Code for plotting two different continuous signal:

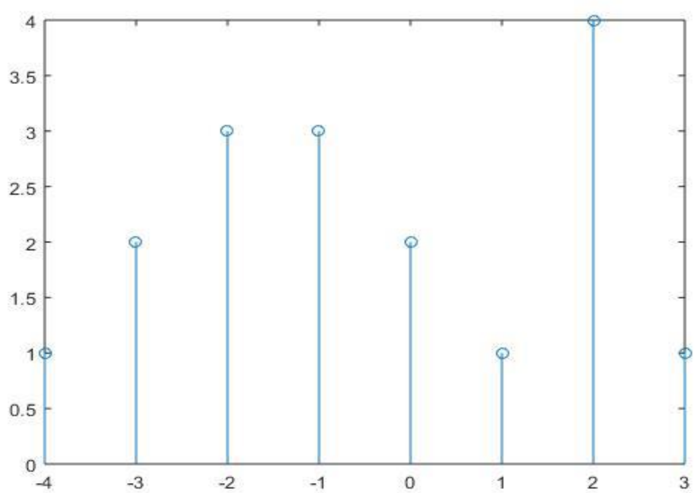
```
clc
clear all
close all
t = -10:0.01:20
n1 = t>=0 & t<=7
n2 = t>=1 & t<=6
n3 = t>=2 & t<=5
s1 = n1+n2+2*n3;
subplot(4,1,1);
plot(t,s1);
xlabel('time');
ylabel('amplitude');
title('1st signal');
t1 = -3:0.01:3
impulse = t1>=0
n11 = t1.*impulse
n22 = t1>=3 & t1<=5
s2 = n11+n22;
subplot(4,1,2);
plot(t1,s2);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

Output:

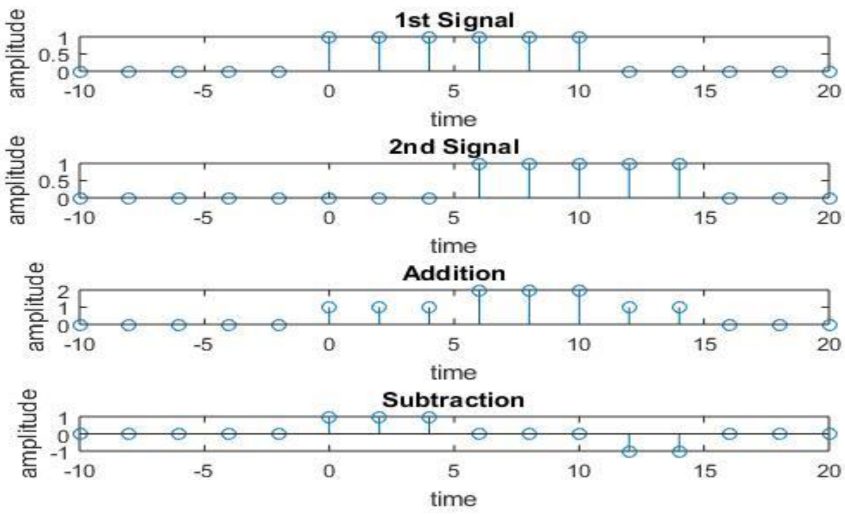
Output for plotting unit step, unit ramp, unit impulse signal:



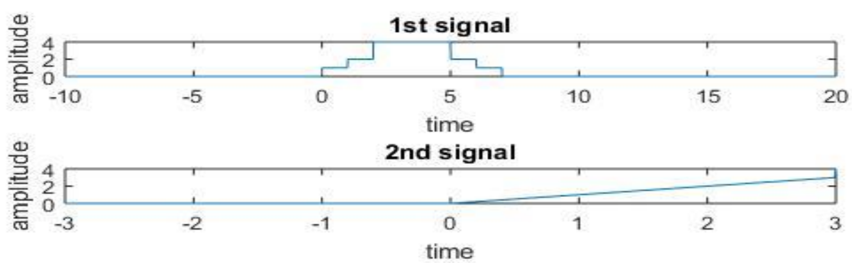
Output for plotting discrete signal:



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



Output for plotting two different continuous signal:



Discussion:
Here in this experiment, firstly we worked with the unit step, unit impulse and unit ramp signals using conditions not the built in functions. For unit step before time zero all values are zero and after time zero all are one. For impulse only one value at zero, otherwise zero values. Discrete plot was done by using stem function. We worked with two different signals, add then and subtract them using steps.

Conclusion: The code was executed successfully and no errors were found.