Aash Agarwal LAB #6

1.1

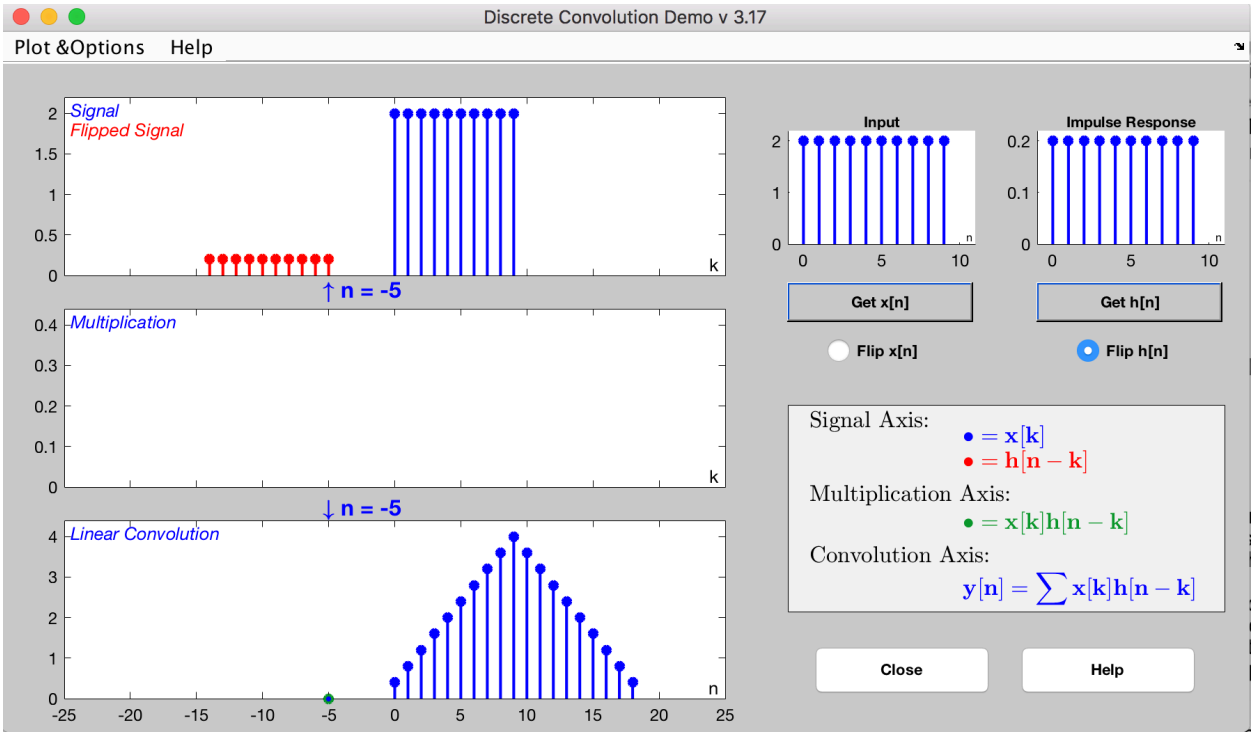
Exercise 1: Filterfir consists of 2 components H and X. The command returns the filtering operation of X which has an impulse response of H. The Y is the output of the function, executed by FILTERFIR(H, X).

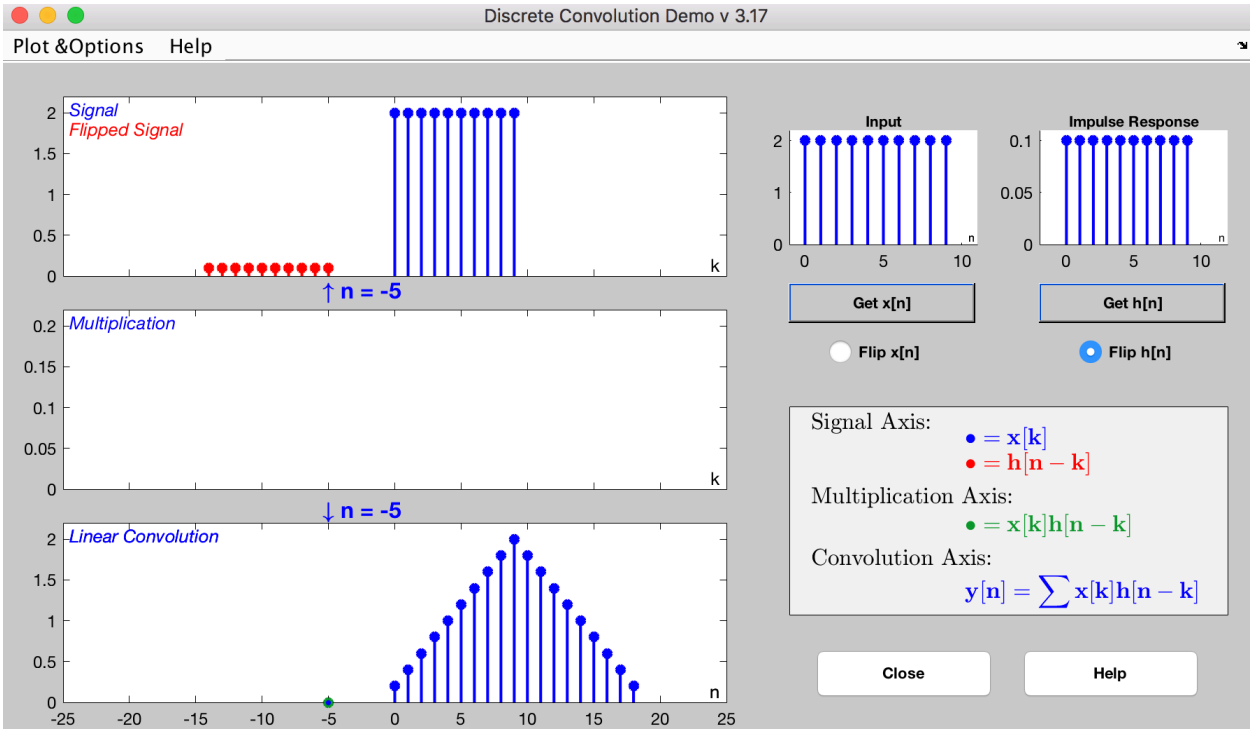
Exercise 2: The command generates the 10-point average which has a amplitude of 0.1.

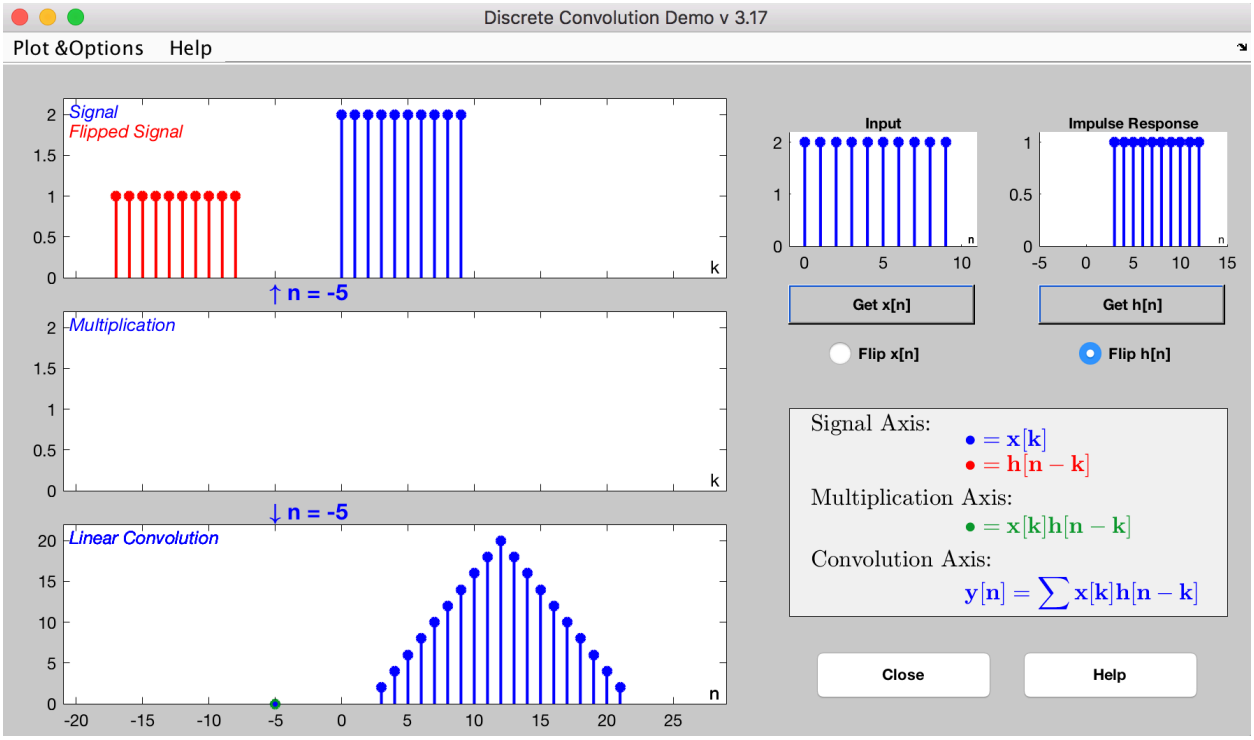
1.2

Exercise 3: In between the %begin and end calculation, omega is defined as a period of 2*pie/N. The function FF gets assigned an expression of (-j*omega) for the length h-1. The frequency response, magnitude response and phase response are calculated by h, mH, and pH respectively.

2.1

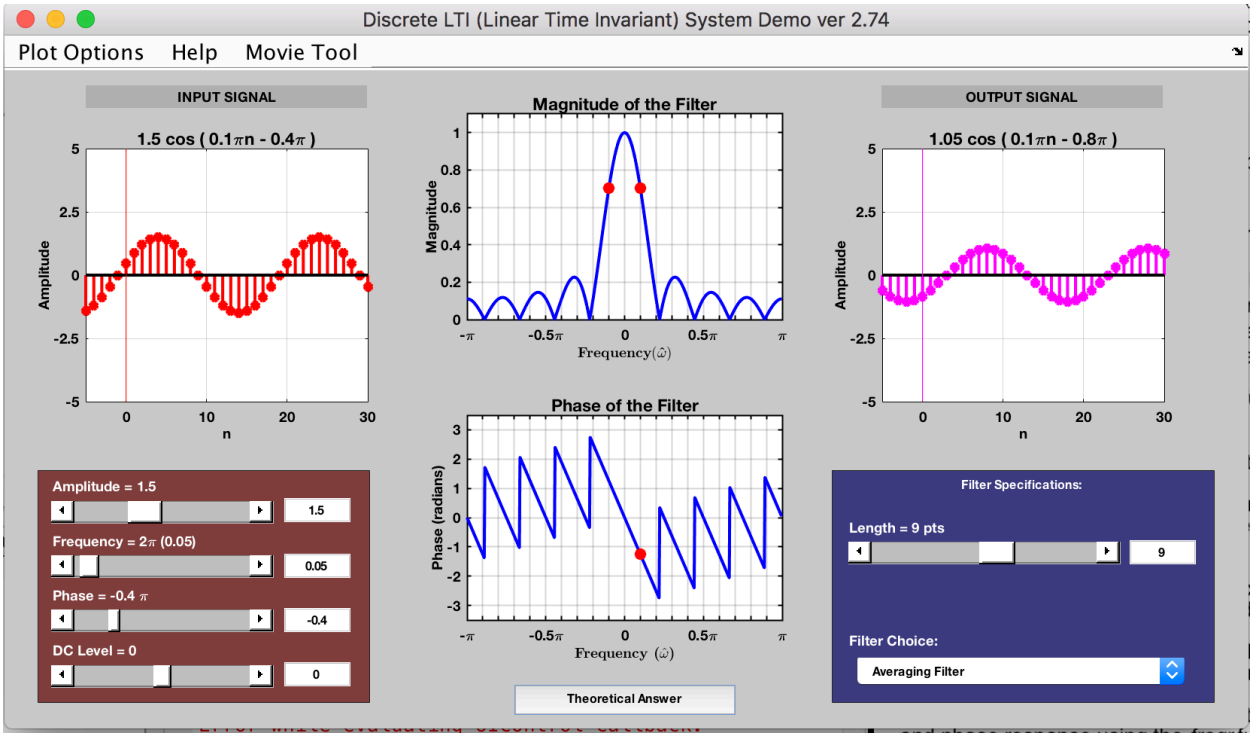



Discrete Convolution Demo v 3.17
Plot &Options
Help
Signal
Flipped Signal
↑ n = -5
Multiplication
↓ n = -5
Linear Convolution
Input
Impulse Response
Get x[n]
Get h[n]
Flip x[n]
Flip h[n]
Signal Axis:
• = x[k]
• = h[n − k]
Multiplication Axis:
• = x[k]h[n − k]
Convolution Axis:
y[n] = ∑ x[k]h[n − k]
Close
Help

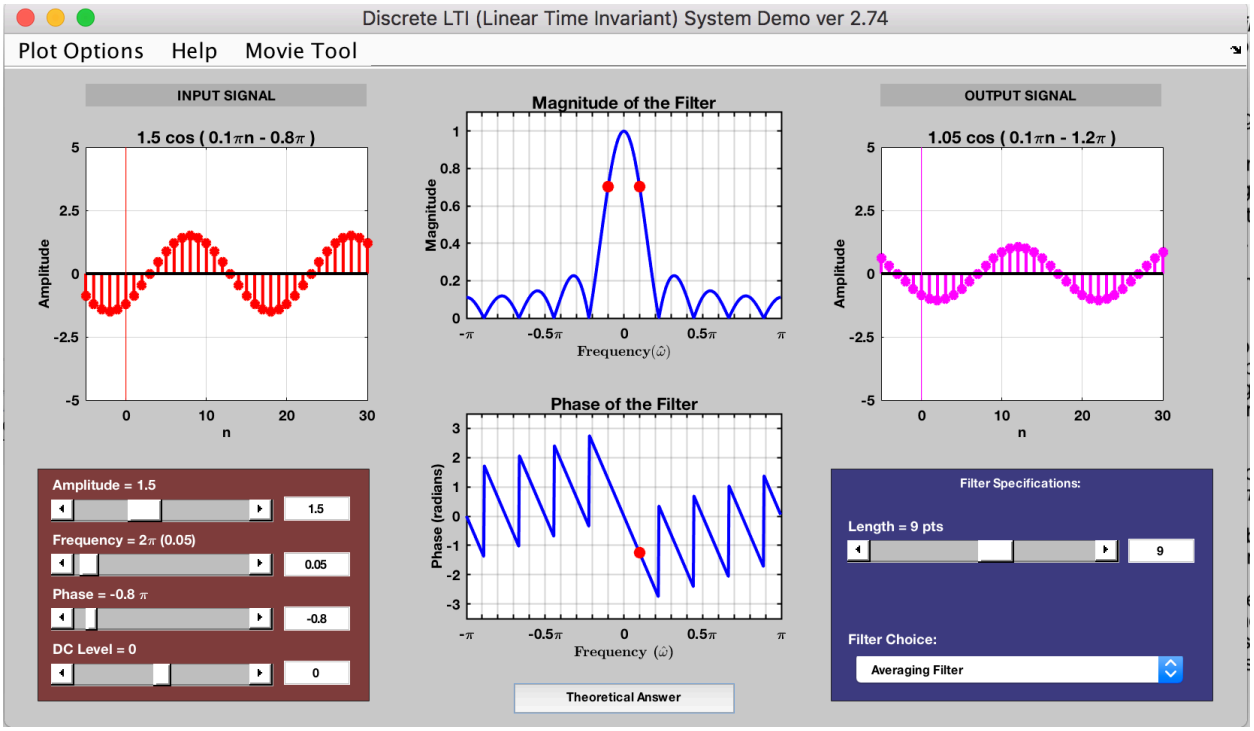

Discrete Convolution Demo v 3.17
Plot &Options
Help
Signal
Flipped Signal
↑ n = -5
Multiplication
↓ n = -5
Linear Convolution
Input
Impulse Response
Get x[n]
Get h[n]
Flip x[n]
Flip h[n]
Signal Axis:
• = x[k]
• = h[n − k]
Multiplication Axis:
• = x[k]h[n − k]
Convolution Axis:
y[n] = ∑ x[k]h[n − k]
Close
Help

2.2

Aash Agarwal LAB #6



The formula for the output of the signal y[n] = 1.05 cos(0.1*pie*n – 0.8*pie)



The peak of the cosine wave has been delayed by 3.

3.

```
  Name          Size                Bytes  Class     Attributes

  h1            1x45                  360  double
  h2            1x45                  360  double
  x1            1x100                 800  double
  x2        24576x1                196608  double
  xtv         256x1                  2048  double
```

Exercise 4:

```
function y=filterfir(h, x)
h=[0 1 2];
x=[2 4 1];
y=filterfir(h, x)
lenh=length(h); lenx=length(x); leny=lenh+lenx-1;
% Make an empty Y vector in the same direction as X if size(x, 1)==lenx
y=zeros(leny, 1);
else
y=zeros(1, leny); end
for k=1:lenh y(k:k+lenx-1)=y(k:k+lenx-1)+h(k)*x; end
return; % End of the function
function freqr(h)
h=[1 2 1];
N=200; % number of frequencies to evaluate
omega=-pi:2*pi/N:pi;
FF=exp(-j*omega'*(0:length(h)-1));
H=FF*h(:); % The frequency response mH=abs(H); % The magnitude response pH=angle(H); %
The phase response
subplot(2, 1, 1); plot(omega, mH);
xlabel('\omega'); ylabel('|H(\omega)|'); title('magnitude response'); h=gca; grid on;
set(h, 'XLim', [-pi, pi]); % set x axis limit
set(h, 'XTick', [-pi: 0.25*pi: pi]); % X axis tick positions set(h, 'FontName', 'symbol'); % prepare
to type tick label set(h, 'XTickLabel', '-p||-0.5p||0||0.5p||p');% tick label
subplot(2, 1, 2); plot(omega, pH);
xlabel('\omega'); ylabel('\angle H(\omega)'); title('phase response'); h=gca; grid on;
set(h, 'XLim', [-pi, pi]); % set x axis limit
set(h, 'XTick', [-pi: 0.25*pi: pi]); % X axis tick positions
set(h, 'FontName', 'symbol'); % prepare to type tick label
set(h, 'XTickLabel', '-p||-0.5p||0||0.5p||p');% tick label return;
```

Exercise 5: I observe a different shape of the signals.

Exercise 6: The filtered version is little unpleasant to hear, since it contained a filtered wave.