Homework2

Programmers

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Clear the Workspace

```
close all;
clear all;
clc;
```

Homework2_1_2

- In this task we want to make a psudo-integrated filter and use the function we made to filter input signal

Here we declare some variables and signals

```
h = 0.1 * ones(1, 10);
t = 0:1:199;
x = [ones(1, 25) zeros(1, 25)];
```

Here we make the input signal which its T is 50

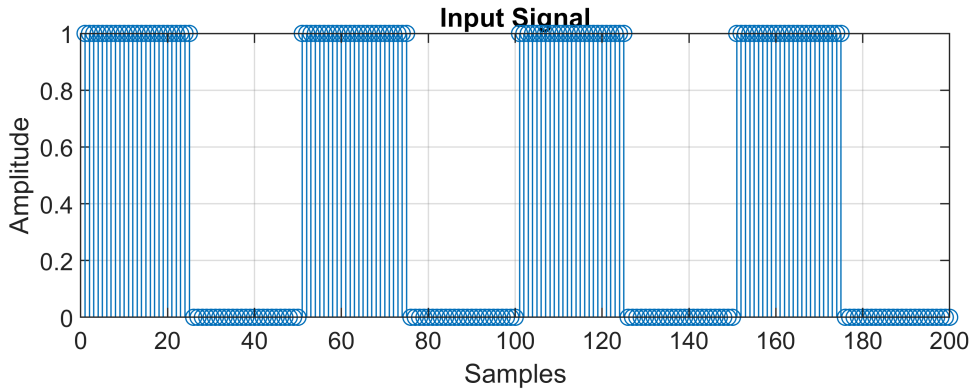
```
for i = 1:3
    x = [x ones(1, 25) zeros(1, 25)];
end
```

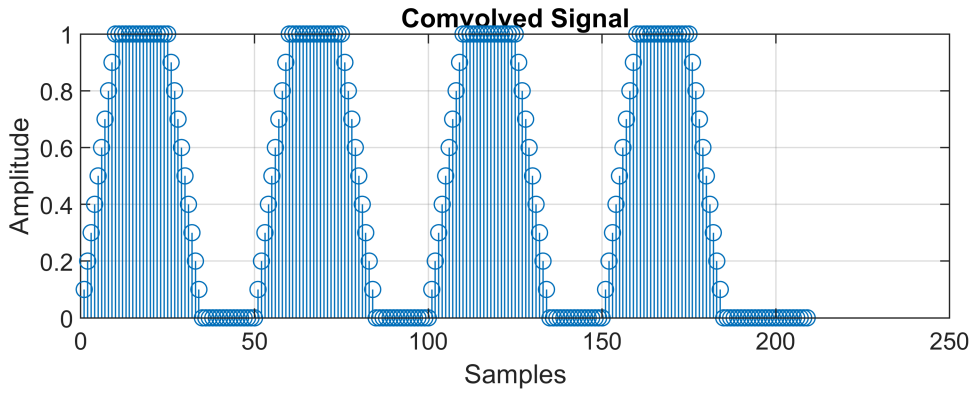
Here we make sure the length of y matches with input signal

```
y = myconv(x, h);
```

Here we plot signals on each other

```
figure('Name', 'Convolution');
subplot(2,1,1)
stem(x);
xlabel('Samples');
ylabel('Amplitude');
title('Input Signal');
grid on;

subplot(2,1,2)
stem(y);
xlabel('Samples');
ylabel('Amplitude');
grid on;
title('Comvolved Signal');
```





Homework2_1_3

- Here we do what we did prior for another filter, with myconv function

Now we declare variables and signals we want to use

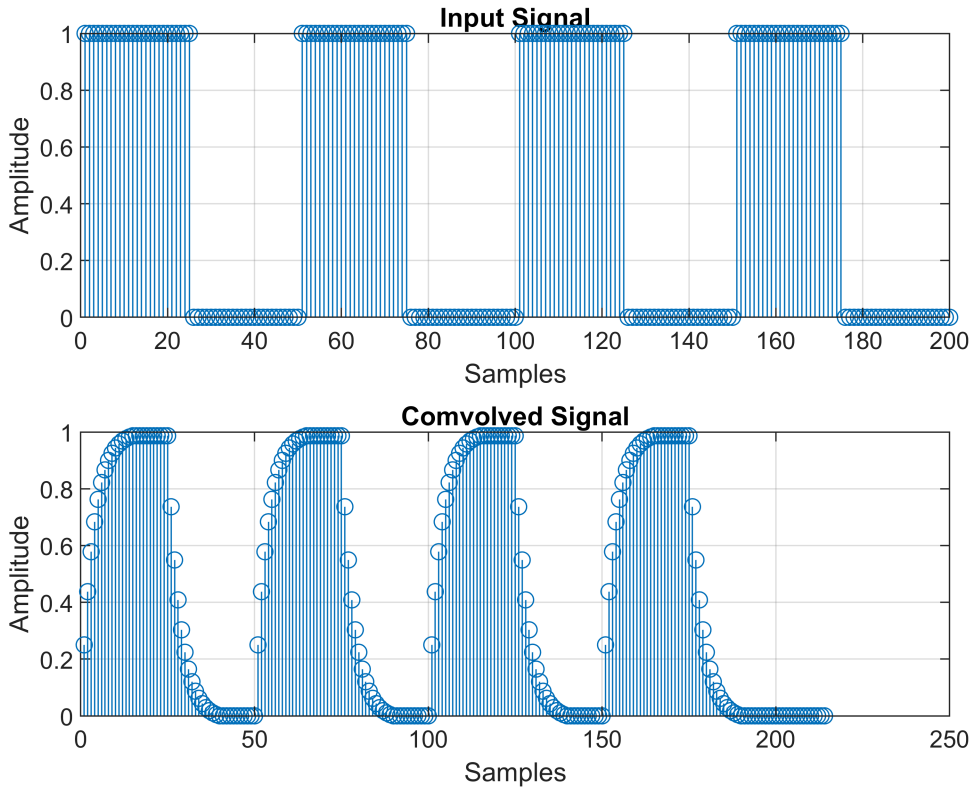
```
h = [1];

for j = 1:14
    h = [h 0.75 ^ (j)];
end

h = 0.25 * h;
x = [ones(1, 25) zeros(1, 25)];
t = 0:1:199;

for i = 1:3
    x = [x ones(1, 25) zeros(1, 25)];
end
```

Here we make sure the length of y matches with input signal

```
y = myconv(x, h);
```

Here we plot signals on each other

```
figure('Name', 'Convolution');
subplot(2,1,1)
stem(x);
xlabel('Samples');
ylabel('Amplitude');
title('Input Signal');
grid on;

subplot(2,1,2)
stem(y);
xlabel('Samples');
ylabel('Amplitude');
grid on;
title('Comvolved Signal');
```



Homework2_1_4

- Here we do the same things as we did till now for another filter

We declare variables and signals now

```
x = [ones(1, 25) zeros(1, 25)];
t = 0:1:199;

for i = 1:3
    x = [x ones(1, 25) zeros(1, 25)];
end
```

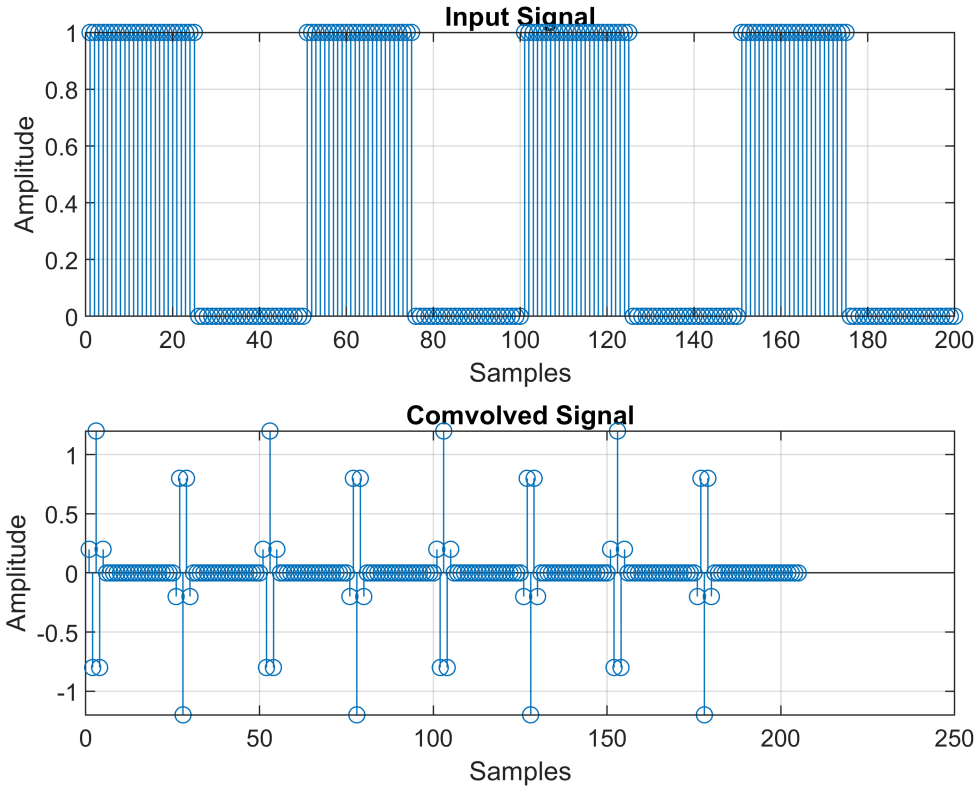
```
y = myconv([1, -1], x);

for i = 1:4
    y = myconv([1, -1], y);
end
```

Here we make sure the length of y matches with input signal

```
y = 1/5 * y;
% y = y(1:200);
```

Here we plot signals on each other

```
figure('Name', 'Convolution');
subplot(2,1,1)
stem(x);
xlabel('Samples');
ylabel('Amplitude');
title('Input Signal');
grid on;

subplot(2,1,2)
stem(y);
xlabel('Samples');
ylabel('Amplitude');
grid on;
title('Comvolved Signal');
```



Homework2_2

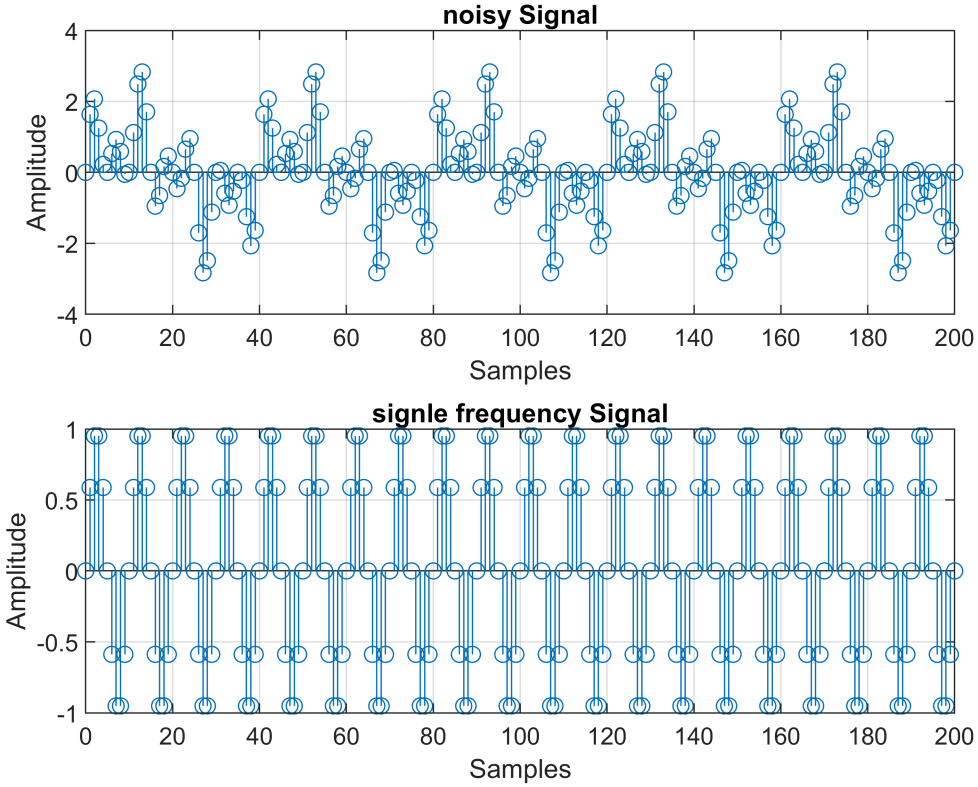
- Main purpose of this task is filtering of noisy signals
- In this part we want to make signals and then plot it

Now first we declare signals and variables below

```
M = 100;
n1 = 0:1:200;
n = 0:1:100;
w = 0.54 - 0.46 * sin(2 * pi * n / M);
h1= (0.25 * sinc(0.25 * (n - M / 2)) - 0.15 * sinc(0.15 * (n - M / 2)));
h = w .* (0.25 * sinc(0.25 * (n - M / 2)) - 0.15 * sinc(0.15 * (n - M / 2)));
s = sin(0.2 * pi * n1);
x = s + sin(0.05 * pi * n1) + sin(0.35 * pi * n1);
```

Now we plot our signal with and without interferenced signals

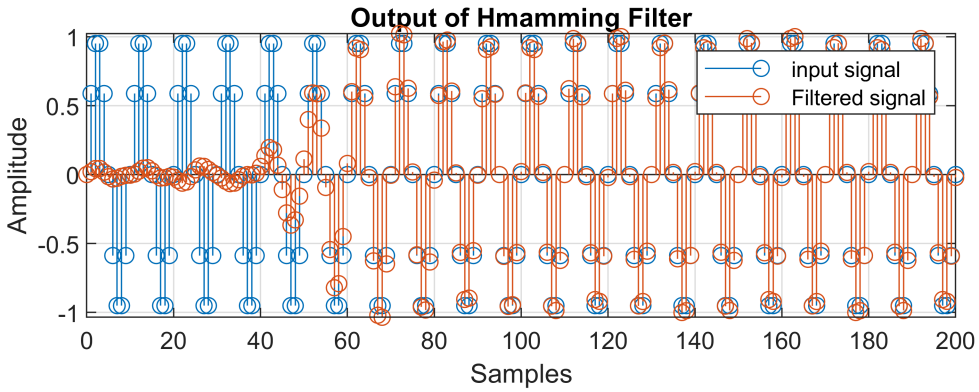
```
figure('Name', 'Convolution');
subplot(2,1,1)
stem(n1,x);
xlabel('Samples');
ylabel('Amplitude');
title('noisy Signal');
grid on;

subplot(2,1,2)
stem(n1,s);
xlabel('Samples');
ylabel('Amplitude');
grid on;
title('signle frequency Signal');
```

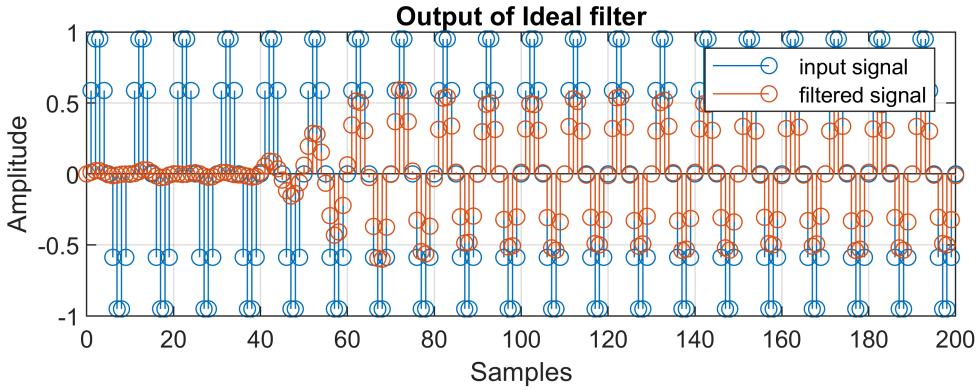


Homework2_2_2 :

Here we filter signal, and plot signals on each other

```
t = -50:50;
y = filter(h, 1, x);
y_ideal=filter(h1,1,x);

figure('Name', 'Filtered signal');
subplot(2,1,1)
stem(n1,s);
xlabel('Samples');
ylabel('Amplitude');
title('Output of Hmamming Filter');
grid on;
hold on;
stem(n1, y_ideal);
legend('input signal', 'Filtered signal');

subplot(2,1,2)
stem(n1,s);
xlabel('Samples');
ylabel('Amplitude');
grid on;
hold on;
stem(n1, y);
legend('input signal', 'filtered signal');
title('Output of Ideal filter');
```





Homework2_2_3 :

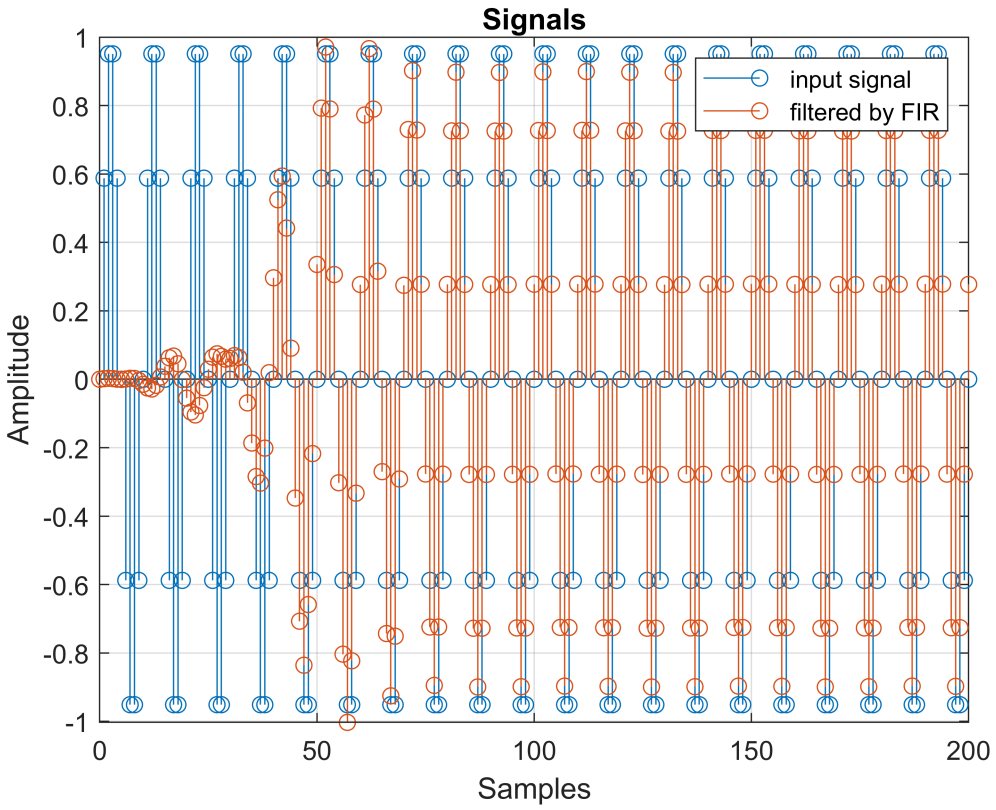
- Here we make a filter with "filterDesigner" toolbox and then filter our signal with it.

Here we used Eliptic filter

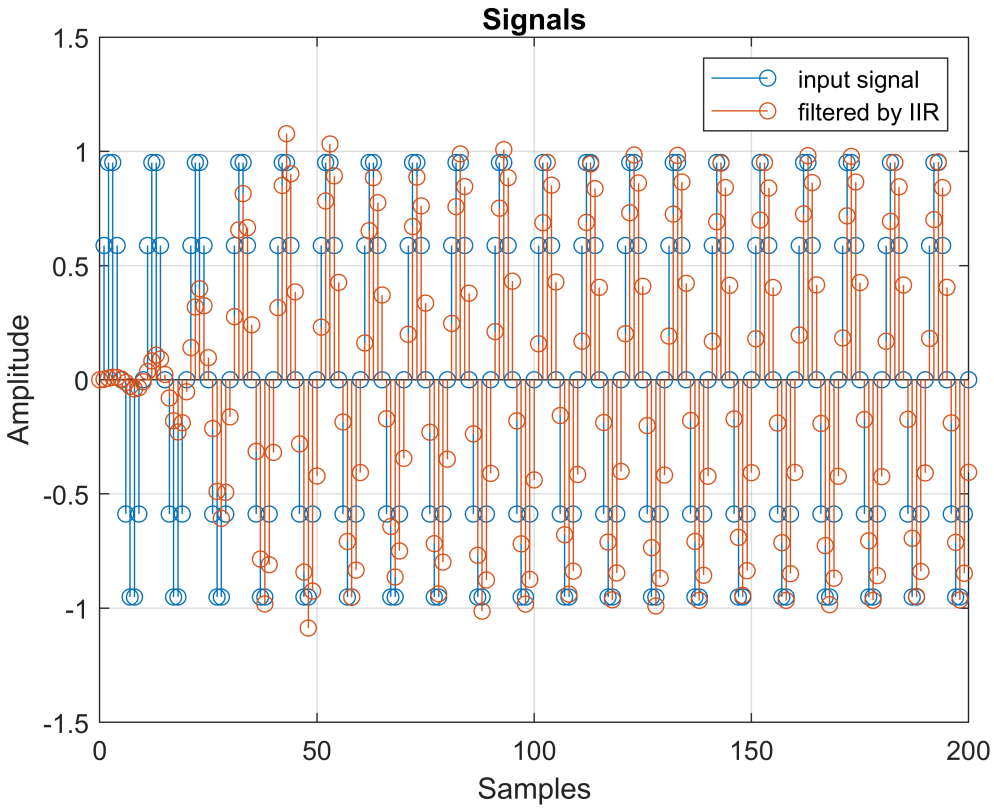
```
FD_FIR = Filter_FIR;
y1 = FD_FIR.filter(x);

FD_IIR = Filter_IIR;
y2 = FD_IIR.filter(x);
```

Now we plot signals on each other

```
figure('Name', 'signals_2');
stem(n1, s);
xlabel('Samples');
ylabel('Amplitude');
title('Signals');
grid on;
hold on;
stem(n1, y1);
legend('input signal', 'filtered by FIR');
```




```
figure('Name', 'signals_3');
stem(n1, s);
xlabel('Samples');
ylabel('Amplitude');
title('Signals');
grid on;
hold on;
stem(n1, y2);
legend('input signal', 'filtered by IIR');
```


Signals
input signal
filtered by IIR
Amplitude
Samples
1.5
1
0.5
0
-0.5
-1
-1.5
0
50
100
150
200