Windowing

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Design, visualize, and implement window functions. Compare mainlobe widths and sidelobe levels of windows as a function of their size and other parameters.

Initialization

```
clear all
clc
```

Function Begin

```
disp('Commented for Publishing');
% function z = Windowing(N) {
```

```
Commented for Publishing
```

STOP BAND Frequency

```
fs=800;
```

PASS BAND Frequency

```
fp=300;
```

Sampling Frequency

```
F=1800;
```

```
Wp=(2*pi*fp)/F;

Ws=(2*pi*fs)/F;

Wc=(Ws+Wp)/2;
```

Order of the filter

Commented for publishing. N=input('Enter the order of the royal filter (Number has to be odd): ');

```
N = 31;

alpha=(N-1)/2;

for i=1:(2*alpha)+1

    hd(i)= (Wc*sin(i-alpha))/(pi*Wc*(i-alpha));


end

t=1:(2*alpha)+1;

hd((N-1)/2)=(Wc/pi);
```

Original

```
hd


hd =

  Columns 1 through 7

    0.0225    0.0103   -0.0142   -0.0289   -0.0173    0.0146    0.0394

  Columns 8 through 14

    0.0299   -0.0148   -0.0610   -0.0602    0.0150    0.1447    0.2678

  Columns 15 through 21

    0.6111    0.2678    0.1447    0.0150   -0.0602   -0.0610   -0.0148

  Columns 22 through 28

    0.0299    0.0394    0.0146   -0.0173   -0.0289   -0.0142    0.0103

  Columns 29 through 31

    0.0225    0.0138   -0.0057
```

Rectangular window

```
r = rectwin(N);
```

Blackman window

```
b= blackman(N);
```

Chebyshev window

```
c = chebwin(N);
```

Tukey window

```
tk = tukeywin(N);
```

Blackmanharris window

```
bmh = blackmanharris(N);
```

Hamming window

```
hm = hamming(N);
```

Hanning window

```
hn = hann(N);
```

Flat Top window

```
ftw = flattopwin(N);
for i=1:(2*alpha)+1
    rh(i)=r(i)*hd(i);
    bh(i)=b(i)*hd(i);
    ch(i)=c(i)*hd(i);
    th(i)=tk(i)*hd(i);
    bmhh(i)=bmh(i)*hd(i);
    hmh(i)=hm(i)*hd(i);
    hnh(i)=hn(i)*hd(i);
    ftwh(i) = ftw(i)*hd(i);
```

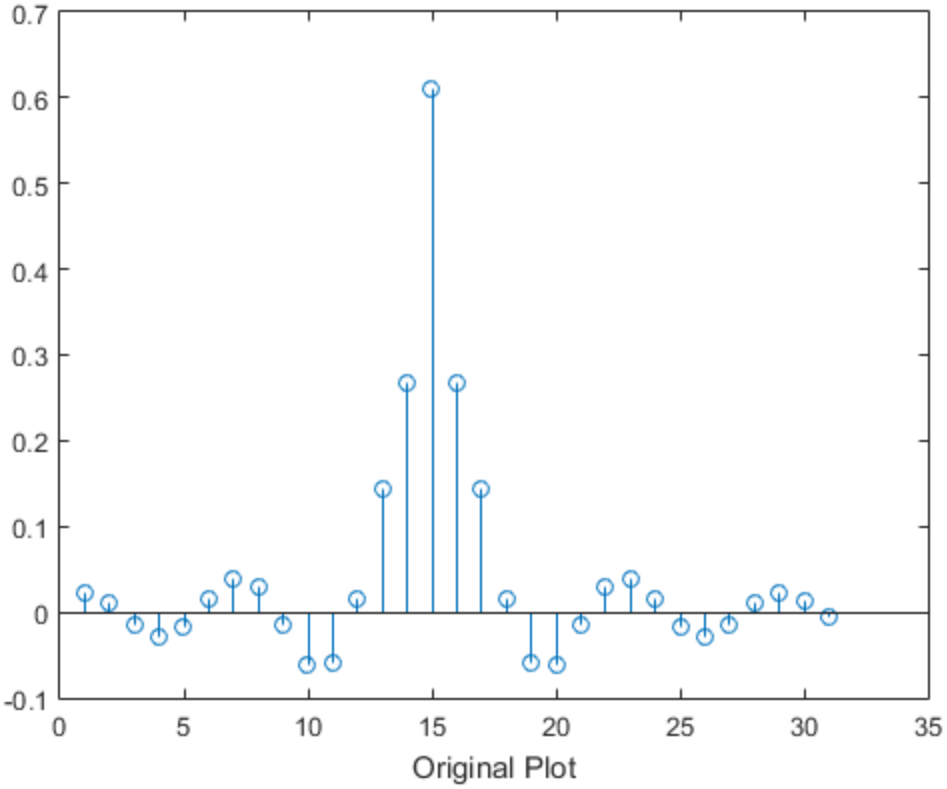
```
end
```

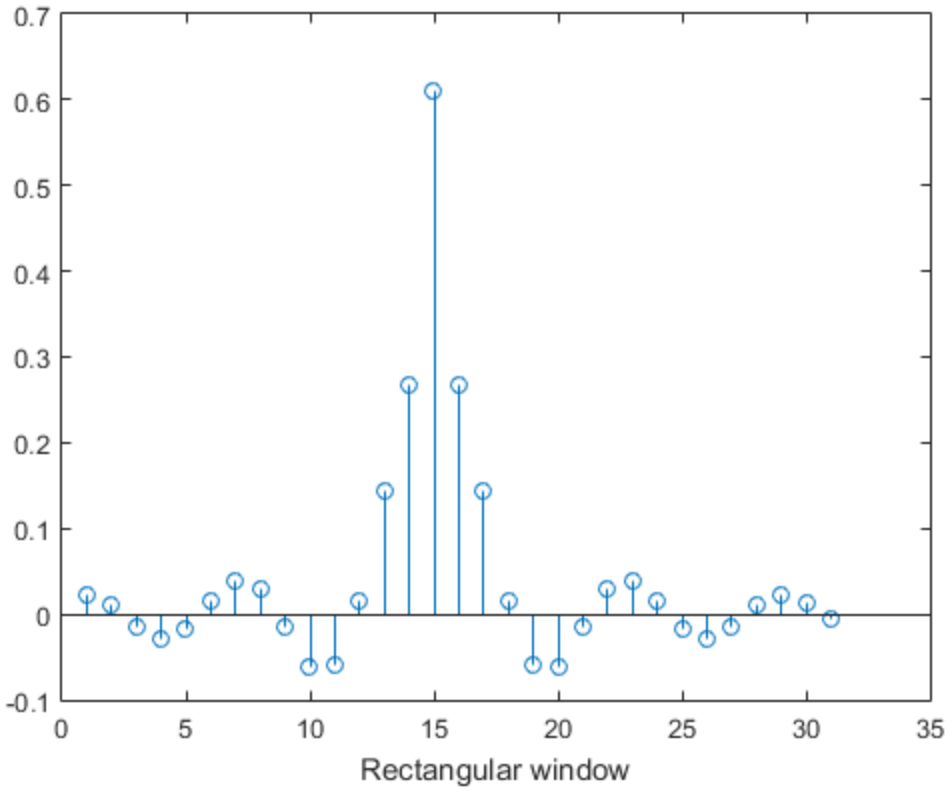
Plotting of OUTPUT for Comparison

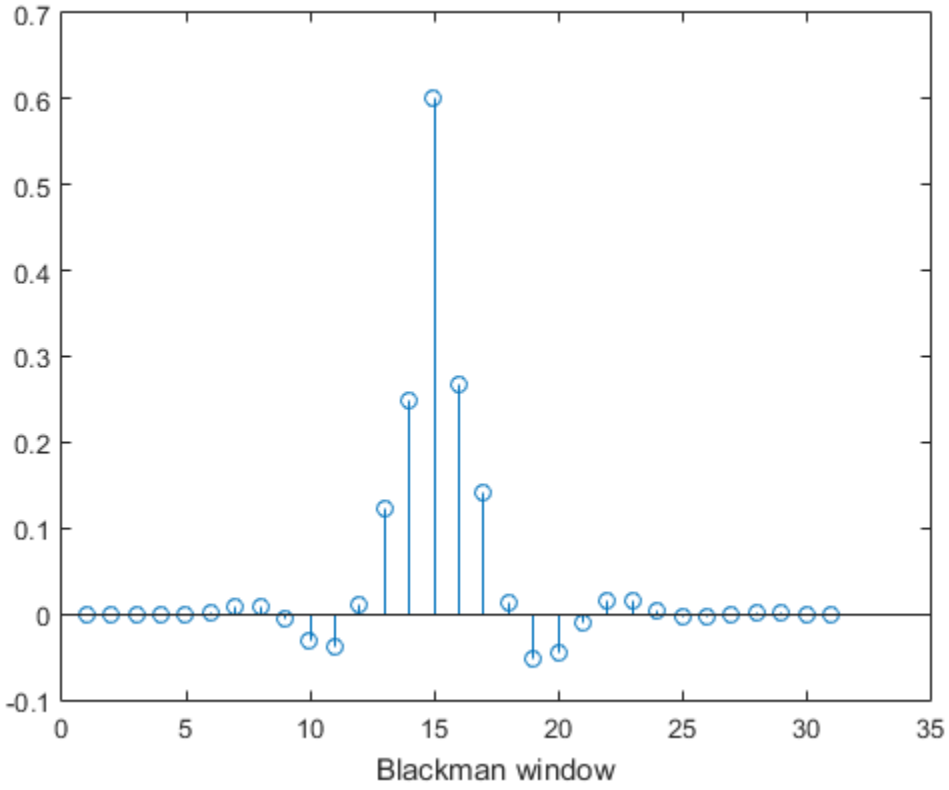
Subplot is Disabled for publishing purposes

```
% subplot(3,3,1);
figure();
stem(t,hd);
xlabel('Original Plot');

% subplot(3,3,2);
figure();
stem(t,rh);
xlabel('Rectangular window');

% subplot(3,3,3);
figure();
stem(t,bh);
xlabel('Blackman window');

% subplot(3,3,4);
figure();
stem(t,ch);
xlabel('Chebyshev window');

% subplot(3,3,5);
figure();
stem(t,th);
xlabel('Tukey window ');

% subplot(3,3,6);
figure();
stem(t,bmhh);
xlabel('Blackmanharris window');


% subplot(3,3,7);
figure();
stem(t,hmh);
xlabel('Hamming window');


% subplot(3,3,8);
figure();
stem(t,hnh);
xlabel('Hanning window');


% subplot(3,3,9);
figure();
stem(t,ftwh);
```

```
xlabel('Flat Top window');
```




0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
-0.1
0
5
10
15
20
25
30
35
Rectangular window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0.6
0.5
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0.3
0.2
0.1
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-0.1
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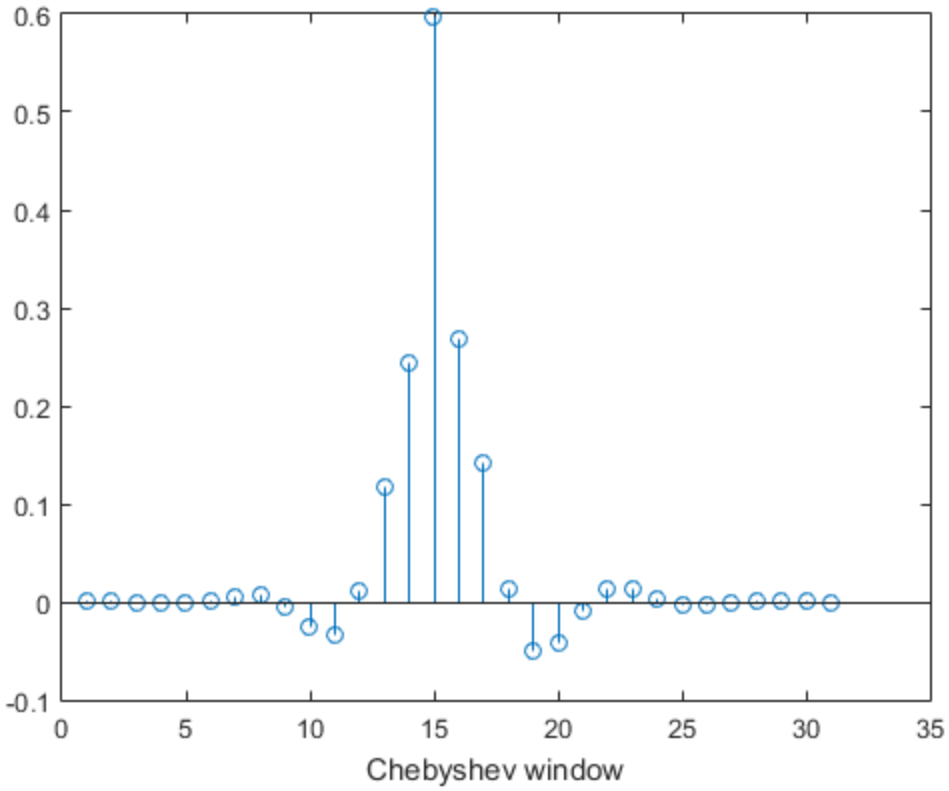
5
10
15
20
25
30
35
Blackman window


0.6
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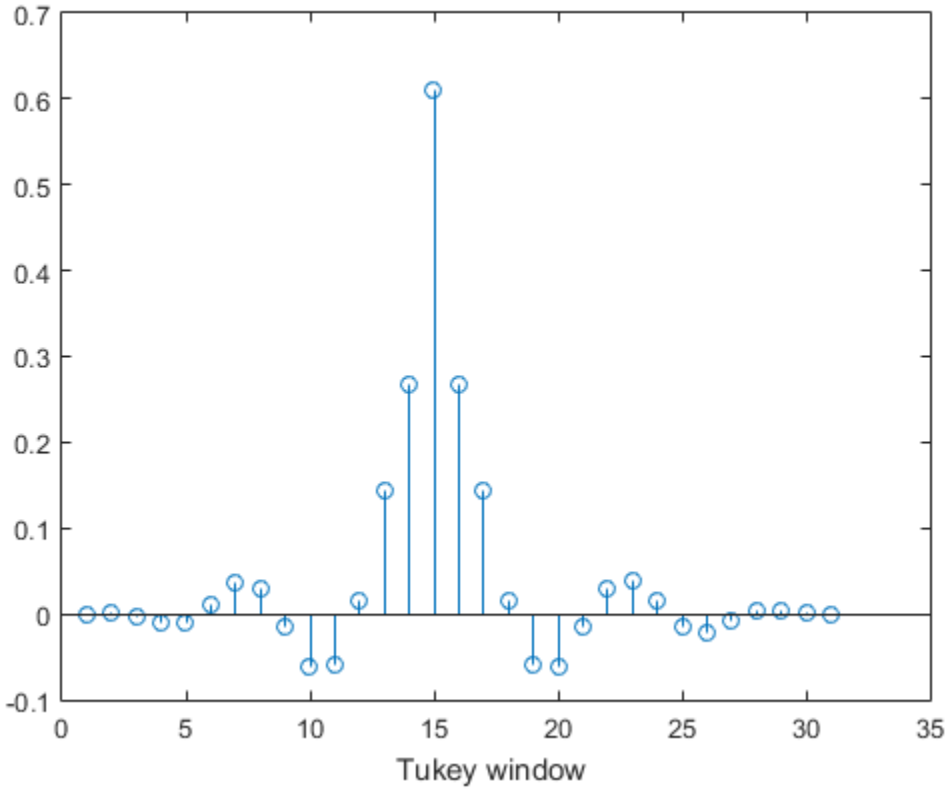
Chebyshev window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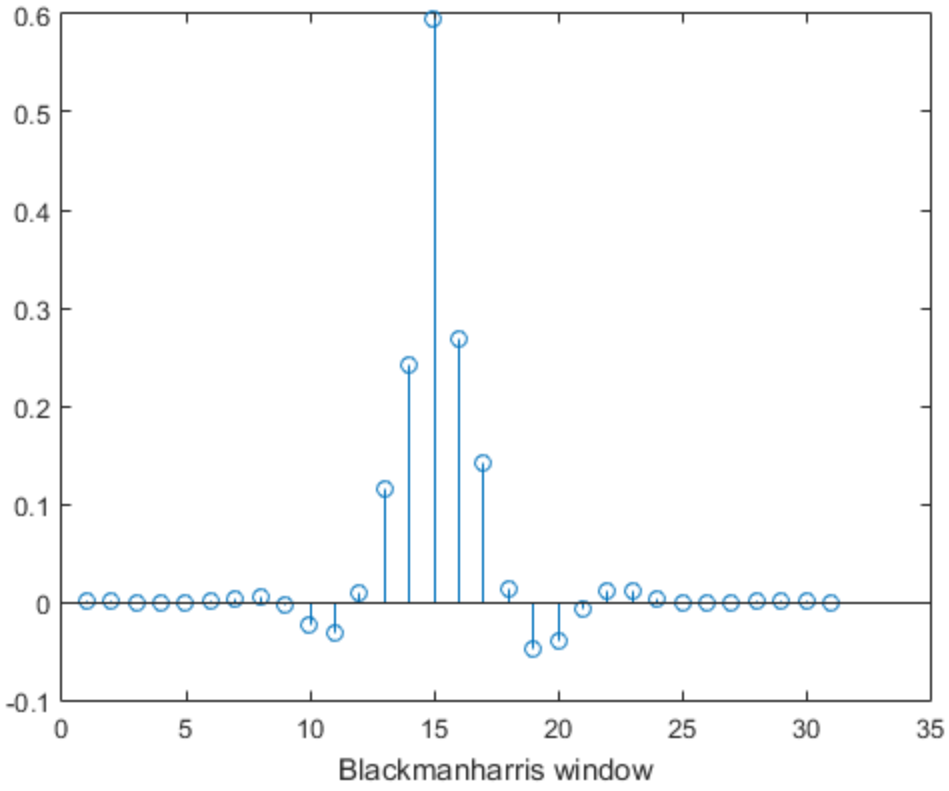
Tukey window


0.6
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0.1
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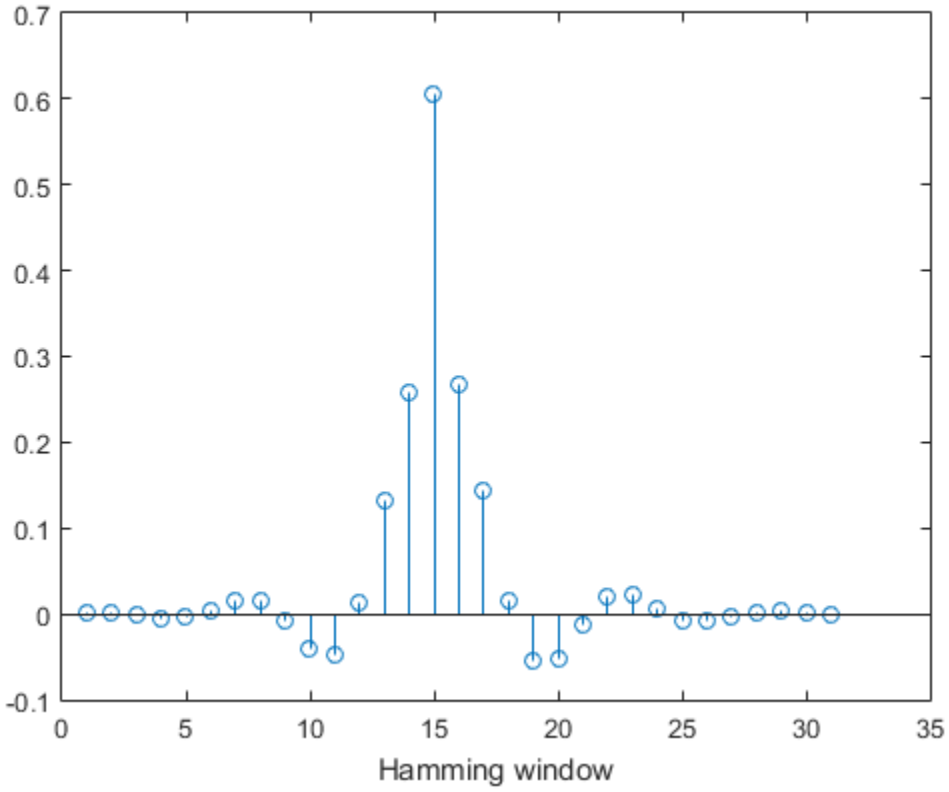
Blackmanharris window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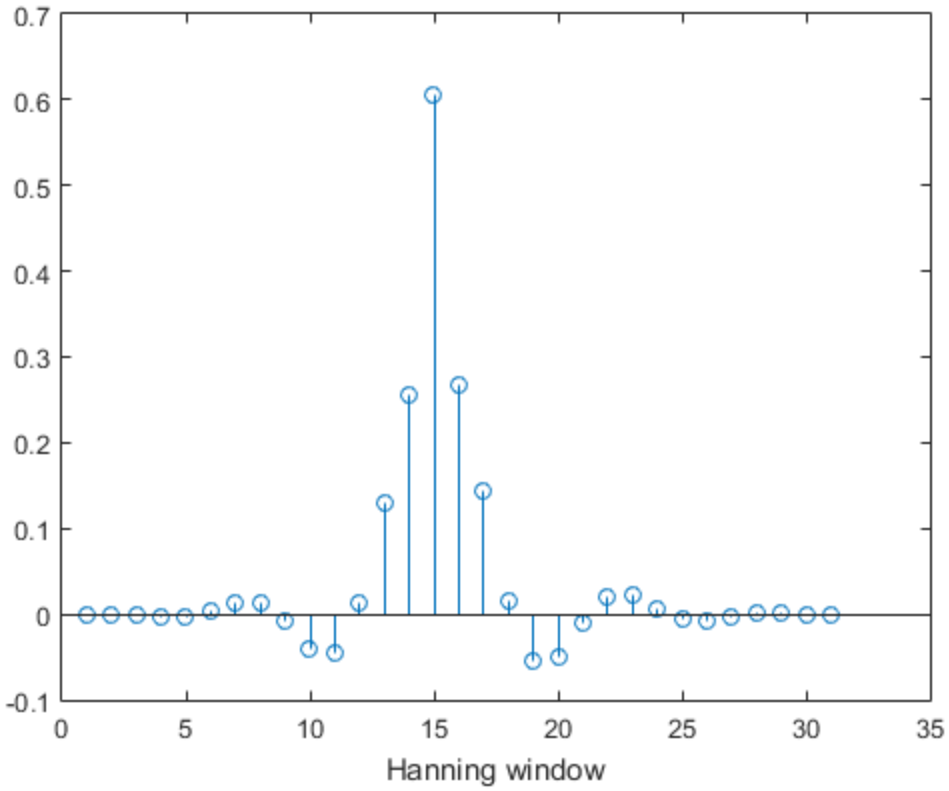
Hamming window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0.5
0.4
0.3
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-0.1
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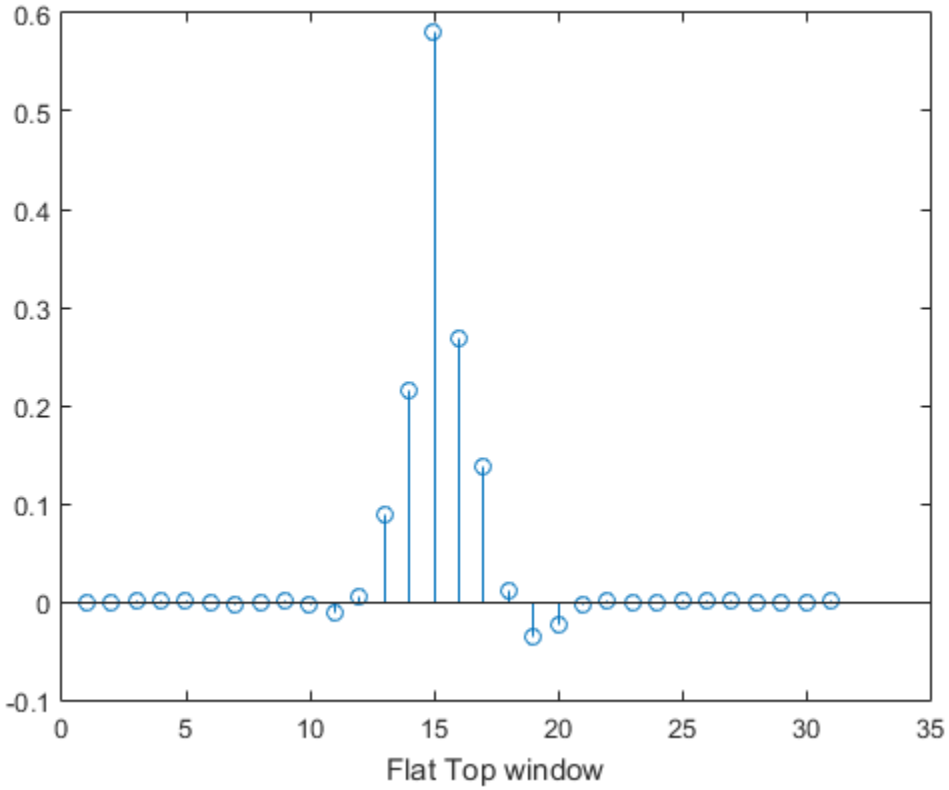
30
35
Hanning window


0.6
0.5
0.4
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0.2
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-0.1
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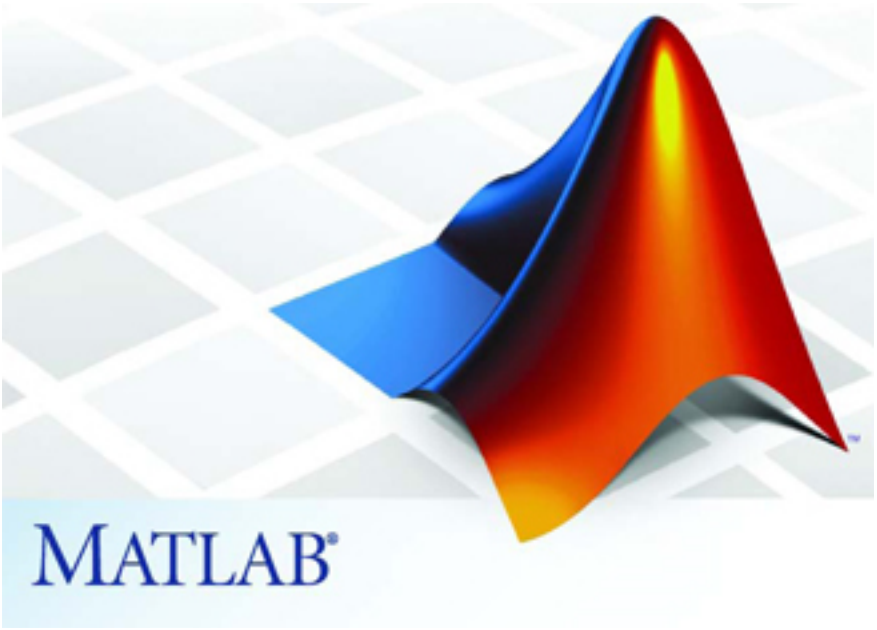
25
30
35
Flat Top window

Author: Kaustubh Shivdikar

MATLAB Lab experiment of Linear to circular convolution.



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