
Digital Signal Processing

MATLAB HW2 - q4

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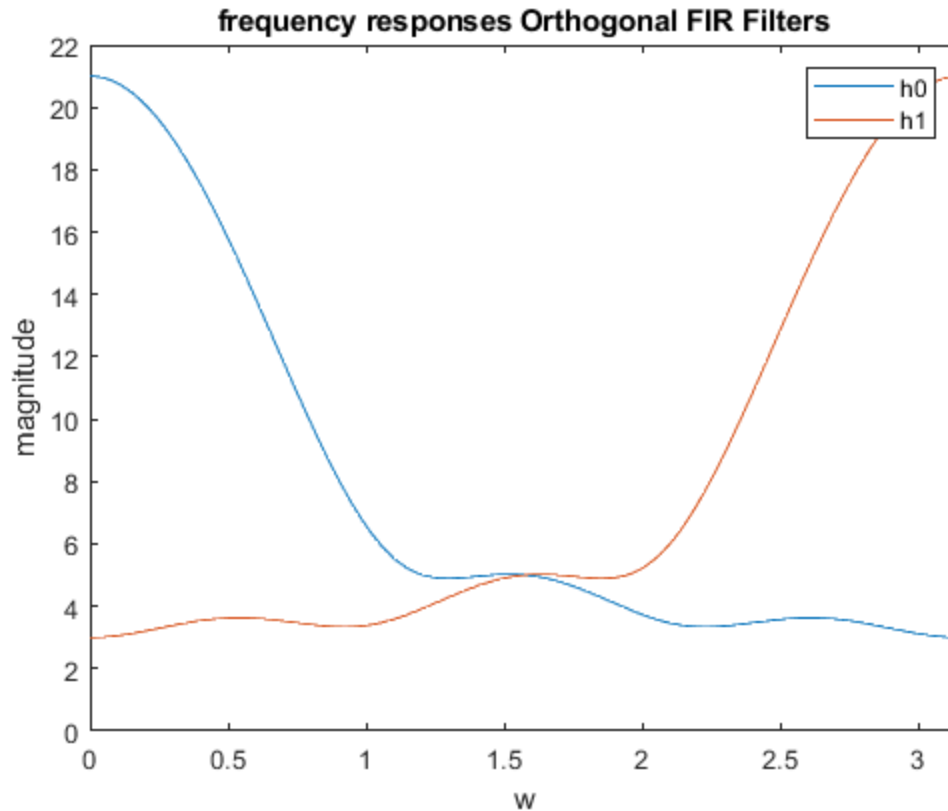
Clear recent data

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

Symmetries and Filter Types

a. Orthogonal FIR Filters

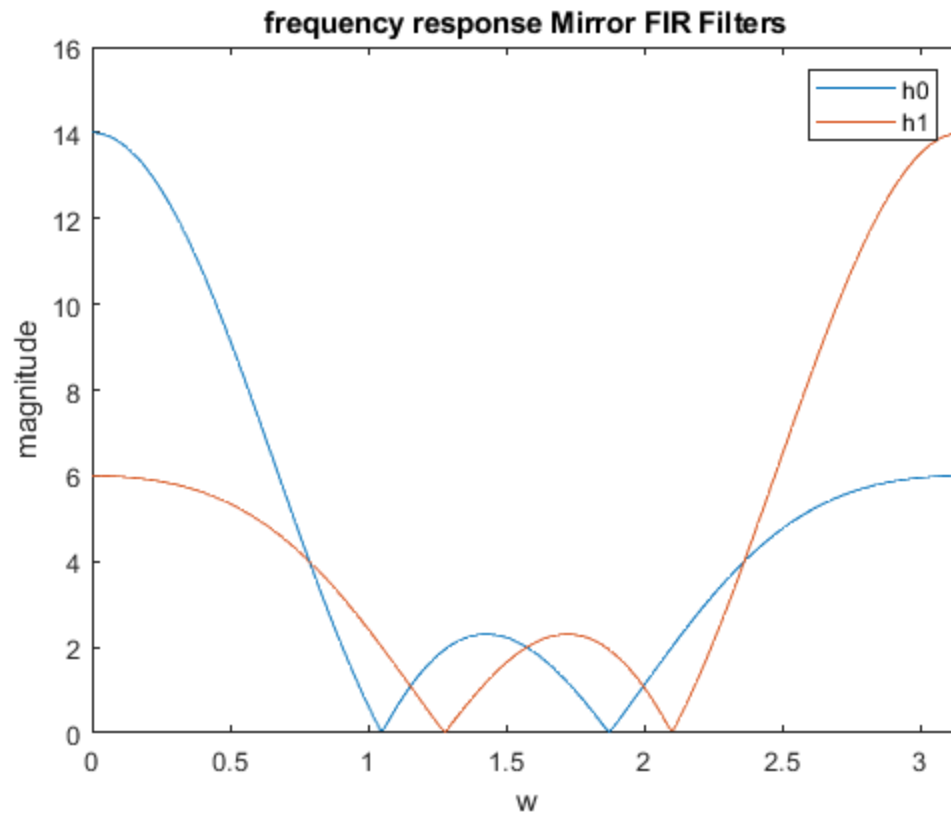
```
ho0=[1 2 3 4 5 6];           %original filter
ho1=[6 -5 4 -3 2 -1];        %orthogonal filter
w=0:(2*pi/511):pi;
H0o=fft(ho0,512);
H1o=fft(ho1,512);
figure(1);
plot(w,abs(H0o(1:256)));
hold on;
plot(w,abs(H1o(1:256)));
legend("h0", "h1");
axis([0 pi 0 22]);
title('frequency responses Orthogonal FIR Filters');
xlabel('w');
ylabel('magnitude');
```



c , d. Mirror FIR Filters

$$H_1(z) = H_0^*(z^*) \quad H_1(e^{j\omega}) = H_0^*(e^{-j\omega})$$

```
% d
h0m=[1 3 1 4 1 3 1]; %original filter
h1m=[1 -3 1 -4 1 -3 1]; %Mirror filter
wm=0:(2*pi/511):pi;
H0m=fft(h0m,512);
H1m=fft(h1m,512);
figure(2);
plot(wm,abs(H0m(1:256)));
hold on;
plot(wm,abs(H1m(1:256)));
legend("h0", "h1");
axis([0 pi 0 16]);
title('frequency response Mirror FIR Filters');
xlabel('w');
ylabel('magnitude');
```



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