

homework 3 Matlab

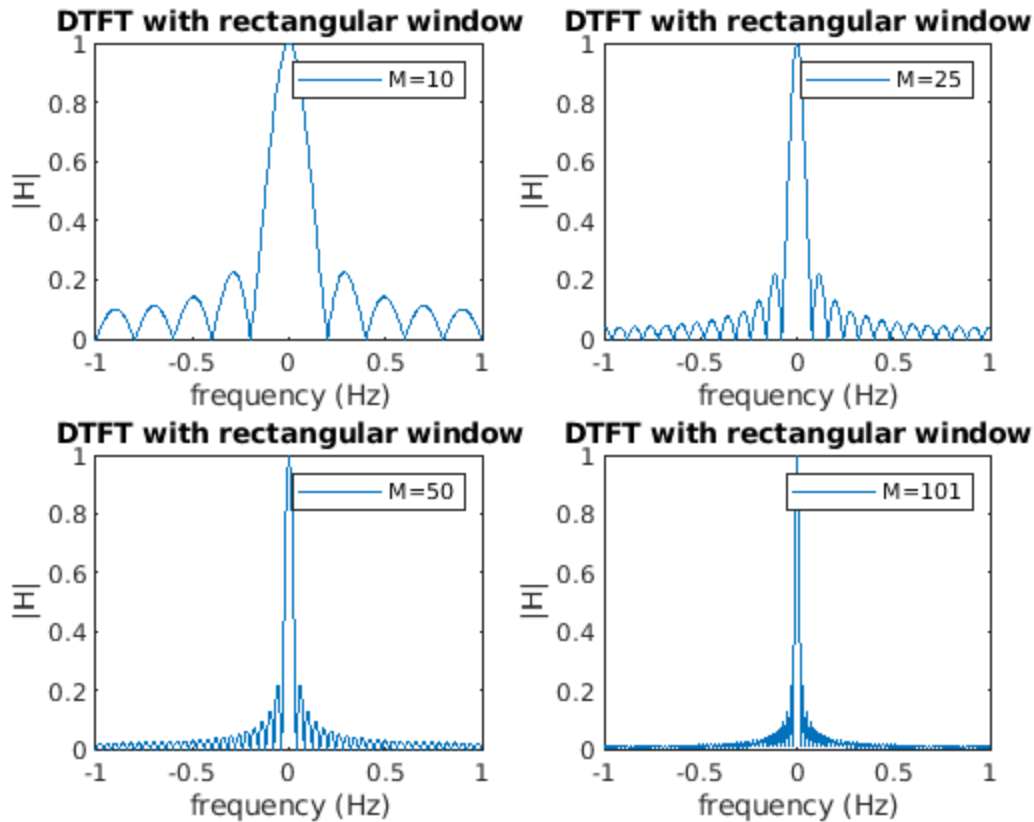
DTFT

```
function [X] = dtft(x,n,w)
% computes the discrete-time fourier transform
% X = dtft values computed at w frequencies
% n = sample position vector
% w = frequency location vector
    X = x * exp(-1j * n' * w);
end
```

Rectangular

```
i = 0;
for M = [10 25 50 101]
    n = 0:1:M-1;
    Rm = (n>=0) - (n>=M);
    w = linspace(-pi,pi,501);
    H = dtft(Rm,n,w);
    h_magnitude = abs(H)/max(abs(H));

    %    plots
    i = i + 1;
    subplot(2,2,i);
    plot(w/pi,h_magnitude);
    xlabel('frequency (Hz)');
    ylabel('|H|');
    title('DTFT with rectangular window');
    legend(sprintf('M=%d',M));
end
```



Hanning

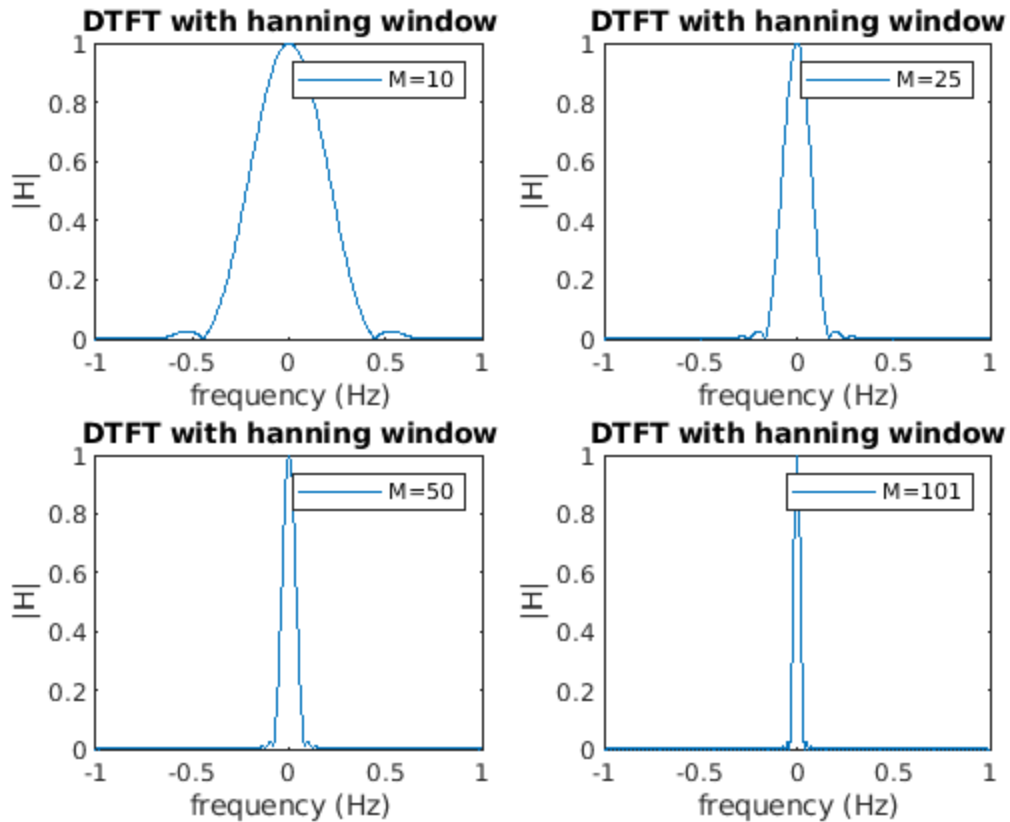
```
i = 0;
for M = [10 25 50 101]
    n = 0:1:M-1;
    Rm = (n>=0)-(n>=M);
    Cm = 0.5*(1-cos((2*pi*n)/(M-1))) .* Rm;
    w = linspace(-pi,pi,501);
    H = dtft(Cm,n,w);
    h_magnitude = abs(H)/max(abs(H));

    %    plots
    i = i + 1;
    subplot(2,2,i);
    plot(w/pi,h_magnitude);
    xlabel('frequency (Hz)');
    ylabel('|H|');
    title('DTFT with hanning window');
```

```

legend(sprintf('M=%d',M));
end

```



Triangle

```

i = 0;
for M = [10 25 50 101]
    n = 0:1:M-1;
    Rm = (n >= 0) - (n >= M);
    Tm = (1 - (abs(M-1-2*n)/(M-1))) .* Rm;
    w = linspace(-pi,pi,501);
    H = dtft(Tm,n,w);
    h_magnitude = abs(H)/max(abs(H));

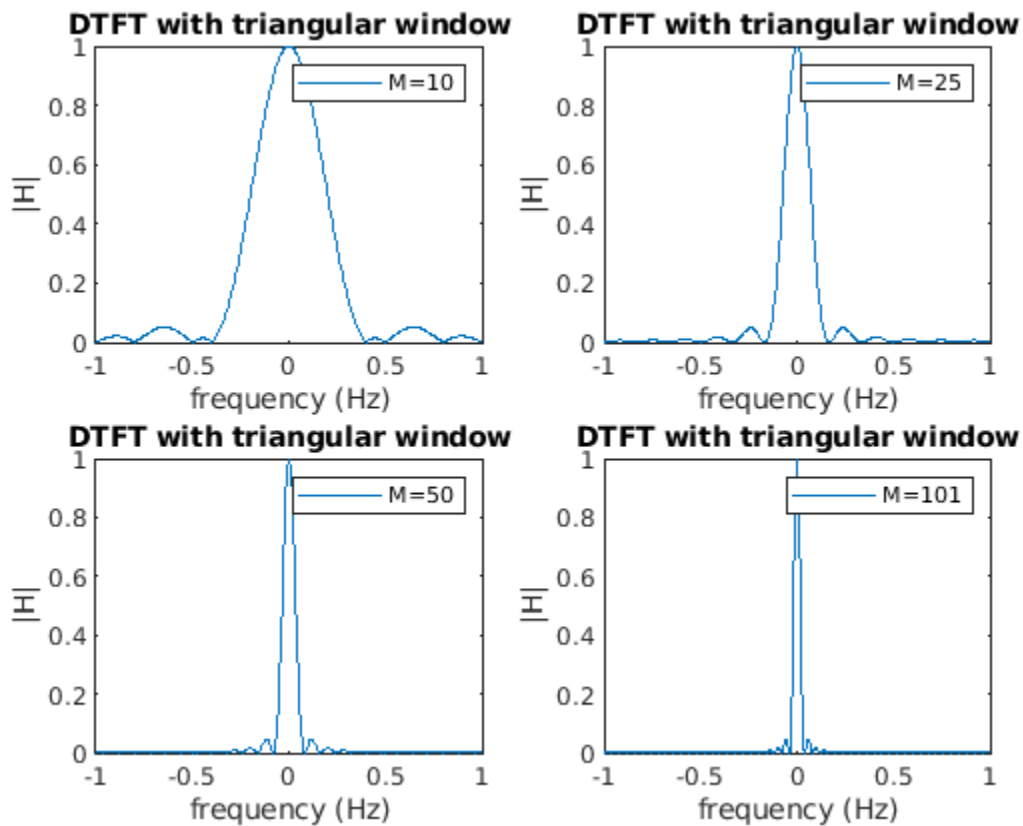
    % plots
    i = i + 1;
    subplot(2,2,i);
    plot(w/pi,h_magnitude);
    xlabel('frequency (Hz)');
    ylabel('|H|');
end

```

```

title('DTFT with triangular window');
legend(sprintf('M=%d',M));
end

```



Hamming

```

i = 0;
for M = [10 25 50 101]
    n = 0:1:M-1;
    Rm = (n >= 0) - (n >= M);
    Hm = (0.54 - 0.46 * cos((2*pi*n)/(M-1))) .* Rm;
    w = linspace(-pi,pi,501);
    H = dtft(Hm,n,w);
    h_magnitude = abs(H)/max(abs(H));

    %    plots
    i = i + 1;
    subplot(2,2,i);
    plot(w/pi,h_magnitude);
    xlabel('frequency (Hz)');
end

```

```

ylabel('|H|');
title('DTFT with Hamming window');
legend(sprintf('M=%d',M));
end

```

