
Table of Contents

ECE 3770 - Lab 7 - Nyquist	1
Part 1 -- Sampled Data	1
Part 2 -- Finding the Aliased Frequency	2
Part 3 -- Superimpose Original Signal	3

ECE 3770 - Lab 7 - Nyquist

G.Davis

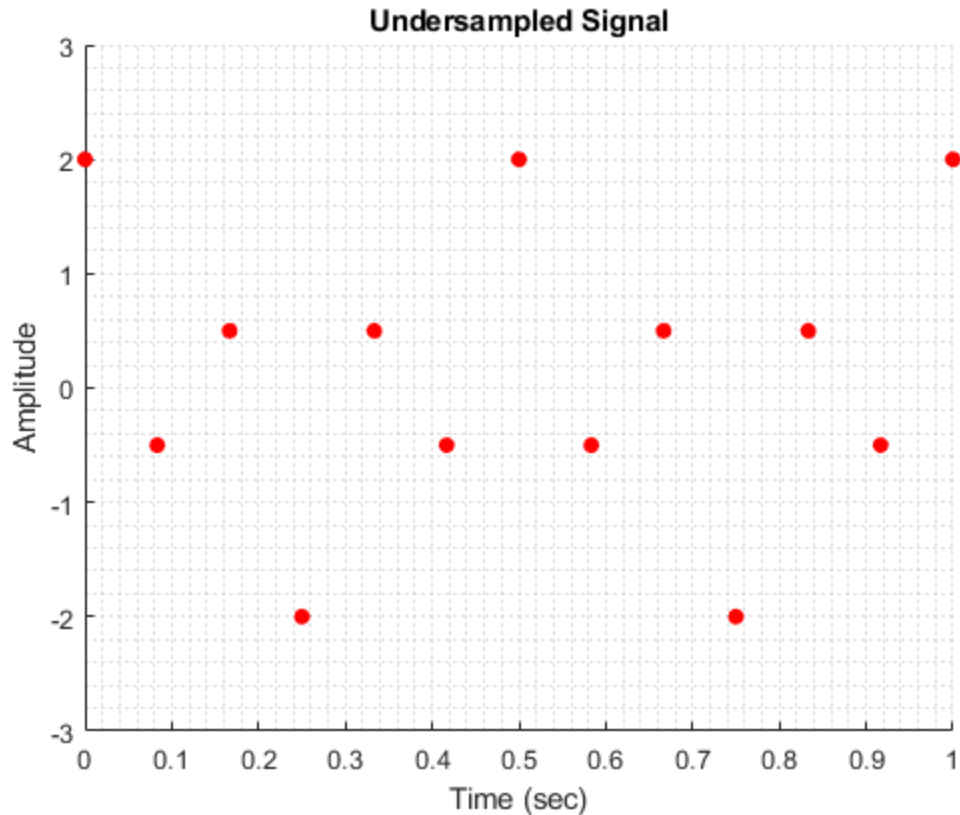
4/7/21

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

Part 1 -- Sampled Data

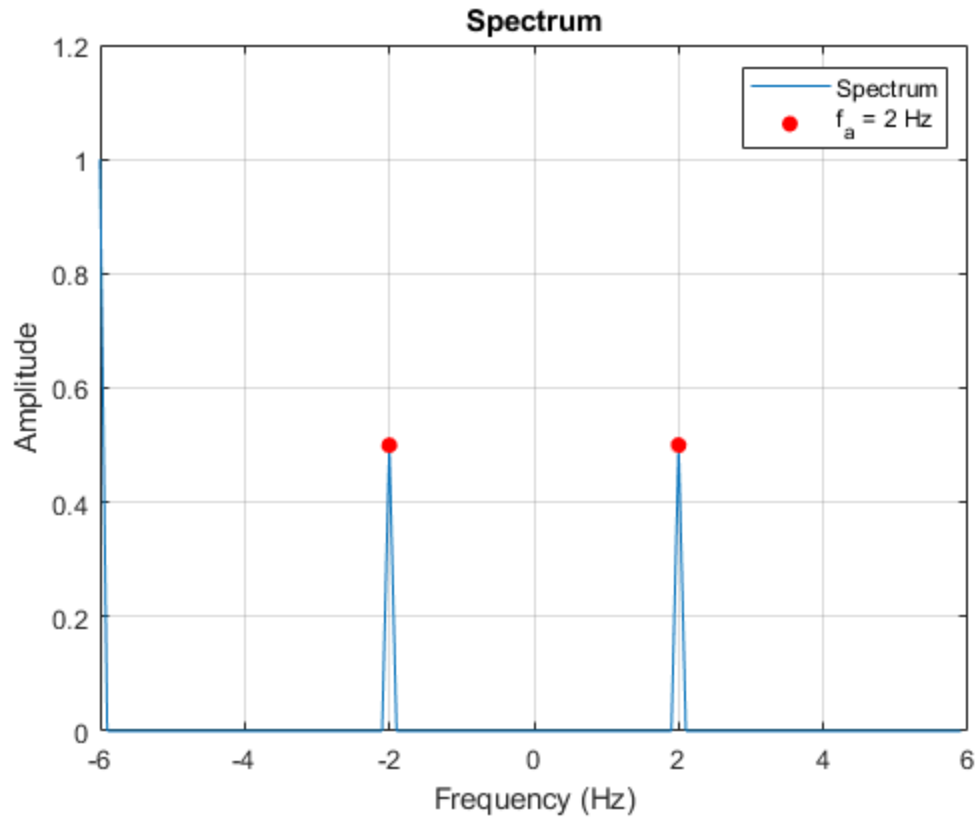
```
load('sampled.mat');

figure(1)
scatter(t, x1,'filled','r'); grid minor
title("Undersampled Signal")
xlabel("Time (sec)")
ylabel("Amplitude")
xlim([0 1])
ylim([-3 3])
```



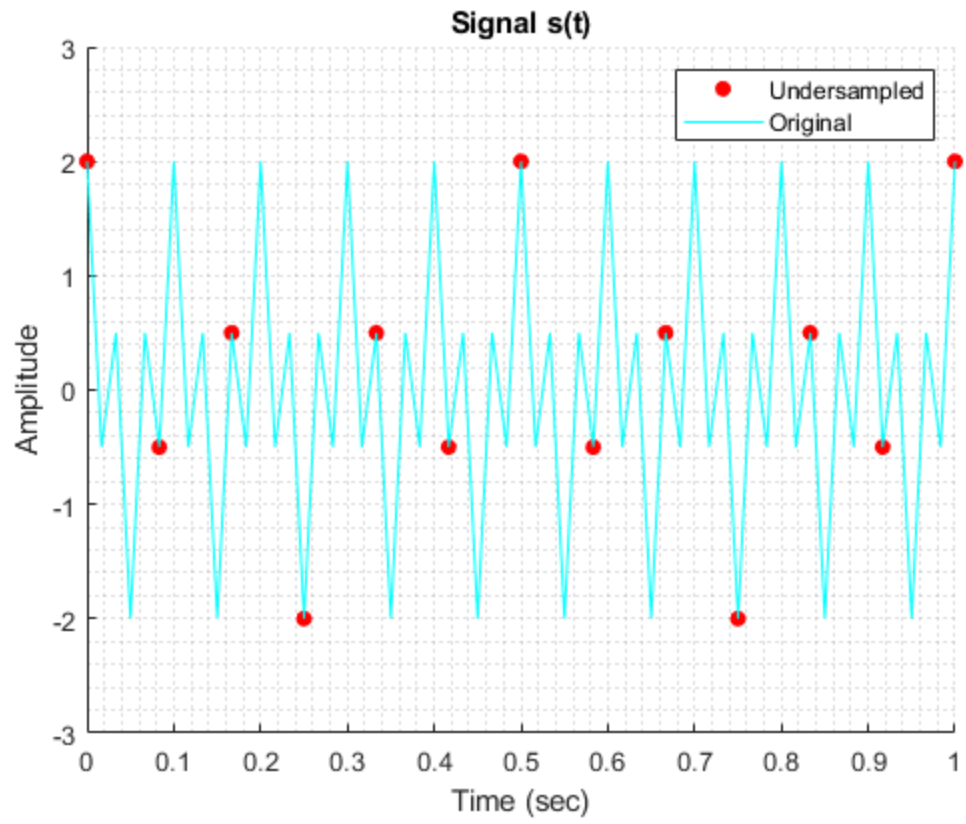
Part 2 -- Finding the Aliased Frequency

```
fs = 1 / ( t(2) - t(1) );  
G = fft(x1);  
n = length(G);  
G = fftshift(G);  
G = G./n;  
GM = abs(G);  
  
df = fs/n;  
F = fs/2;  
f = -F:df:F-df;  
  
figure(2)  
plot(f, GM); grid on  
hold on  
scatter([-2 2],[0.5 0.5], 'filled', 'r')  
hold off  
title("Spectrum")  
ylabel("Amplitude")  
xlabel("Frequency (Hz)")  
legend("Spectrum", "f_a = 2 Hz")  
% Plot shows fa = 2 Hz  
% fa = |f - Nfs|, 2 = |f - 1*12|, f = 10 Hz
```



Part 3 -- Superimpose Original Signal

```
figure(3)
scatter(t, x1, 'filled', 'r')
hold on
t = 0:1/60:3; % f = 60 Hz = 2*30 (fmax)
s = cos(2*pi*10*t) + cos(2*pi*30*t);
plot(t, s, 'c'); grid minor
hold off
title("Signal s(t)")
ylabel("Amplitude")
xlabel("Time (sec)")
xlim([0 1])
ylim([-3 3])
legend("Undersampled", "Original")
```



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