M E 345

Today, we will:

- Do some review example problems digital data acquisition and aliasing
- Review the pdf module: Signal Reconstruction, and do an example problem
- Discuss the pdf module: Spectral Analysis and Fourier Series, and begin to discuss the Fast Fourier Transform.

Example: Digital data acquisition

Given: Consider each of the following scenarios, with signal frequency f and digital sampling frequency f_s .

To do: In each case, determine if there is aliasing, and calculate the *perceived* frequency inferred from the acquired data.

Note: The general formula for perceived frequency is $f_{\text{perceived}} = \left| f - f_s \cdot \text{NINT} \left(\frac{f}{f_s} \right) \right|$

	f(Hz)	<i>f</i> _s (Hz)	Aliasing? (Yes or No)	f _{perceived} (Hz)
(a)	600	2000		
(b)	70	90		
(c)	700	700		
(d)	80	70		
(e)	600	320		
(f)	380	250		

Example: Digital data acquisition

Given: A voltage signal from a segment of music contains frequency components at 150, 350, and 700 Hz. It also contains some electronic noise at 60 Hz. We sample the data digitally at a sampling frequency of 400 Hz.

To do: Is there any aliasing? If so, what frequencies will we see (perceive)?

Solution:

Example: Fourier analysis

Given: A voltage signal is of the form: $f(t) = 5.20 + 1.50 \sin(18.0\pi t)$.

(*a*) To do: Calculate the fundamental frequency in Hz and the fundamental period in s. Solution:

(b) To do: Calculate the Fourier coefficients.

Solution:

