EE382 Communication Systems I

Lab Assignment†

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This Final lab assignment is in regard to sampling theorem. We want to observe the time and frequency domain behaviors caused by the sampling in frequency and time domain respectively. Again, Fig. 1 is the illustration of the Fourier Transform pair in regard to a Rectangular pulse in the time domain and a Sinc function in the frequency domain.

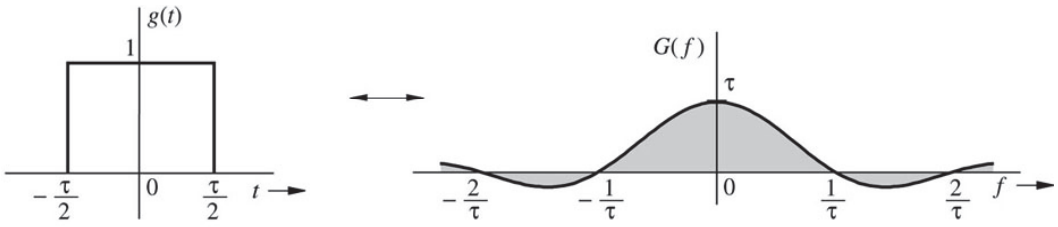

Fig. 1: Fourier Transform pair: Rectangular pulse and Sinc function

(1) **[Frequency domain sampling]** Let us set τ to be 10, i.e., $\tau = 10$. Plot the frequency domain samples and their inverse Fourier transform in the time domain for the following sampling periods, $\Delta f = f_S$, in frequency domain: $f_S = \frac{1}{4\tau}$, $f_S = \frac{1}{2\tau}$, and $f_S = \frac{1}{\tau}$. What is your interesting observations? Pleaes describe them.

(2) **[Time domain sampling]** Starting at $t = -\frac{\tau}{2}$, perform sampling the rectangular with the following sampling periods, $\Delta T = T_S$, in the time domain: $T_S = \tau$, $T_S = \frac{\tau}{2}$, and $T_S = \frac{\tau}{4}$. Plot corresponding three plots of samples in the time domain.
Also, draw three plots of the associated Fourier transform in the frequency domain. Please describe interesting observations.

(3) Describe your observations, unexpected symptoms and reasons for them if exist.