"Natural Sampling"

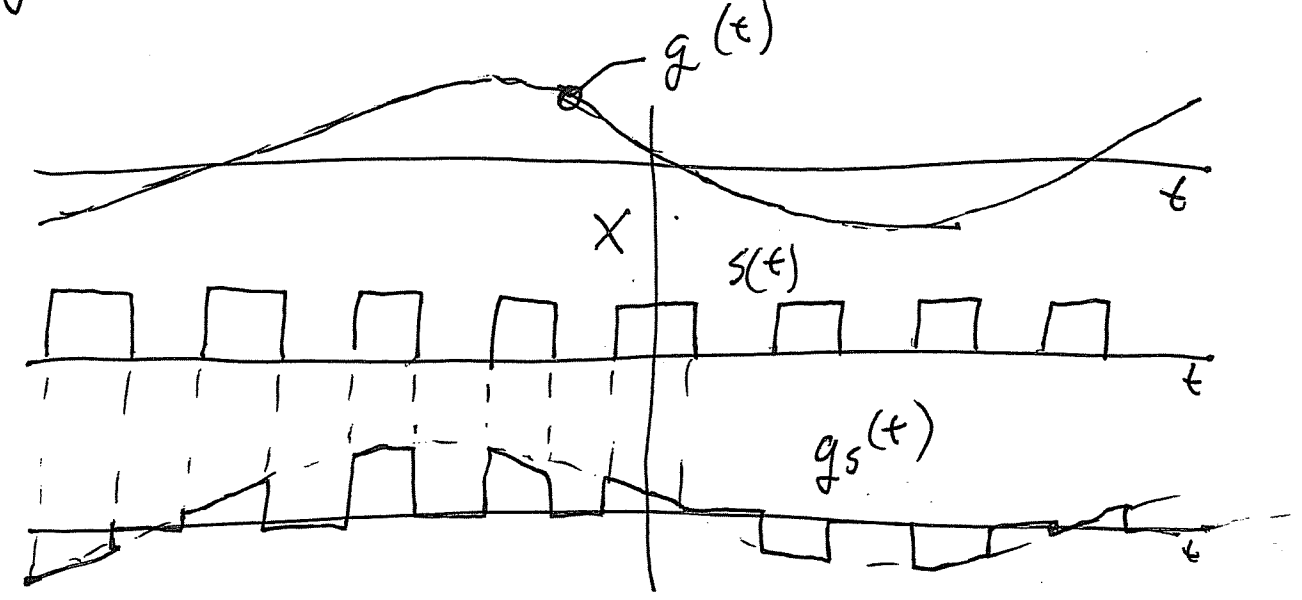
Instead of multiplying by an impulse train, we multiply by a square wave $s(t)$.

$$g_s(t) = g(t)\, s(t)$$

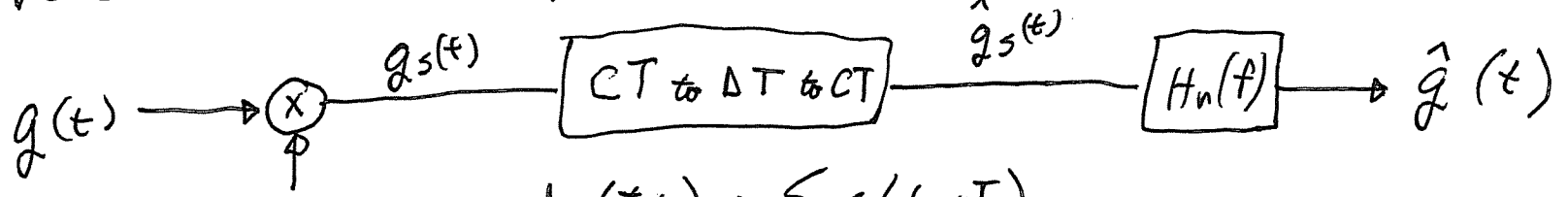
where $$s(t) = \text{rect}\left(t/\tau\right) * \sum_n \delta(t - nT)$$

so $$g_s(t) = g(t)\left(\text{rect}(t/\tau) * \sum_n \delta(t - nT)\right)$$

Ex:



~~Reconstruction~~ Spectrum



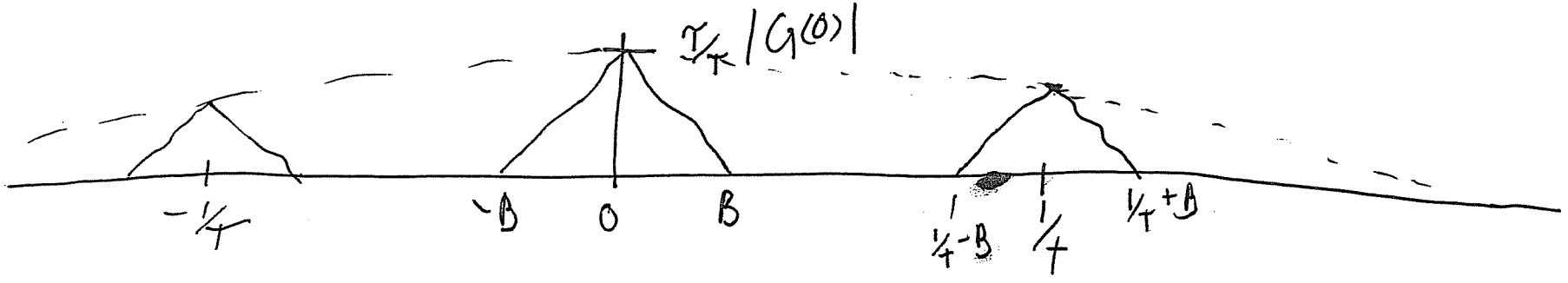
The FT of $g_s(t)$ is

$$G_s(f) = G(f) * \left(\frac{\tau}{T} Sa(\pi f \tau) \sum_k \delta(f - k/T) \right)$$

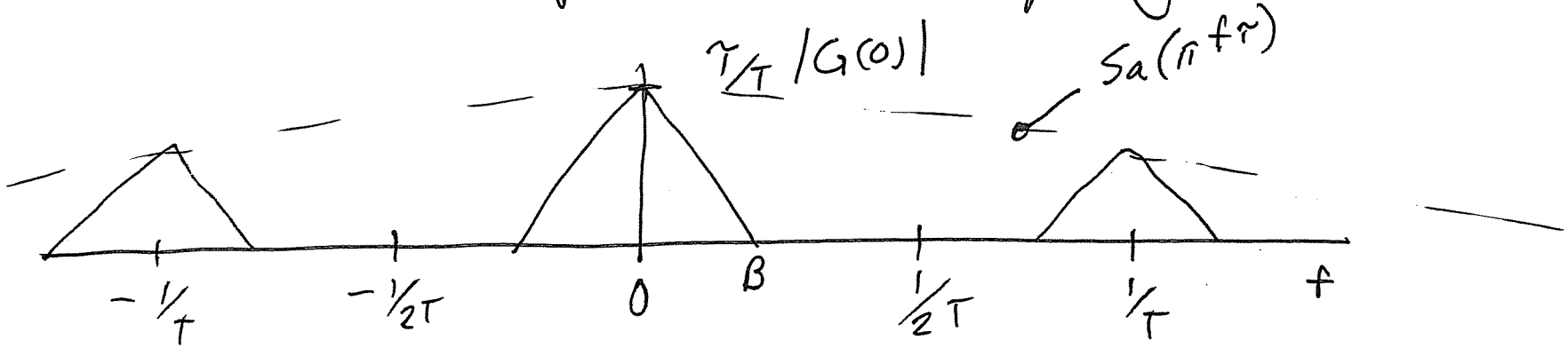
where $Sa(\pi f \tau) = \frac{\sin \pi f \tau}{\pi f \tau} = \text{sinc}(f\tau)$

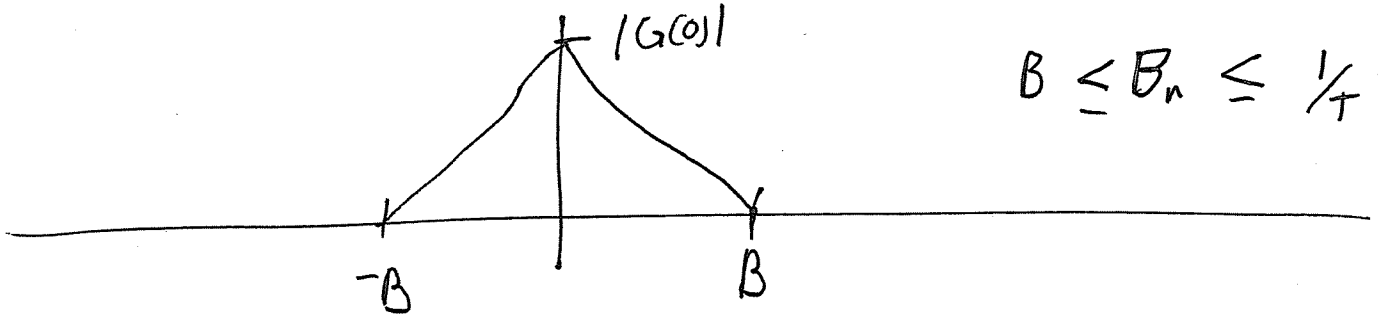
$$G_1(s) = G(f) * \left(\tau/T \sum_k Sa\left(\pi \frac{k\tau}{T}\right) \delta(f - k/T) \right)$$

$$= \frac{\tau}{T} \sum_k Sa\left(\pi \frac{k\tau}{T}\right) G(f - k/T)$$



Reconstruction of Natural sampling





$$B \leq B_r \leq \frac{1}{T} - B$$