Recap

Quadrature sampling of band-pass signals

Topics for this session

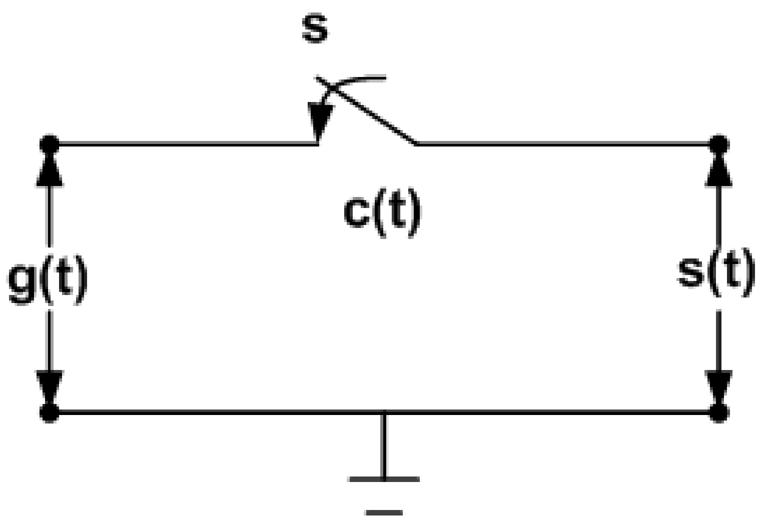
Practical aspects of sampling

Practical sampling methods

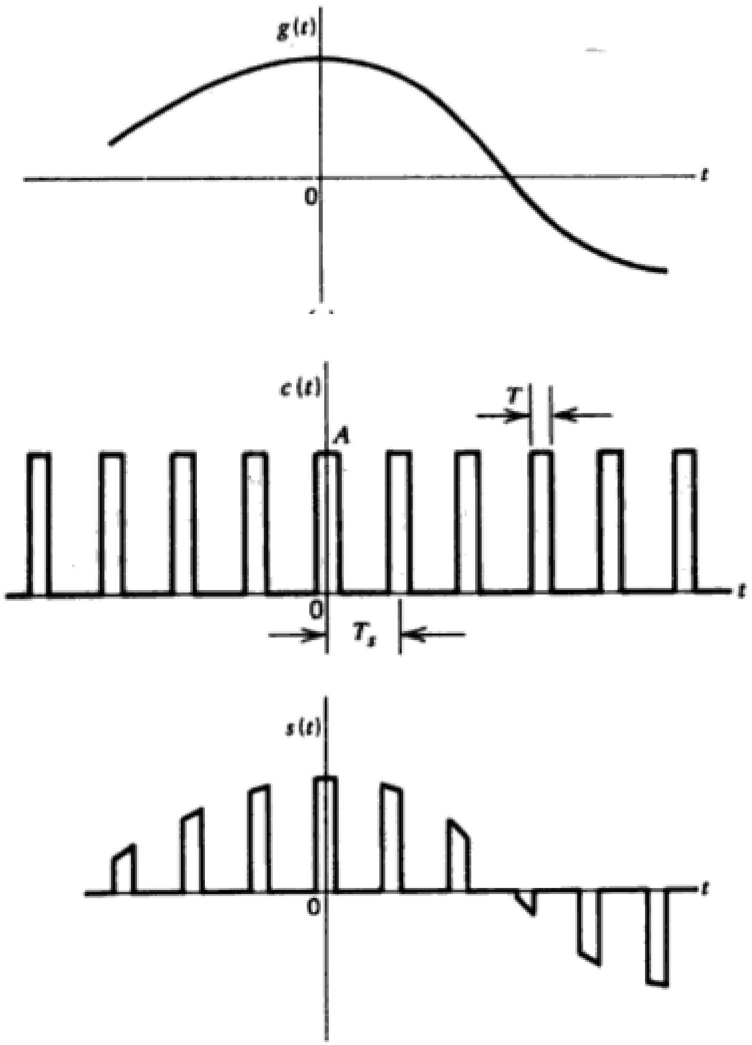
- ***Natural* sampling**

  Using samples of finite duration
- ***Flat-top sampling***

•*Natural* sampling



Natural Sampling



Analog signal

Rectangular-pulse train

Sampled signal

Natural sampling

$$s(t) = g(t)c(t)$$

Fourier series of c(t)

$$c(t) = \sum_{n=-\infty}^{\infty} C_n \, e^{jnw_0 t} ; w_0 = \frac{2\pi}{T_s}$$

$$C_n = \frac{1}{T_s} \int_{\frac{-T}{2}}^{\frac{T}{2}} A e^{-jnw_0 t} \, dt;$$

$$C_n = ATf_s \frac{\sin\left(\frac{n\pi T}{T_s}\right)}{T \frac{n\pi}{T_s}}$$

Natural sampling

$$C_n = ATf_s \sin c(nf_sT)$$

$$c(t) = ATf_s \sum_{n=-\infty}^{\infty} \sin c(nf_sT)\, e^{j2\pi nf_st}$$

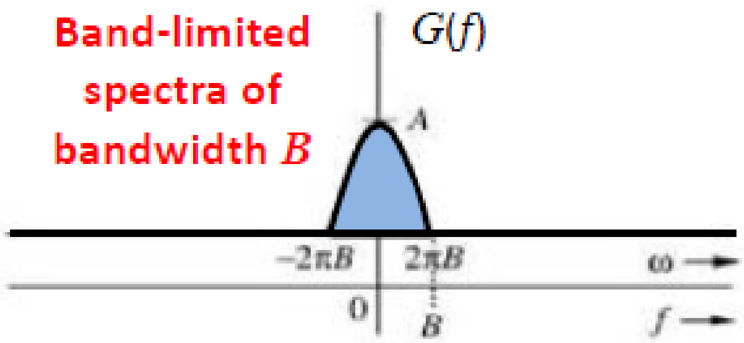
$$s(t) = ATf_s \sum_{n=-\infty}^{\infty} \sin c(nf_sT)\, e^{j2\pi nf_st}\, g(t)$$

Fourier Transform of s(t)

$$S(f) = ATf_s \sum_{m=-\infty}^{\infty} \sin c(mf_sT) G(f - mf_s)$$

Natural Sampling

Band-limited spectra of bandwidth B



envelope of $G(f)$ is the sinc function.

At f = 0 the amplitude is A/T_s