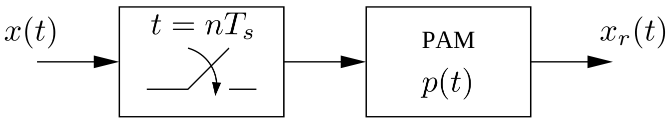
SAMPLINGSTEOREMET

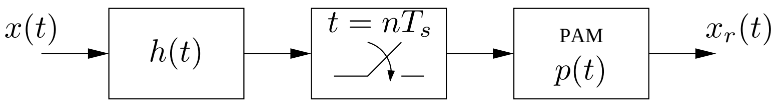


Om:

- $x(t)$ bandbegränsad: $X(f) = 0$, $|f| \geq B$
- Nyquistkriteriet: $f_s = \frac{1}{T_s} > 2B$
- $P(f) = \begin{cases} T_s & |f| \leq f_s/2 \\ 0 & \text{f.ö.} \end{cases}$

så fås perfekt rekonstruktion: $x_r(t) = x(t)$.

ANTIVIKNINGSFILTER



Om signalen inte uppfyller Nyquistkriteriet, lägg till antivikningsfilter före samplingen.

Idealt antivikningsfilter:

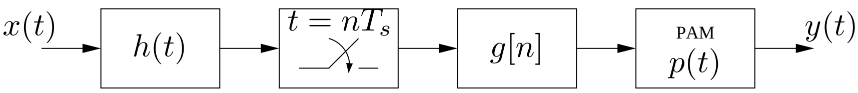
$$H(f) = \begin{cases} 1 & |f| \leq f_s/2 \\ 0 & \text{f.ö.} \end{cases}$$

Samma $p(t)$ som samplingsteoremet

$$\Longrightarrow$$

$$X_r(f) = \begin{cases} X(f) & |f| \leq f_s/2 \\ 0 & \text{f.ö.} \end{cases}$$

ANALOG SIGNAL GENOM DIGITALT FILTER



Allmänt:

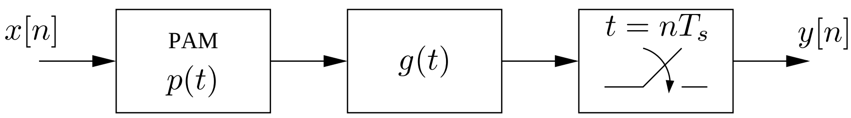
$$Y(f) = f_s P(f) G\Big(\frac{f}{f_s}\Big) \sum_{k=-\infty}^{\infty} H(f - kf_s) X(f - kf_s)$$

Med idealt antivikningsfilter och PAM:

$$H(f) = \begin{cases} 1 & |f| \le f_s/2 \\ 0 & \text{f.ö.} \end{cases}, \qquad P(f) = \begin{cases} T_s & |f| \le f_s/2 \\ 0 & \text{f.ö.} \end{cases}$$

$$Y(f) = H(f) G\Big(\frac{f}{f_s}\Big) X(f) = \begin{cases} G\Big(\frac{f}{f_s}\Big) X(f) & |f| \le f_s/2 \\ 0 & \text{f.ö.} \end{cases}$$

DIGITAL SIGNAL GENOM ANALOGT FILTER



Allmänt: $Y(\nu) = H(\nu) X(\nu)$, där

$$H(\nu) = f_s \sum_{k=-\infty}^{\infty} G\big((\nu - k) f_s\big) \, P\big((\nu - k) f_s\big)$$

Med $p(t)$ från samplingsteoremet:

$$H(\nu) = \begin{cases} G(\nu f_s) & |\nu| \le 1/2 \\ \text{periodisk upprepning} & \text{f.ö.} \end{cases}$$