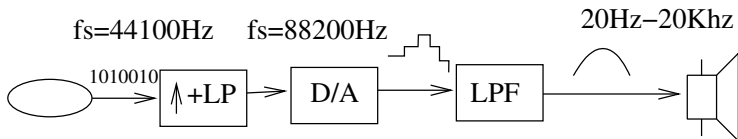
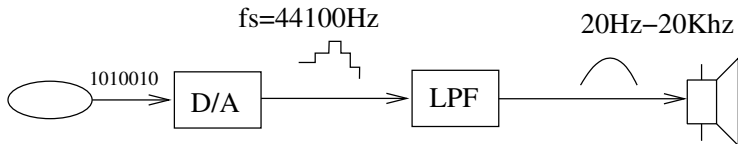


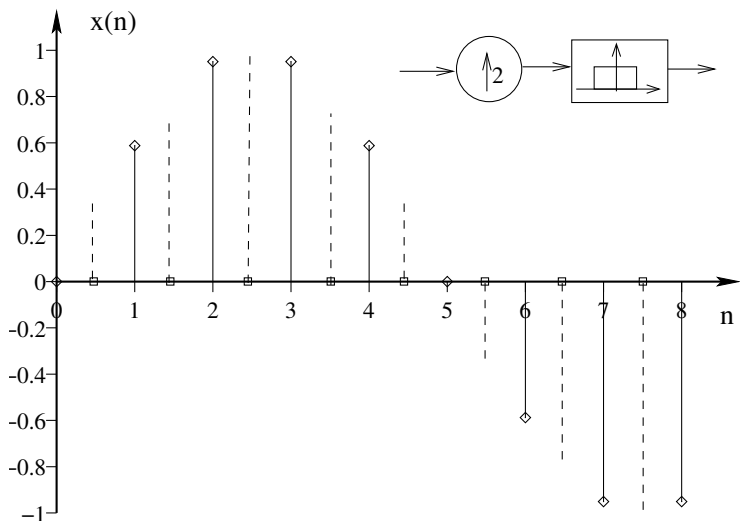
EDISP: Advanced Techniques

Jacek Misiurewicz

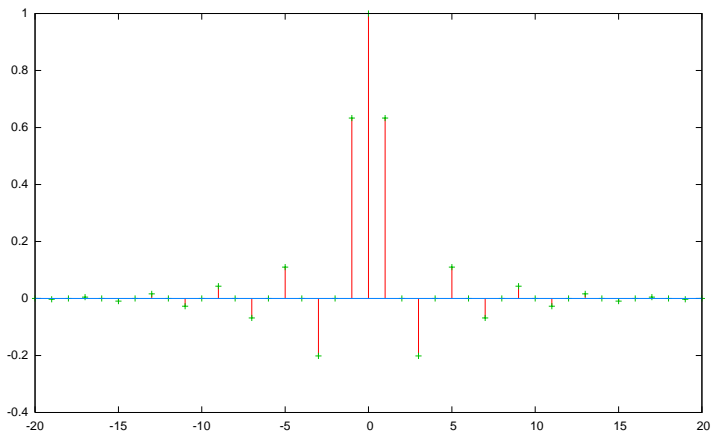
January 28, 2015

- ▶ CD sampling frequency: 44100 Hz
- ▶ Nyquist limit: 22050 Hz
- ▶ Hi-Fi audio: up to 20000 Hz
- ▶ → Analog reconstruction filter problem





- ▶ Adding points (*upsampling*)
- ▶ Finding values (*interpolation*) – LP filtering

Interpolating filter ($\theta_b = \pi/2$)

Note *zero* coefficients at even n positions!

Do it with FFT

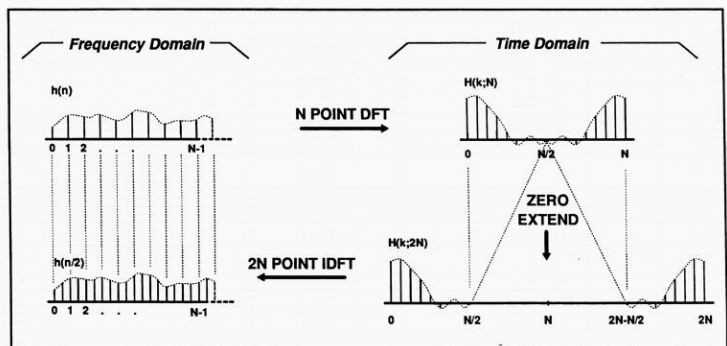
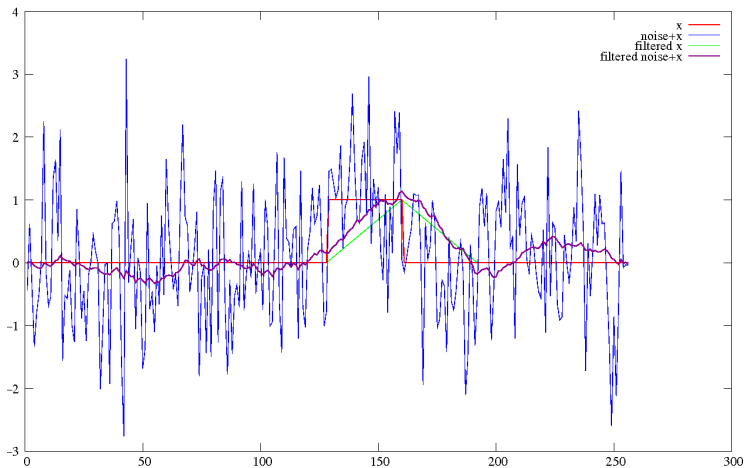
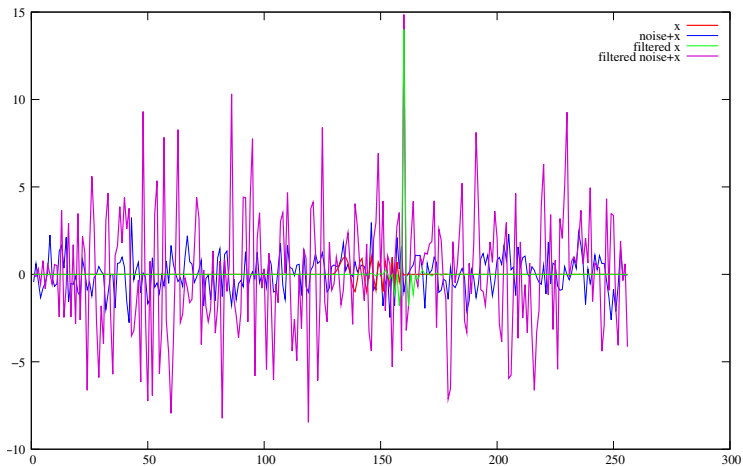


Figure 1. Band-Limited Interpolation with Zero-Extended Spectra

Matched filter - square impulse



Matched filter - LMF impulse



Other advanced subjects

- ▶ Weak signal detection w/MF
- ▶ Pulse compression w/MF
- ▶ Adaptive filters