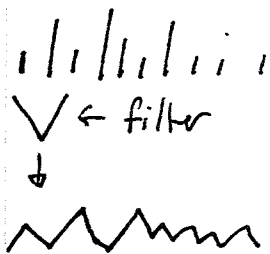


Review of Signal Processing Filters and Filter Quality Resampling

Signal / Image \Rightarrow Frequency Domain
"High Frequencies"
Band Limits
Low Pass Filter \Leftrightarrow Blur
Samples = Spike Chain
Ideal / Real Reconstruction

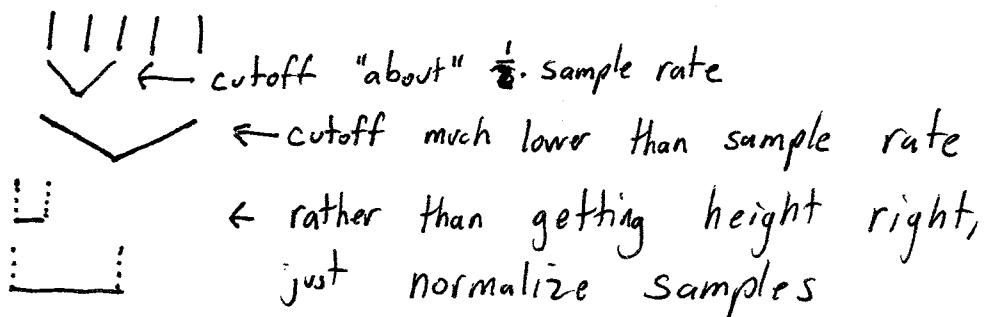


Filter Properties:

Cutoff Frequency

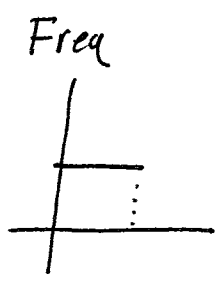
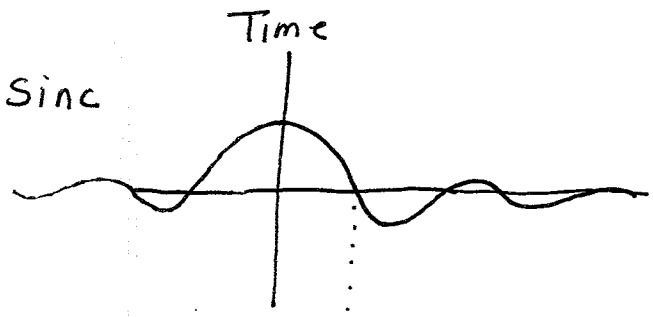
lower cutoff = wider filter

Width / Cutoff vs. Extent

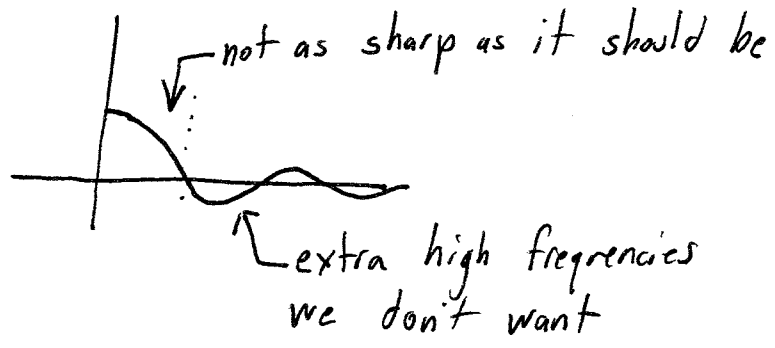
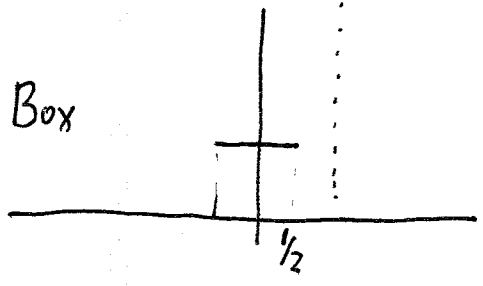


11-7

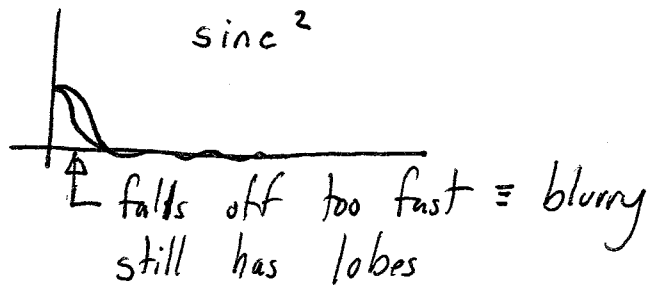
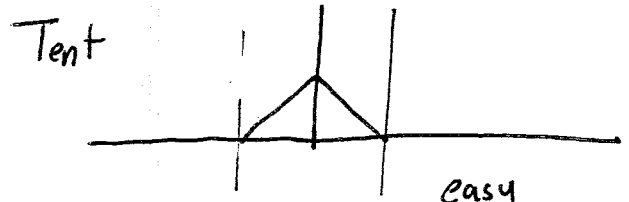
Some Filters



Ideal LPF
Rings

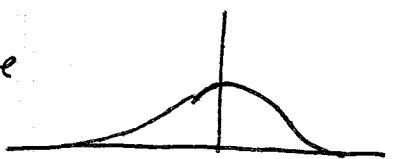


easy!
no ringing!



easy
no ringing
 $\mathcal{L}(1)$

B-Spline



sinc^n

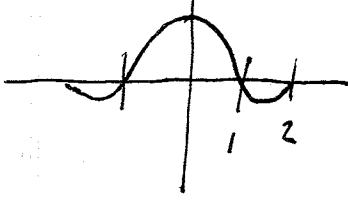


Gaussian

always positive
blurs increasingly
convolutions of unit box
stops interpolating after 1

11-7

Interpolating Filters -
ring (if > 1)



cubic spline - catmull rom
much sharper
ringing

Mitchell Netravali

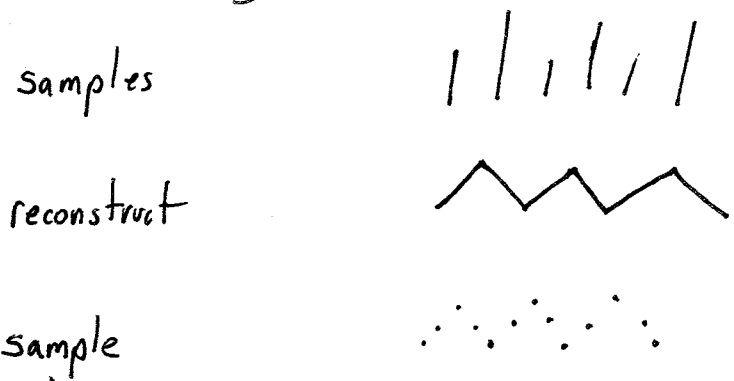
Blend B-Spline w/ CR

balance sharpness w/ ringing

Sometimes use wider filters to be conservative

11-7

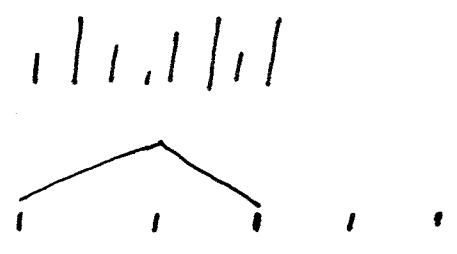
Resampling



← we know the band limit!

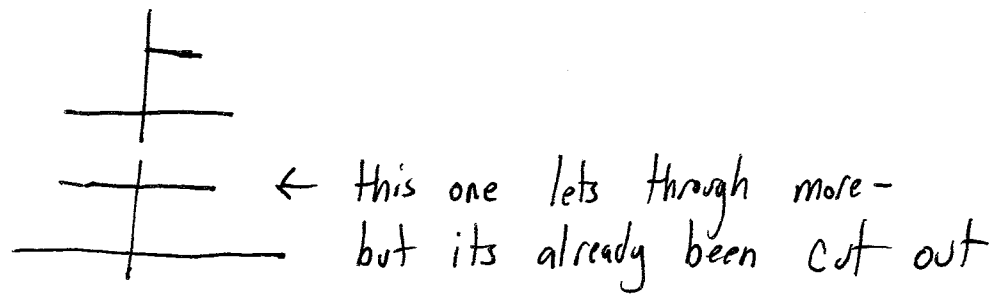
if the band limit is OK for sampling rate we're OK

if the band limit is not OK need to prefilter



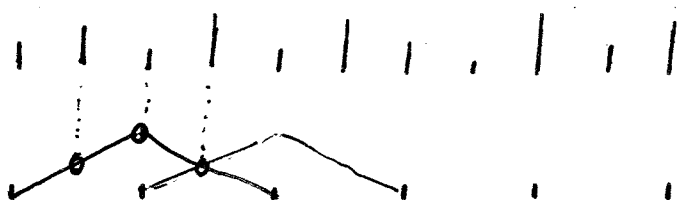
← filter width based on target samples -
→ same sampling rate issues

Ideal Case : Lower filter dominates

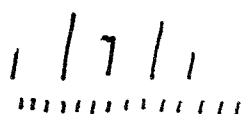
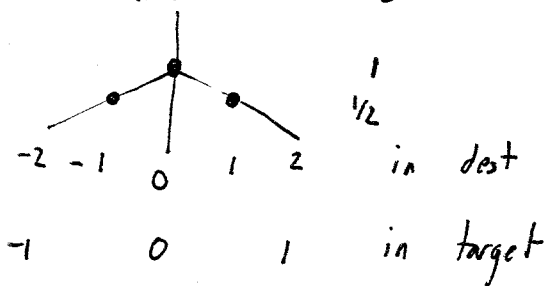


11-7

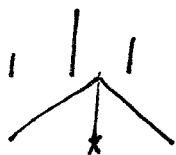
Resampling in practice - we only evaluate convolution @ samples



sample filter kernel @ appropriate places
renormalize so it adds to 1!



← pick source, not target filter



~~In practice up sampling use sharper filters~~