Reconstruction Theory

1. Make a signal w/ spikes
   LPF to get signal w/o HF
   \[ \text{\ldots} \]

2. In practice
   \[ \text{\ldots} \]
   \[ \text{\ldots} \]
   or \[ \text{\ldots} \]

Resampling - only evaluate this at particular places

Upscaling
- by factor of 3
  - pixel replication
  \[ \text{\ldots} \]
  - connect dots
  \[ \text{\ldots} \]

What about pre-filtering?
- already band-limited by reconstruction?

Interpolating vs. approximating reconstruction
- simple @ sample \( \Rightarrow \) guess value
Reconstruction Kernels

- blocky
- lerp = soft
- cubic spline = windowed sinc

2D Convolutions

Separability

Resampling

image has \( N \) samples want \( M \)

\[
\text{reconstruct} \quad (\text{f} \ast \text{f}) \quad (\text{filter}) \quad \text{sample}
\]

\[
\text{pre-filter}
\]

Do p 23

Work through an example

Edge Cases
Fourier

\[ \text{simplification} \]

Intuitions: HF (square wave)

remove HF = soften hard edges

Spike Chain \[ \text{LLLL} \rightarrow \text{LLLL} \]

Nyquist Shannon

Sample at \( \frac{1}{2} \) period

- ambiguous

Sample at less than \( \frac{1}{2} \) period

- OK

Goto 012

Show:

reconstruction = practice

pixel replication (box is a bad filter)

pixel