Day 5

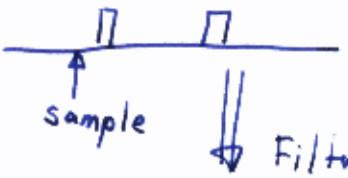
Java Impressionist Demo

Today: Re-Sampling in Practice
Image Warping
Quantization - Trading Value for Position

Re-Cap

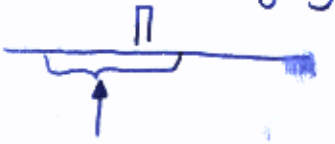
Small Details get missed when sampled
⇒ Nyquist limit no high frequencies
Filter out HF

Event



lose detail, but not lose altogether

Same as weighted averaging over region



this is what convolution does

Convolution precomputes the weighted average for all places in time

Discrete Convolution

⊛ ⇒ show process

Weighted Averaging
Zero centering (signal getting bigger)

2D version

Area Sampling vs. Pre-Filtering and Point Sampling.

Image WARPING

$x, y = x', y'$

Forward

For Each x, y

$x', y' = F(x, y)$ ~~← Sam~~

$I_2(x', y') = I_1(x, y)$ sample + reconstruct

Holes? Overlaps? ~~easy element~~ hard reconst ← easy sample

Splat

REVERSE

FOR EACH x', y' ← need inverse

$x, y = F^{-1}(x', y')$

$I_2(x', y') = I_1(x, y)$

$I_2(x', y')$: easy reconstruct

$I_1(x, y)$: sample

Effects w/ CONVOLUTION

No change in Geometry

Change Geometry

Lecture 4 - Color and Quantization

Schedule - intertwined nature of topics

Quantization

Halftoning / Dithering

Color Basics

Shift

Digital Representation of continuous functions

1d $f(t)$ 

2d $f(x,y)$

signal processing

2 issues: time is discrete (sampling)

values are discrete (quantization) ↔ trade-off

Quantization Error 

Today: spatial resolution for brightness resolution

Perception -

can't see really small things

percieved brightness or color is area thing

1/60° of a degree (visual acuity) over 150° horizontal

How to use this -

Basic halftone - each pixel has own area

Dithering - each pixel shares area

Gray example:

Note some pixels get different value than others with same "noise"