Antialiasing II
Week 11, Wed Mar 31

Review: Supersample and Average
- supersample: jaggies less obvious, but still there
  - small pixel center check still misses information
  - unweighted area sampling
    - equal areas cause equal intensity, regardless of distance from pixel center to area
    - aka box filter

Sampling Frequency
- if don't sample often enough, resulting signal misinterpreted as lower-frequency one
  - we call this aliasing

Image As Signal
- image as spatial signal
- 2D raster image
  - discrete sampling of 2D spatial signal
- 1D slice of raster image
  - discrete sampling of 1D spatial signal

Sampling Theorem
continuous signal can be completely recovered from its samples
iff
  - sampling rate greater than twice maximum frequency present in signal

Nyquist Rate
- lower bound on sampling rate
  - twice the highest frequency component in the image's spectrum

Filtering
- low pass
  - blur
- high pass
  - edge finding

Low-Pass Filtering
- low pass filtering
  - remove high frequency function parts
  - aka prefiltering, band-limiting

Supersample and Average
- supersample: create image at higher resolution
  - e.g. 768x768 instead of 256x256
  - shade pixels with area covered by thick line/rectangle
  - average across many pixels
    - e.g. 3x3 small pixel block to find value for 1 big pixel
    - rough approximation divides each pixel into a finer grid of pixels

Weighted Area Sampling
- intuitively, pixel cut through the center should be more heavily weighted than one cut along corner
- weighting function, W(x,y)
  - specifies the contribution of primitive passing through the point (x, y) from pixel center
  - Gaussian filter (or approximation) commonly used

Aliasing
- incorrect appearance of high frequencies as low frequencies
  - to avoid: antialiasing
    - supersample
    - sample at higher frequency
    - low pass filtering
      - remove high frequency function parts
      - aka prefiltering, band-limiting
- typo on P4 writeup
  - it's worth 15% of grade not 18%
Texture Antialiasing
- texture mipmapping: low pass filter

Temporal Antialiasing
- subtle point: collision detection about algorithms for finding collisions in time as much as space
- temporal sampling
  - aliasing: can miss collision completely with point samples
- temporal antialiasing
  - test line segment representing motion of object center

Modern Hardware
- use nice slides by Gordon Wetzstein
  - lecture 23 from
    - slides, downloadable demos