Programming Details

Why RGBA?

Why Pre-Multiplied?

Unsigned char (8 bits)

Colors - grays
Sampling issues

- miss something entirely
- measurements misrepresent

Checkerboard

1 0 1 0 0 \implies divide by 2 all white?
0 1 0 1 0 \implies all black?

Jaggies \|

Crawlies

1D

signal

time (or row/column of image)

\ldots \ldots \ldots \text{samples which reconstruction?}

Sampling: continuous \implies discrete
Reconstruction: discrete \implies continuous
Re-Sampling: discrete \implies discrete

Need to agree on 1 reconstruction

Smoothest possible signal

for some defn of smoothness
Magic of sampling theory:

- given samples $\rightarrow$ 1 correct reconstruction

- given a signal $\rightarrow$ Can sample "enough"

  if the signal is the smoothest possible signal
  for a set of samples (rate), then finite samples
  are enough

  for a given sample rate $\rightarrow$
  Signal must be smooth enough
  (so that it will be the smoothest possible)
  otherwise, won't get the correct reconstruction

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Key Idea:

- Ideal reconstruction

  Agree that the correct reconstruction is the smoothest
Reconstruction " faut fancy math "

Connect the dots
- not the smoothest, but pretty smooth

Sample point to reconstruct

Linear combination of neighboring samples

Slide kernel along spike chain

or

just put it where you need it

Convolution $f \ast g$

\[ \text{kernel} \]

\[ \text{function} \]
\[ \text{(spikes)} \]

Why? fancier combinations $\Rightarrow$ smoother

\[ \text{elegant theory} \]
Notes on Convolution

Continuous -

any signals $f \ast g \rightarrow h$
reverse $g$ (often symmetric)
area under curve - slide kernel along

$$h(t) = \int_{-\infty}^{\infty} f(u) g(x-u) \, du$$

Discrete 2D

Associative
Commutative $f \ast g = g \ast f$

Boundaries
zero
clamp
mirror