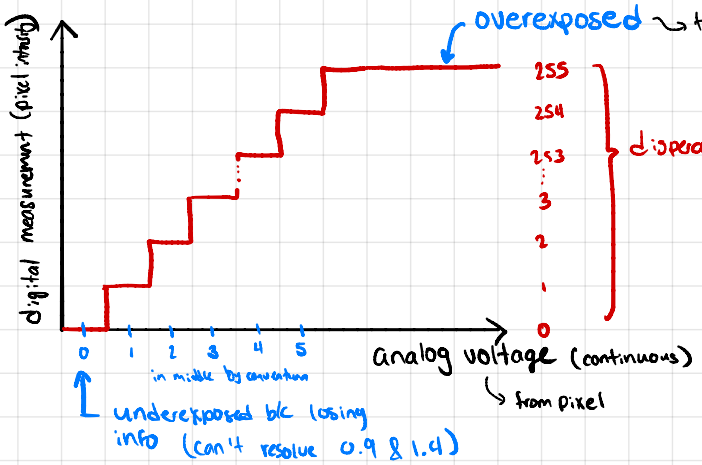
1/14/20

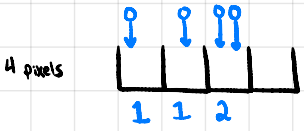
Image Formation 2

Analog to digital conversion



How to fix underexposure / overexposure:

- analog gain before digitization
  0-5 → 0-255 to get proper range
- once you digitize, you can't get back any information that was lost
- happens to ALL pixels

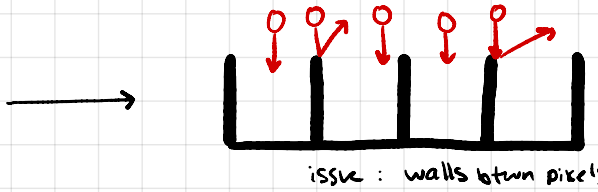


- doesn't help if we arbitrarily choose pixels
  ↳ relative intensity matters

During shutter: integrate light over time & area

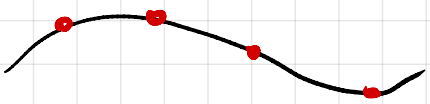
$\int\int$ light dtdA (time, A)

- issue: image sun
  1. overexposed sun b/c focus on bird
  2. underexposed bird b/c focus on sun

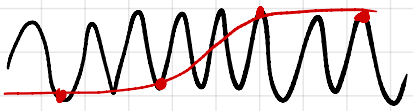


1. Discretization in intensity
2. Discretization in space

Sampling



ALIASING!

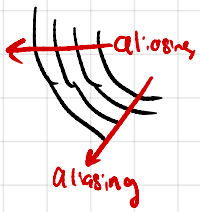


bad b/c not just losing information
↳ we get incorrect information
↳ indistinguishable from real information

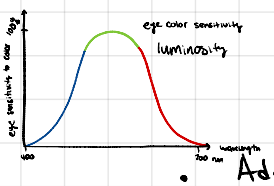
If image is downsampled w/o antialiasing
↳ aliasing gets reintroduced

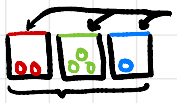
- solve using an optical lowpass filter

Going from 1 dimension to 2 dimension:



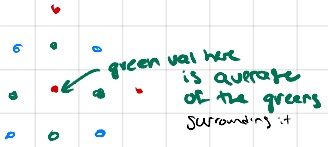
Color





Bayer array

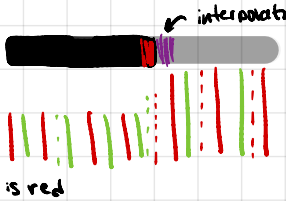
- 1/2 green
- 1/4 red
- 1/4 blue



- Additive RGB

- Subtractive CMYK

- HSV (hue/saturation/value)
  color — white to color — black to color



Bayer artifact

- algorithm to not interpolate across edges can fix it