LEBANON CAMERA CLUB

Image Resizing

4/4/2017

Image Resizing

Motivation

- Film
  - Small negative (or slide) needs to be enlarged
    - Slides → projector
    - Prints → enlarger

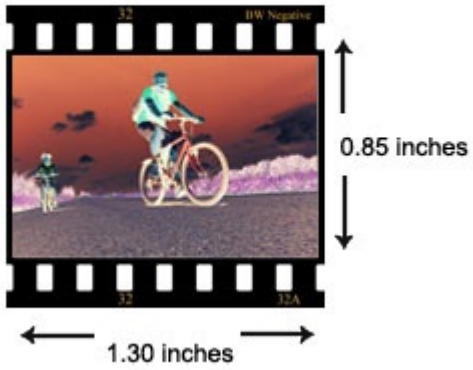
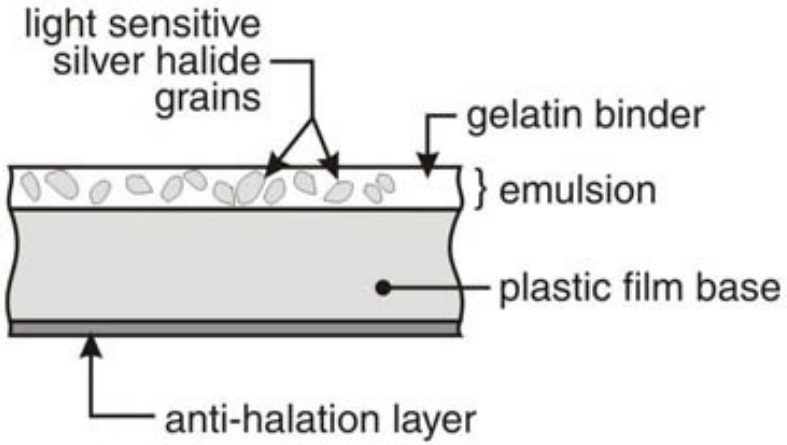


Image Resizing

Motivation

- Film
  - Small negative needs to be enlarged
    - Slides → projector
    - Prints → enlarger
  - Done optically
    - Film consists of random light-sensitive 'grains' in an emulsion
    - Lenses and a light source used to project a larger image



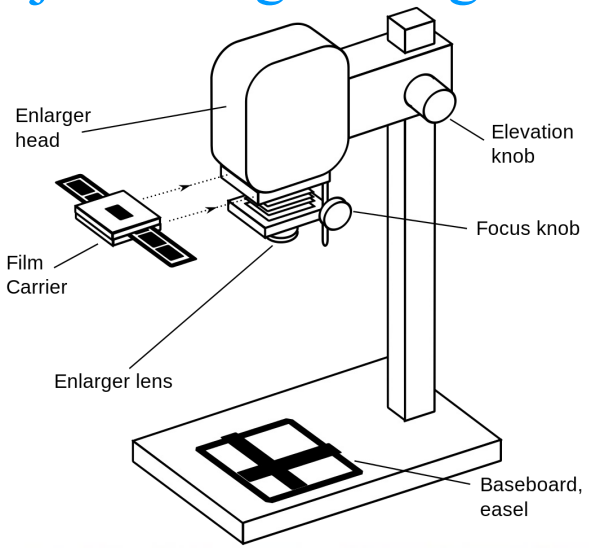
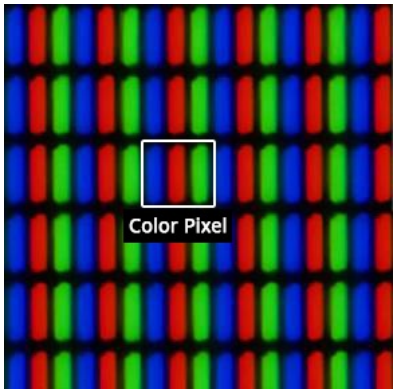


Image Resizing

Motivation

Note: Monitor pixels are composed of three physically separate color emitters—if small enough (or far enough away) the eye will combine them into a single multicolored pixel

- Digital
  - Need to resize to match display device
    - Monitor: low resolution relative to camera sensor → shrink image
    - Printer: resolution depends print size, can be high → enlarge image
  - Resolution
    - Number of pixel elements (pixels) which comprise an image



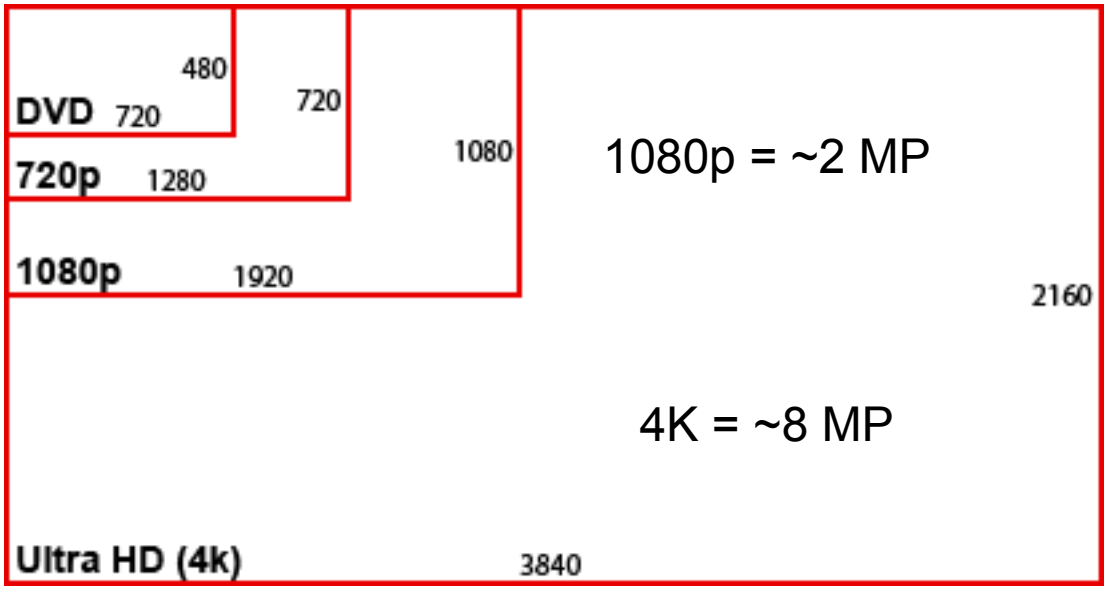
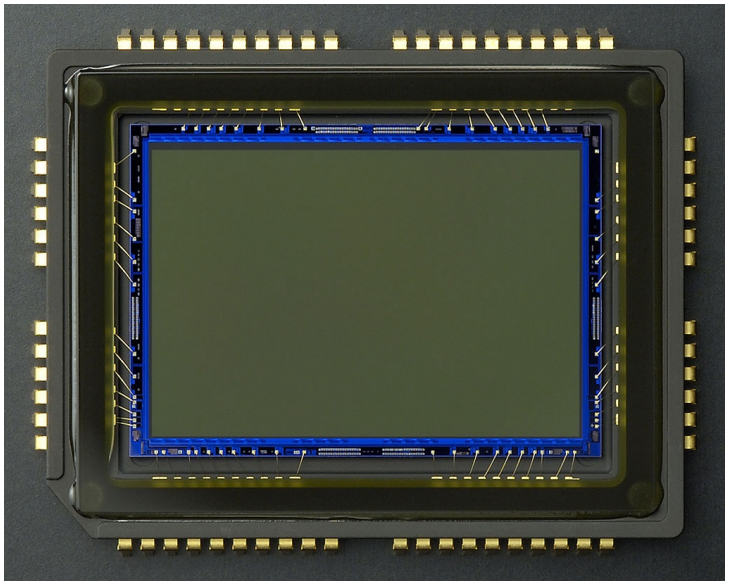


Image Resizing

Motivation

Note: Camera sensor pixels are single light sensitive sites, each with a red, green, or blue color filter—the result is the Bayer filter array

- Digital
  - Resizing done by computer manipulation of pixel counts
    - Fewer pixels = lower resolution, more pixels = higher resolution



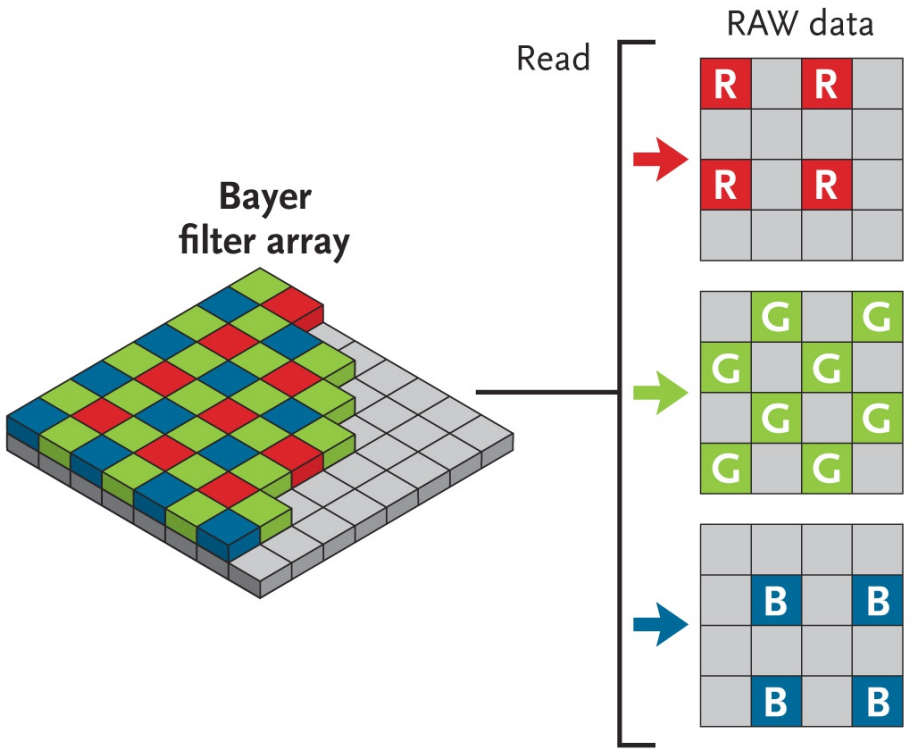


Image Resizing

Motivation

Note: The 'demosaic' interpolation process estimates missing RGB data from RAW pixel values

- Digital
  - Resizing done by computer manipulation of pixel counts
    - Fewer pixels = lower resolution, more pixels = higher resolution
    - Bayer data to full RGB data → 'demosaic' algorithm

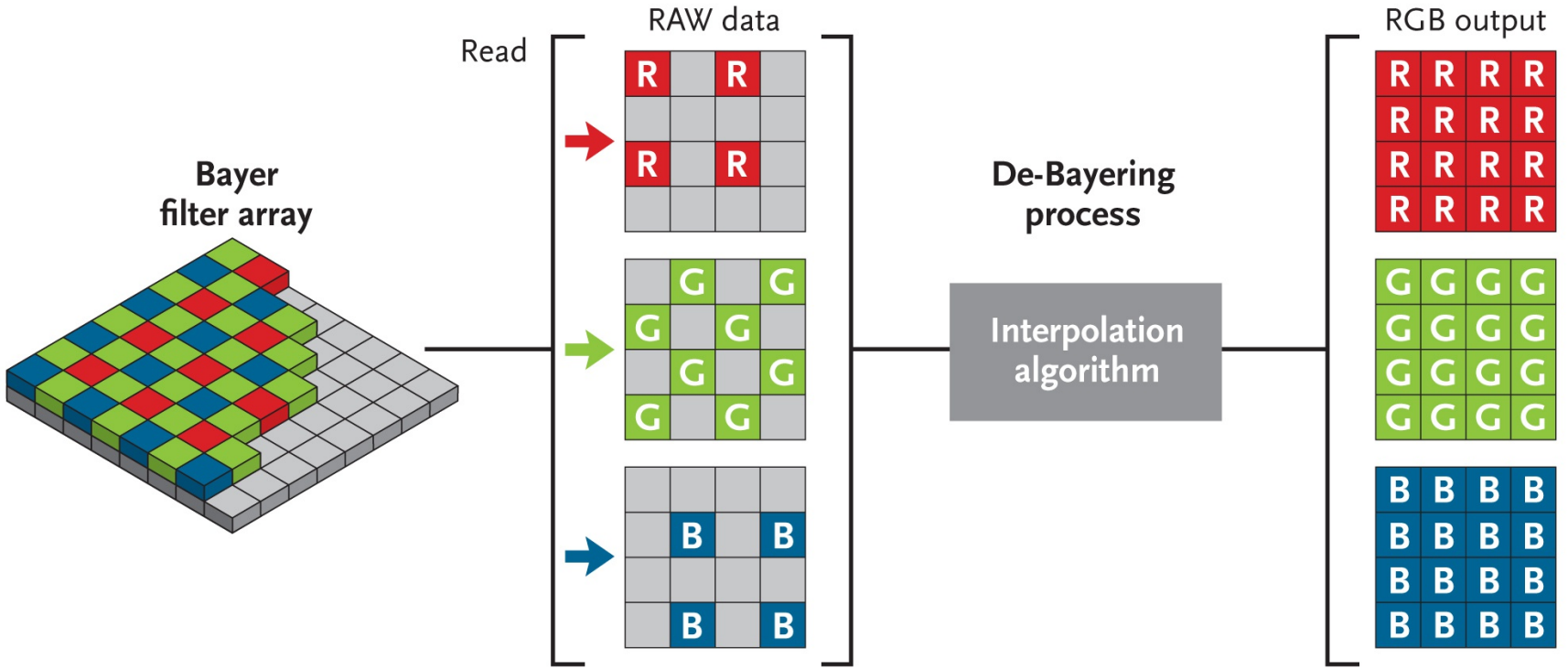
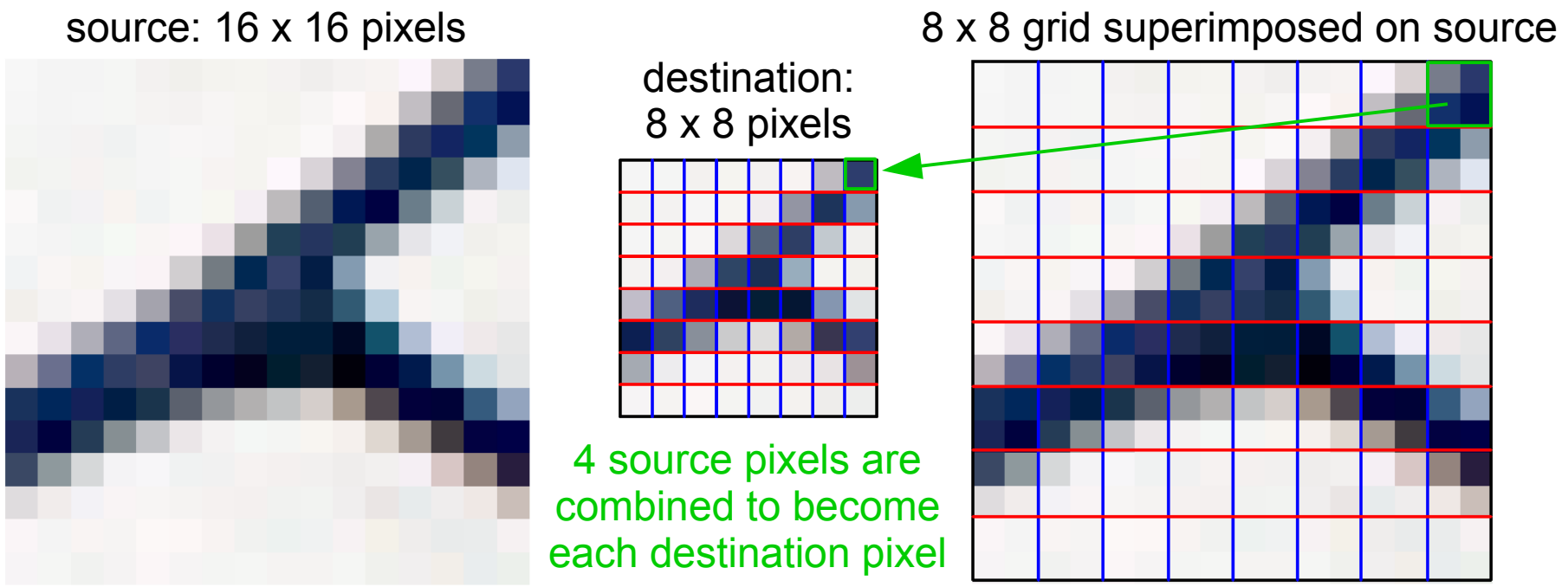


Image Resizing

Scaling down

- Reducing resolution by combining pixel data
  - Not a trivial operation in general
    - Data needs to be combined across rows and columns



simple case (rare) → new grid cells contain an exact number of source pixels

Image Resizing

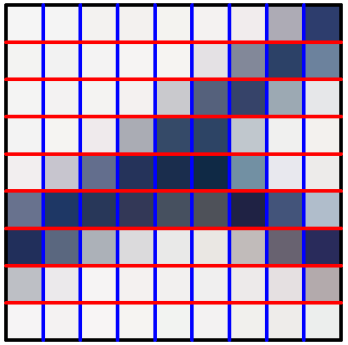
Scaling down

Note: When scaling down by a large amount softness is less apparent, because the image lacks the resolution to display soft transitions

- Reducing resolution by combining pixel data
  - Not a trivial operation in general
    - Data needs to be combined across rows and columns
    - Preserving edge transitions is a challenge → images tend to soften

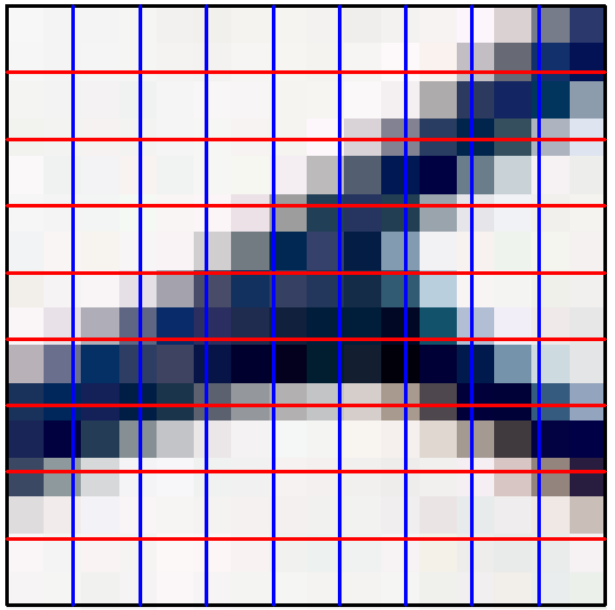
source: 16 x 16 pixels

destination:
9 x 9 pixels



pixels don't line up with grid lines

9 x 9 grid superimposed on source



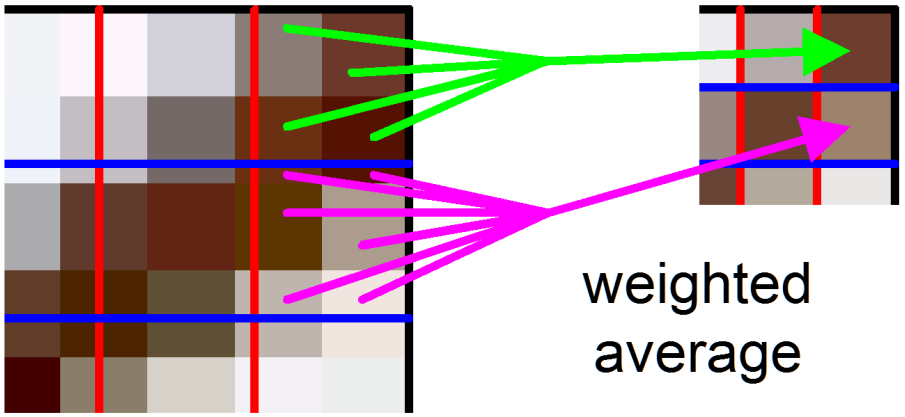
complex case (common) → new grid cells contain fractions of source pixels

Image Resizing

Scaling down

Note: In a weighted average, the values that are summed to determine the average are scaled according to how much they contribute

- Reducing resolution by combining pixel data
  - Not a trivial operation in general
    - Data needs to be combined across rows and columns
    - Preserving edge transitions is a challenge → images tend to soften
  - Many algorithms exist
    - Some are better than others in general → weighted average is poor
    - Some are better then others for specific images
    - Recommended standard algorithms: Bicubic and Lanczos



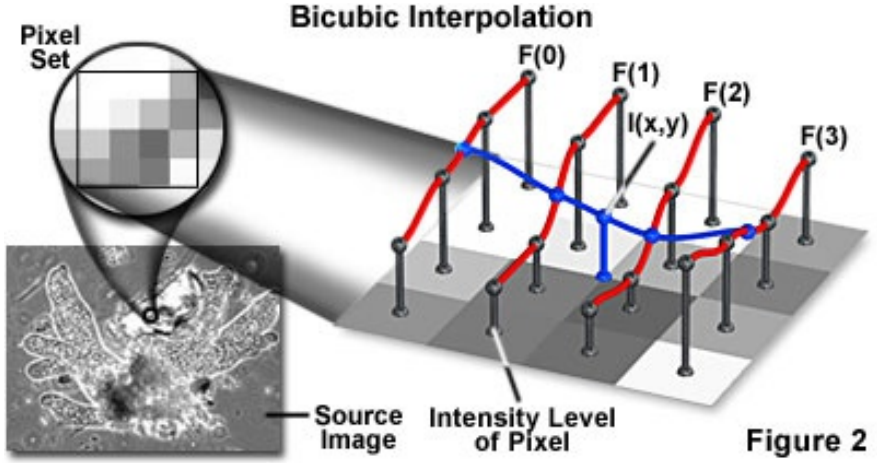


Figure 2

Image Resizing

Scaling up

Note: Interpolation uses mathematics to estimate values in between known data points

- Increasing resolution by interpolating pixel data
  - Even more difficult than scaling down
    - Math can estimate values, but doesn't “understand” the scene
    - Image softening is much more pronounced
  - Many algorithms exist
    - Single-purpose algorithms tend to perform best
    - Usually part of a standalone program or app
    - Recommended algorithms: Genuine Fractals and A Sharper Scaling

Bicubic

Bicubic + sharpen

PS preserve details

A Sharper Scaling

Image Resizing

Printing

Note: Printing is generally less sensitive to scaling effects than viewing images on a monitor

- Maximum resolution
  - Each printer has its own maximum resolution (dots per inch)
    - Common inkjet values: 300 dpi, 350 dpi, 360 dpi
    - Pro inkjet printers may accept double resolution: 600 dpi, 720 dpi
    - Example: 6000 x 4000 image (24 MP) @ 300 dpi = 20” x 13.3” print
  - Scaling
    - Smaller print → scale down the image
    - Larger print → print dots farther apart –or– scale up the image
    - Issue: how well does the printer handle resolution mismatches?
    - Solution: resize manually with a good algorithm, print at maximum resolution → might not be necessary for modern printers
    - Example: 15” x 10” print @ 360 dpi = 5400 x 3600 pixels

Image Resizing

Note: unsharp mask can be used for better sharpening control

Image editor

- Print Size
  - Select print size @ resolution
    - Resolution/print size does not matter for competition images
- Pixel Dimensions
  - Select Pixels or Percent
  - 'Locked' → aspect ratio fixed
  - Competition → select Pixels
    - Width ≤ 1400, Height ≤ 1050
- Advanced settings
  - Algorithm → Bicubic, etc.
    - Sharpness control to compensate for loss of edge contrast

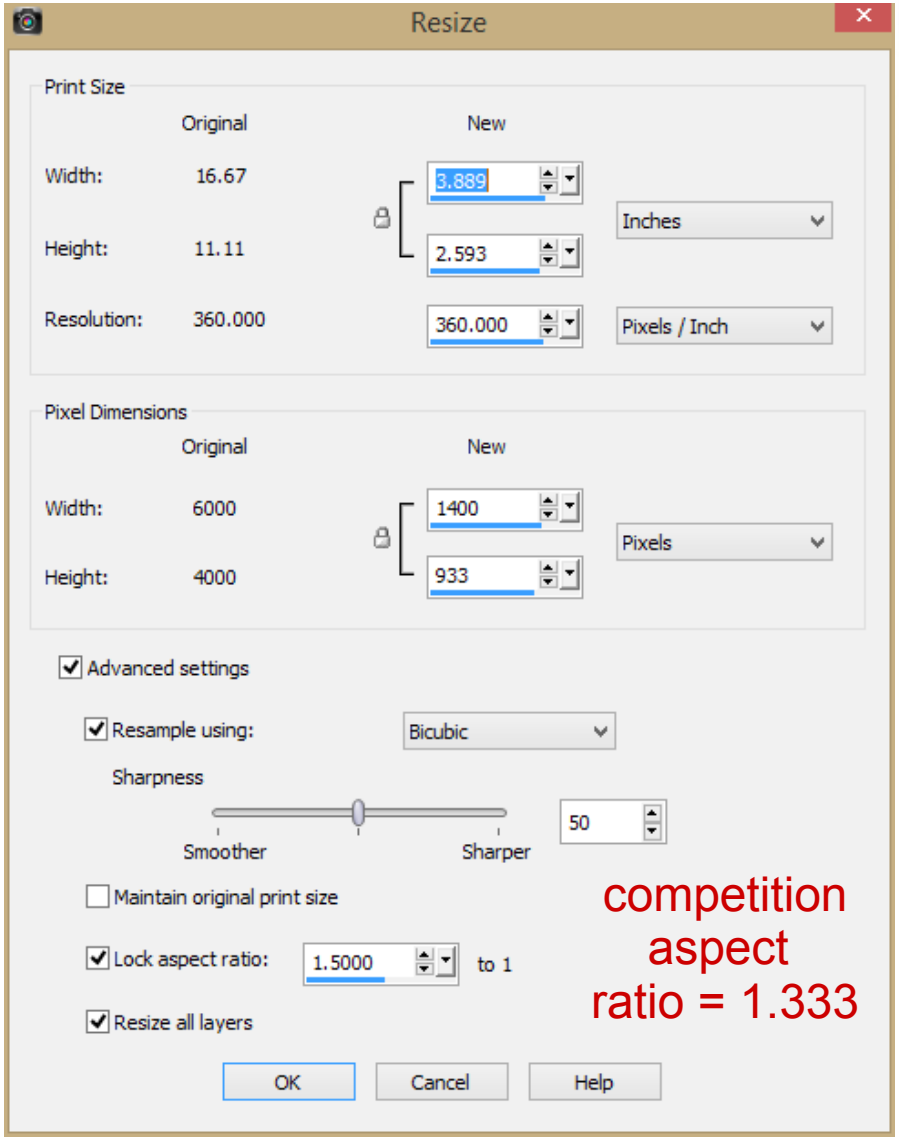


Image Resizing

Image editor

- Advanced settings
  - Lock aspect ratio
    - Choose if aspect ratio is 'locked'
    - Normally selected, otherwise objects may appear distorted
  - Maintain original print size
    - If selected, print width & height are fixed and resolution changes as pixel dimensions are changed
  - Resize all layers
    - Normally selected, if not selected then only the current layer is resized (rare)

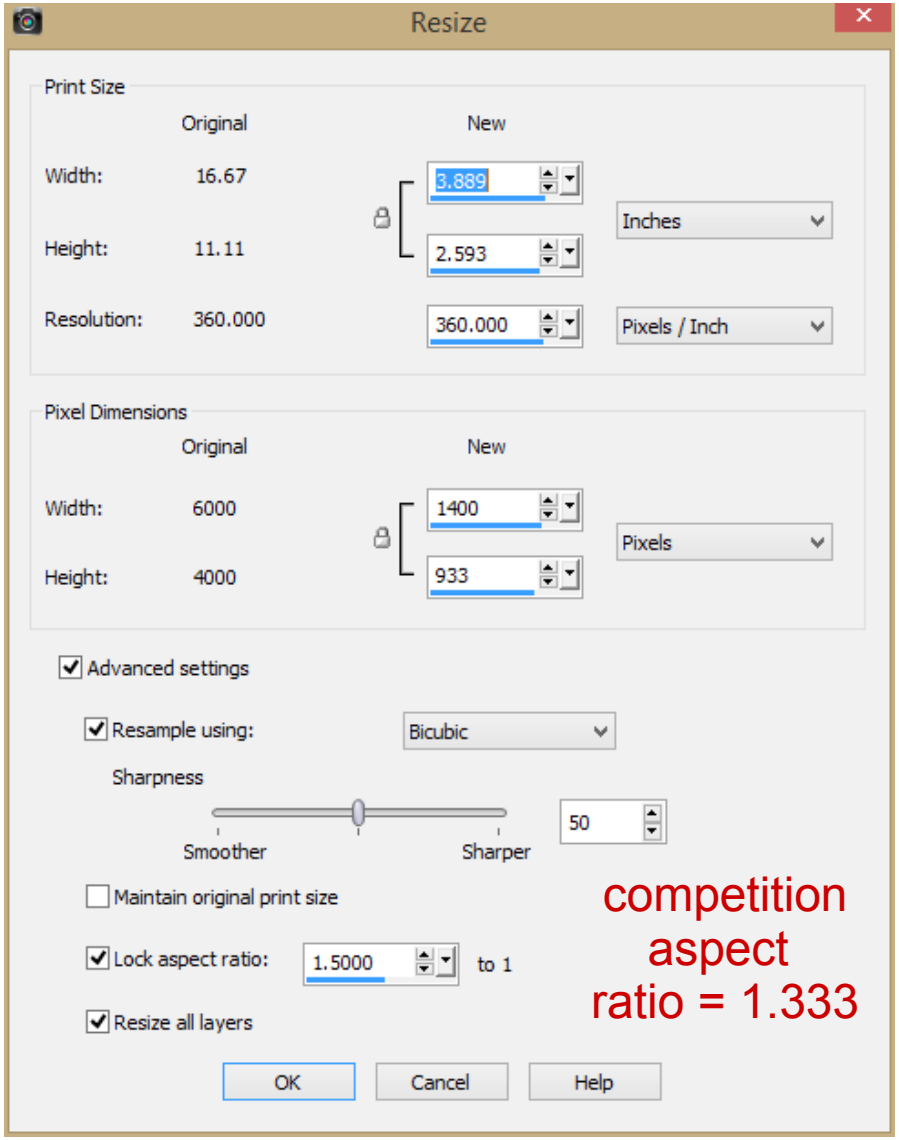


Image Resizing

Image editor

- Image information
  - Dimensions
    - Check pixel counts for competition images → 1400 (width) x 1050 (height) maximum
    - Print size and resolution (pixels per inch) not important for competition images
  - Color depth
    - 8 bits/channel for competition images