LEBANON CAMERA CLUB

Image Sharpening

2/2/2016

Image Sharpening

What is sharpness?

- Combination of resolution and acutance
  - Resolution → amount of detail in an image
    - More pixels for a given area → more detail

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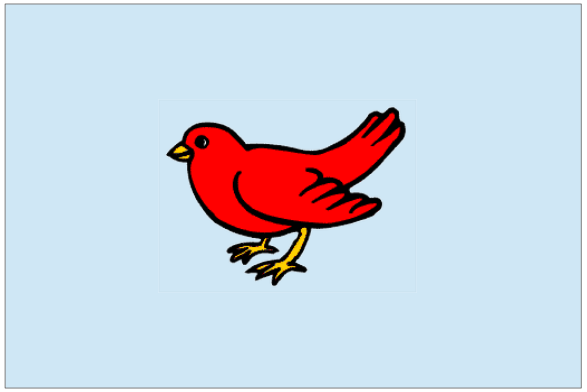
full frame



24 megapixels

APS-C (crop)

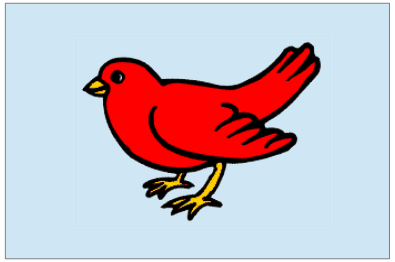


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Image Sharpening

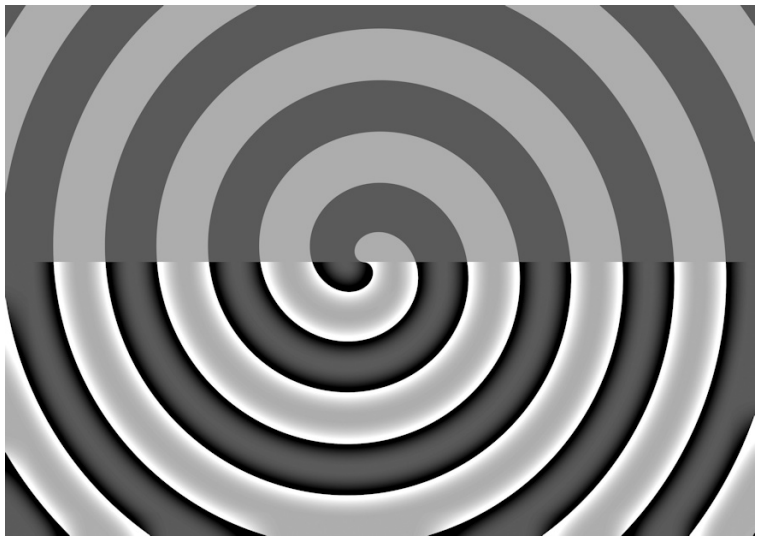
What is sharpness?

- Combination of resolution and acutance
  - Resolution → amount of detail in an image
    - More pixels for a given area → more detail
    - Lens quality affects maximum resolution
    - Cannot be increased once a photo is taken

Image Sharpening

What is sharpness?

- Combination of resolution and acutance
  - Acutance → perceived sharpness based on edge contrast
    - Enhanced changes in brightness at edges appears sharper
    - Can be increased in postprocessing



unprocessed | slight edge enhancement | heavy edge enhancement

Image Sharpening

Why do images need to be sharpened?

- Bayer mosaic interpolation
  - Incomplete Bayer RGB array must be made into full RGB
    - Must do some form of averaging to create missing data
    - Averaging can reduce acutance

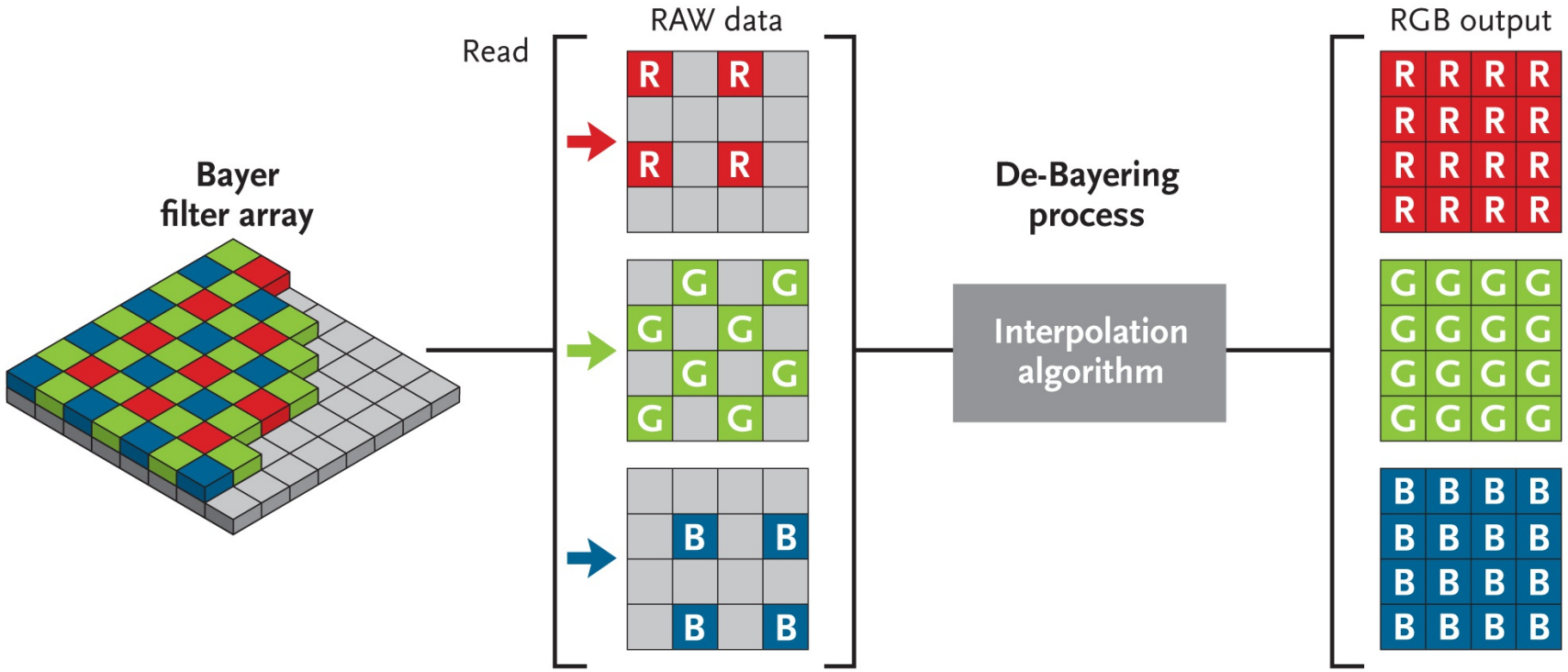


Image Sharpening

Why do images need to be sharpened?

- Anti-aliasing filter (low pass filter)
  - Intentionally blurs image to prevent aliasing
    - Aliasing → artifacts produced when sampling a signal
    - Commonly seen as a moiré pattern in an image
    - Removing high freq. information reduces aliasing – and sharpness*

* Both resolution and actuance are reduced

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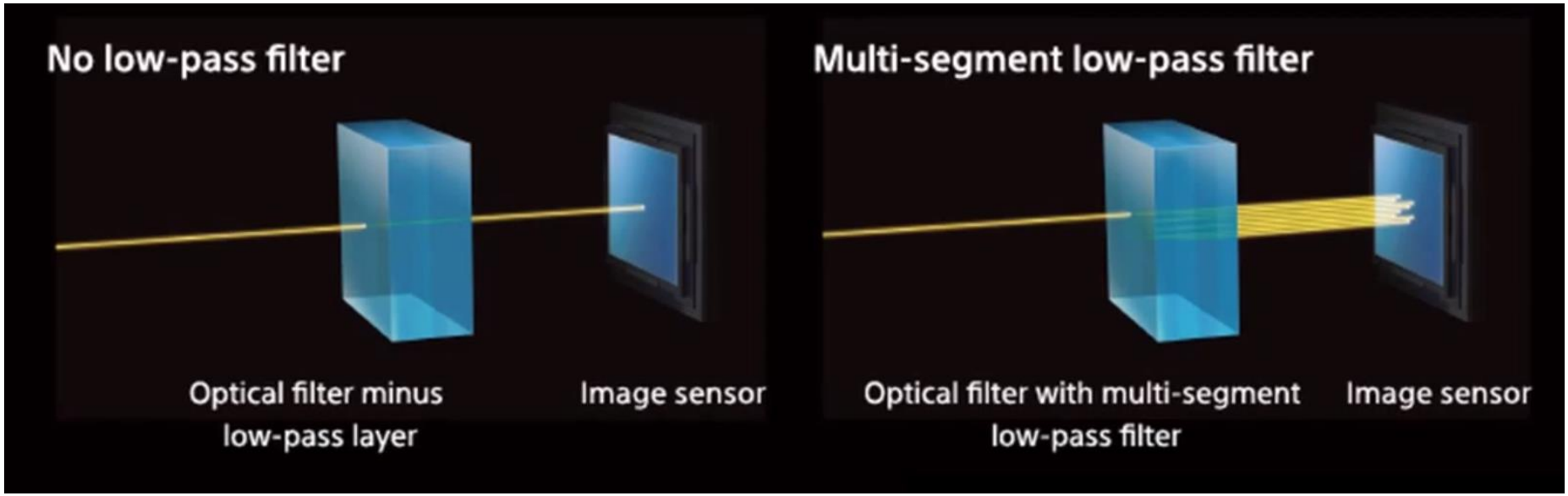

Image Sharpening

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    - Aliasing → artifacts produced when sampling a signal
    - Commonly seen as a moiré pattern in an image
    - Removing high freq. information reduces aliasing – and sharpness!
  - AA filter strength varies from camera to camera
    - Cameras with strong AA filter → benefit more from sharpening
    - Cameras with weak AA filter → need less sharpening
    - Cameras with no AA filter → high sharpness, but can have moiré

Image Sharpening

Why do images need to be sharpened?

- Resizing
  - Making an image larger
    - Requires interpolation (estimating intermediate pixel values → averaging)
    - May involve adding blur to avoid pixelation (pixel squares are visible)
    - Printing often requires upsizing → may need to sharpen more
  - Making an image smaller (i.e. resizing for digital competition)
    - May require interpolation, depending on reduction percentage
    - Can produce moiré, which is counteracted by adding blur
    - But downsizing generally reduces blur and can increase acutance
    - May not need any sharpening, or just a small amount

Image Sharpening

How are images sharpened?

- In-camera sharpening
  - Menu item
    - Numerical value (0-9) or set of options (less/standard/more)
    - "Standard" (default) sharpening can vary from brand to brand
  - Only applies to JPEG images from camera
    - RAW images do not have sharpening applied

Image Sharpening

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- In-camera sharpening
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    - Numerical value (0-9) or set of options (less/standard/more)
    - "Standard" (default) sharpening can vary from brand to brand
  - Only applies to JPEG images from camera
    - RAW images do not have sharpening applied
  - Be careful → over-sharpening is difficult to fix
    - Some photographers under-sharpen in JPEG, add more later in editor

Image Sharpening

How are images sharpened?

- In an image editor
  - Simple methods
    - "Sharpen" or "Sharpen more" → basic, no control

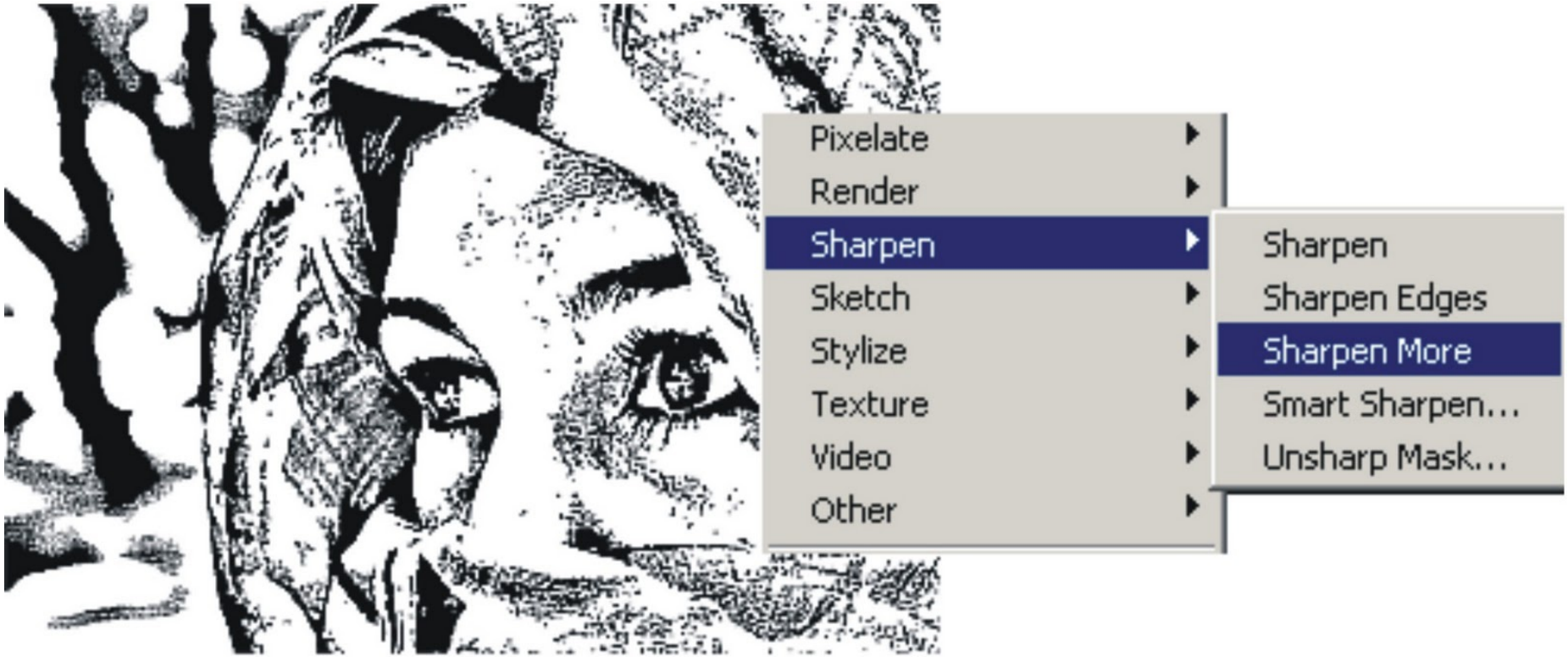
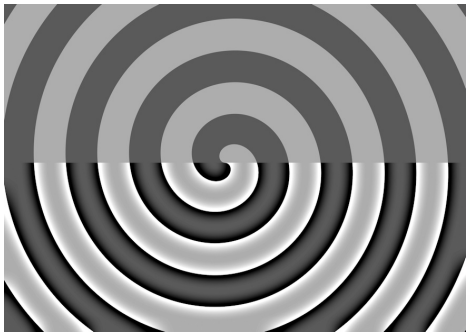


Image Sharpening

How are images sharpened?



- In an image editor
  - Unsharp masking (USM)
    - Preferred method → controls: Amount, Radius, Threshold
    - Amount (Strength) → how much contrast is added (percentage)

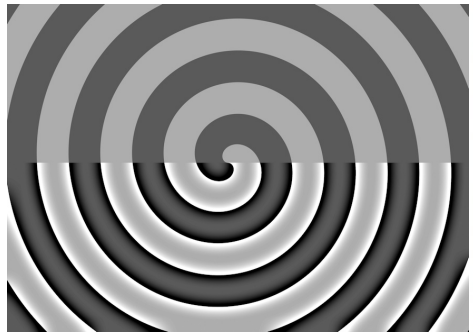
Unsharpened

Amount = 100

Amount = 200

Image Sharpening

How are images sharpened?



- In an image editor
  - Unsharp masking (USM)
    - Preferred method → controls: Amount, Radius, Threshold
    - Amount (Strength) → how much contrast is added (percentage)
    - Radius → size of edge zone to be enhanced (too large causes "halos")

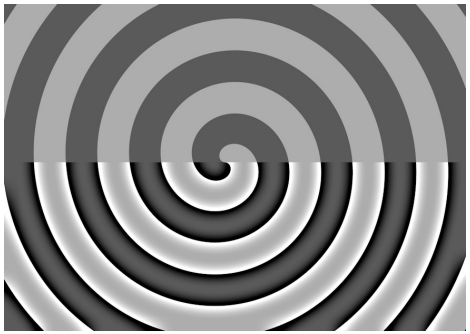
Unsharpened

Radius = 1.5

Radius = 7.5

Image Sharpening

How are images sharpened?



- In an image editor
  - Unsharp masking (USM)
    - Preferred method → controls: Amount, Radius, Threshold
    - Amount (Strength) → how much contrast is added (percentage)
    - Radius → size of the edges to be enhanced (too large causes "halos")
    - Threshold (Clipping) → minimum brightness change to be sharpened

Unsharpened

Threshold = 5

Threshold = 1

Image Sharpening

Recommendations

- Sharpen last (or sharpen, then downsize)
  - If you are upsizing, sharpen after (less clear for downsizing)
  - If you are printing → resize in editor, USM sharpen, print
    1. No control of printer resizing algorithm (use bicubic or Lancsoz in editor)
    2. No control of any sharpening the printer might do after resizing
- Difficult to sharpen out-of-focus areas
  - Very few (if any) edges to sharpen
- USM settings (starting point)
  - Radius = 1.5
  - Threshold = 5
  - Amount between 50% and 150% (depends on camera and image)
- Programs/plugins: Topaz, NIK, PixelGenius, ...