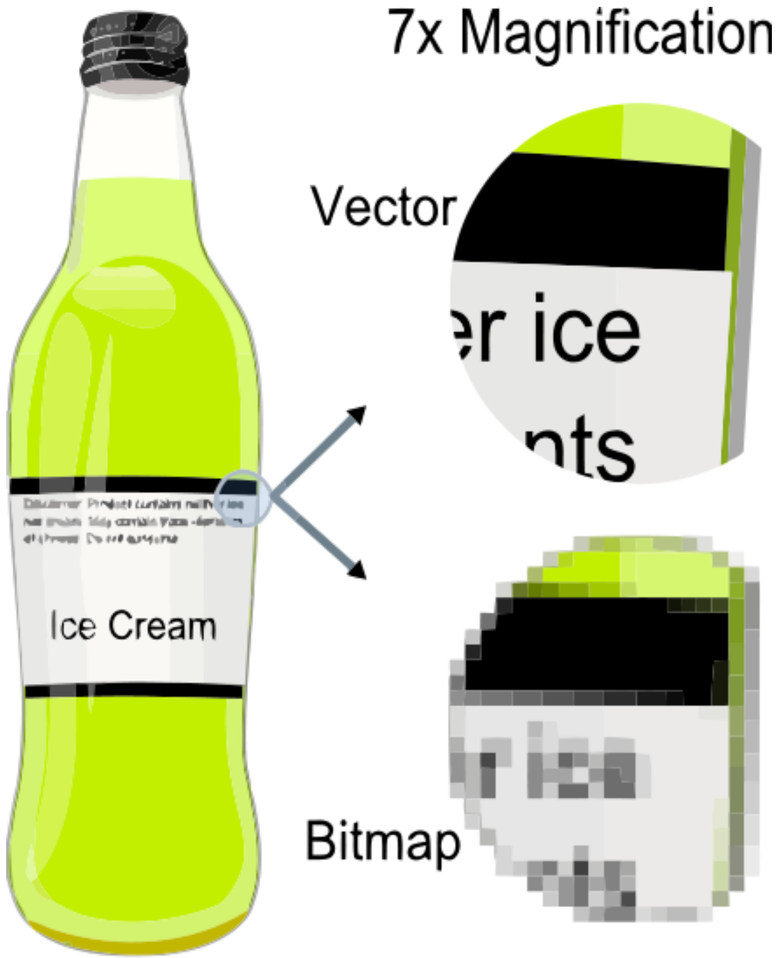
Images

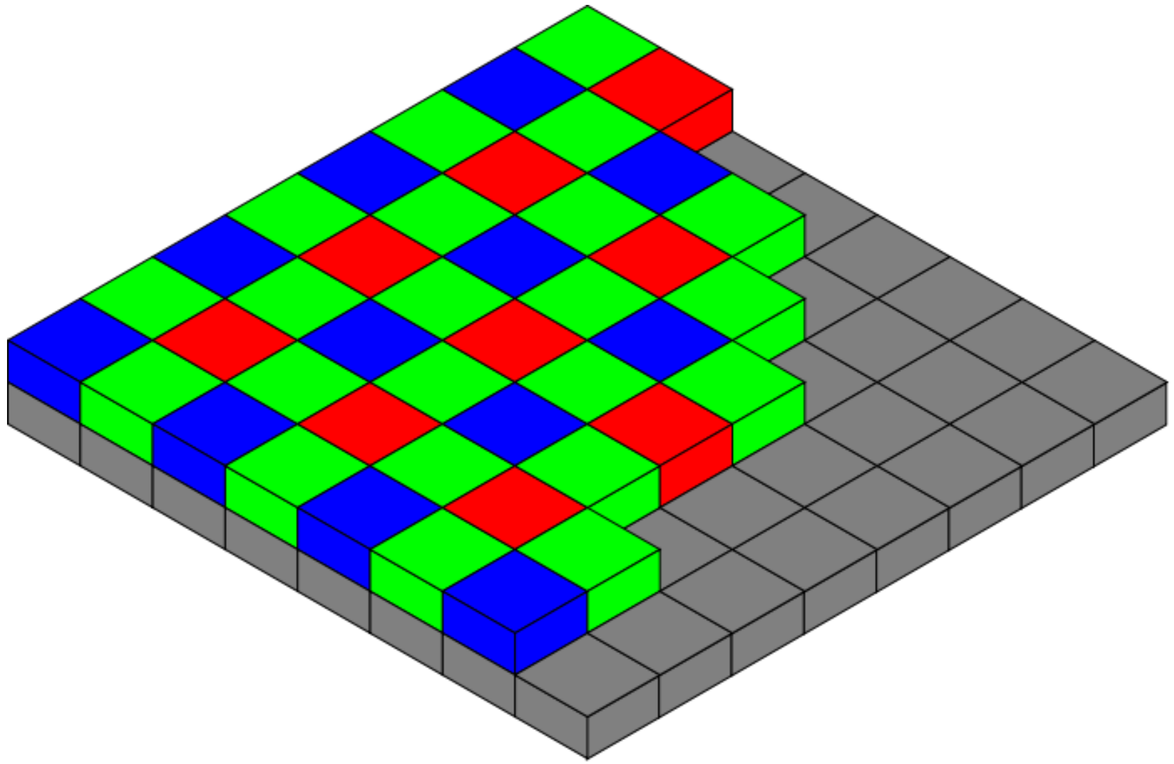
Images



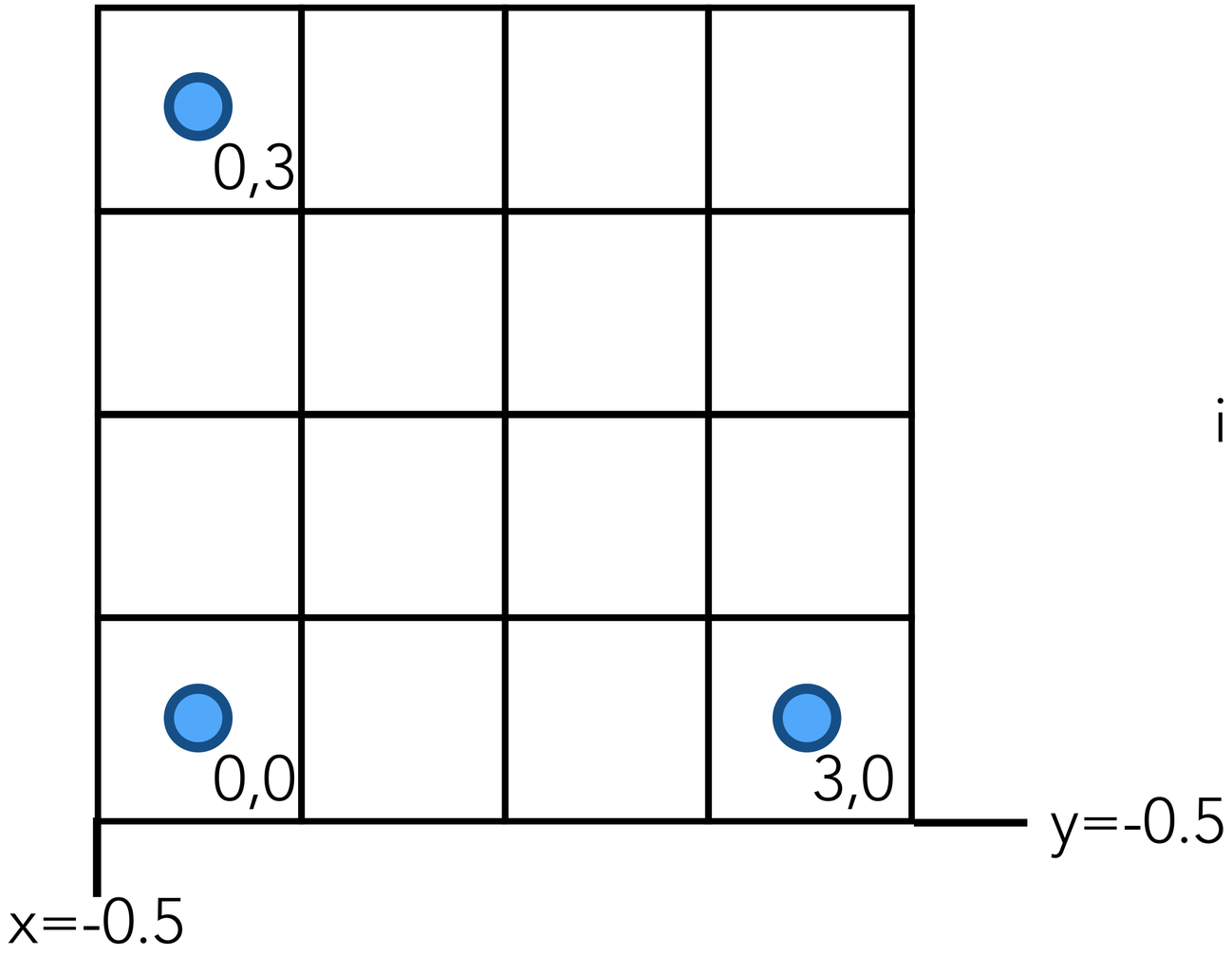
Raster Devices

- Output
  - 2D: Display (LCD,LED)
  - 1D: Hardcopy (ink-jet, dye sublimation)
- Input
  - 2D Array: digital camera
  - 1D Array: scanner

Bayesian Color-Filter



Pixel Coordinates - Raster Image



Be Careful:
Y is flipped
in some APIs

Pixel Values (Framebuffer format)

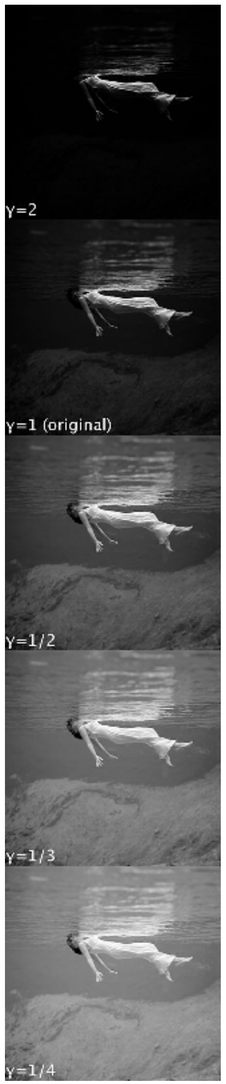
- 1-bit greyscale - text
- 8-bit RGB (24 bits) - web and email
- 8-bit RGBA (32 bits) - alpha channel, see next slide
- 16/24/32bits - high accuracy for photography and HDR

Monitors Intensity, Gamma Correction

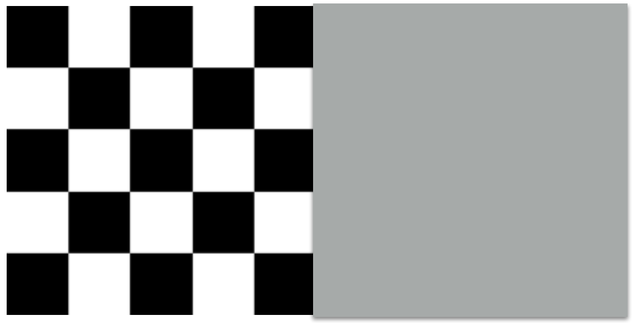
- What is the minimal and maximal light intensity?
- The intermediate intensities are different for each person, and it is non-linear
- Monitors needs to be calibrated for a certain viewer, using a procedure called “Gamma Correction”
- The rule is simple: displayed intensity = (max intensity) * a^{γ}

Pixel Value

Gamma Correction



- Find the neutral gray: $0.5 = a^{\gamma}$
- Compute $\gamma = \frac{\ln 0.5}{\ln a}$

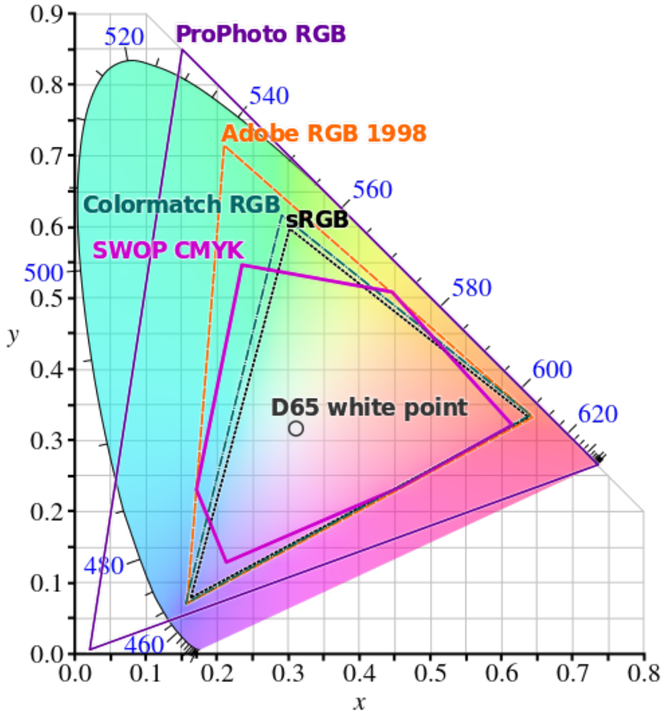


- The colors will not be uniform on normal screens, one of the major factor affecting the cost of screens is their ability to be consistent on all pixels!

By X-romix 10:00, 7 June 2008 (UTC), Updated by --Rubybrian (talk) 14:25, 14 September 2010 (UTC); Photographer: Toni Frissell - This file was derived from: Weeki Wachee spring 10079u.jpg, GFDL, https://commons.wikimedia.org/w/index.php?curid=4176109

RGB vs CMYK colors

- RGB is additive



- CMYK is subtractive

By BenRG and cmglee - http://commons.wikimedia.org/wiki/File:CIE1931xy_blank.svg, CC BY-SA 3.0, https://commons.wikimedia.org/w/index.php?curid=32158329

Calibration is very important!

Alpha Compositing

- A way to represent transparency
- The pixels of an image are blended linearly with the image below
- $\mathbf{c} = \alpha \mathbf{c_{new}} + (1 - \alpha)\mathbf{c_{old}}$

$\alpha = 1$

$\alpha = 0$

RGBA is very common, and you will use it often!

Image Formats

- Lossy:
  - **jpeg** - compact, introduces artifacts
- Lossless:
  - **png** - common for web applications
  - **ppm** - very simple, not compressed
  - **tiff** - mostly scientific use

References

Fundamentals of Computer Graphics, Fourth Edition
4th Edition **by Steve Marschner, Peter Shirley**

Chapters 1,2,3