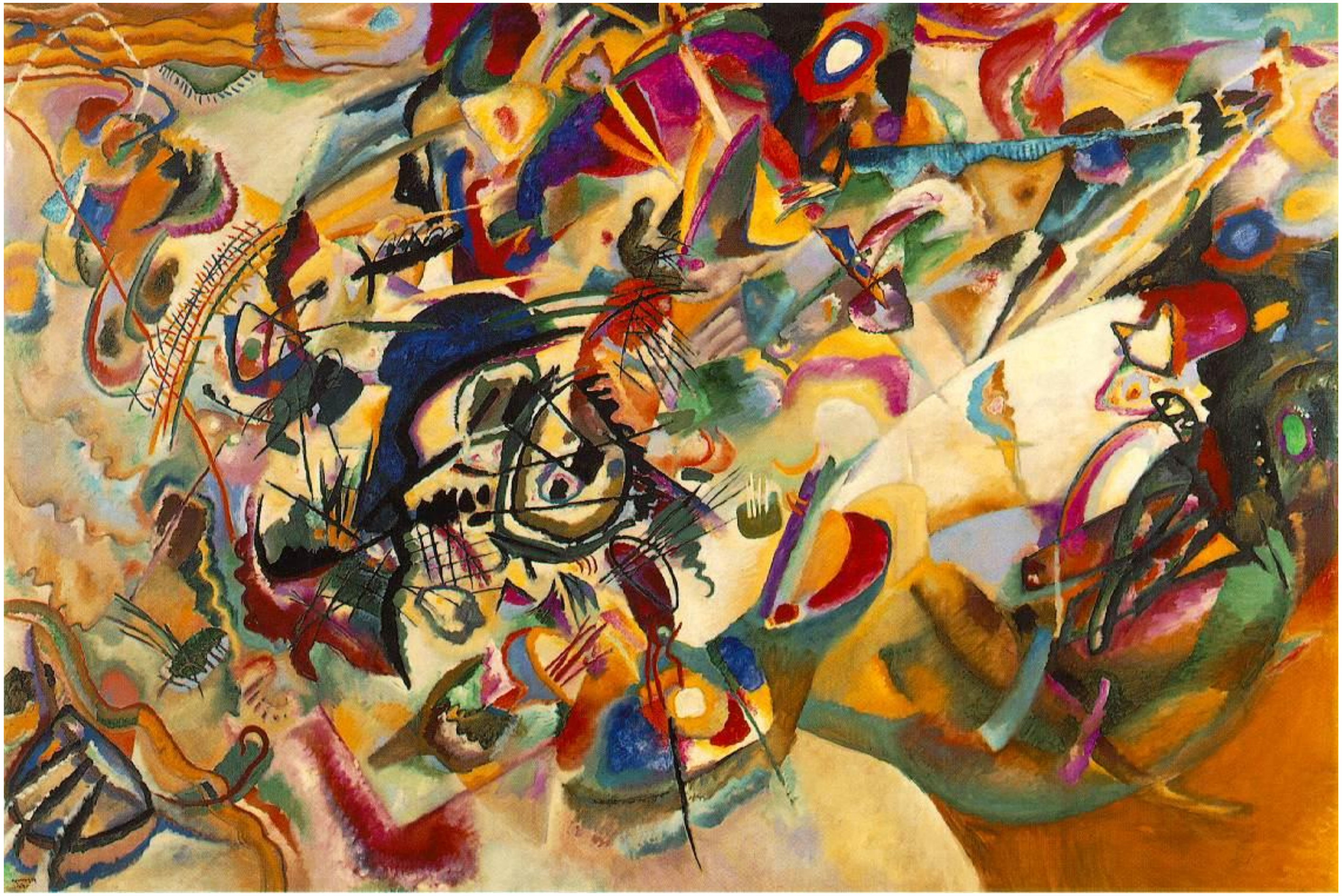
Brief Intro to Imaging and Colour



Wassily Kandinsky, “Composition VII”

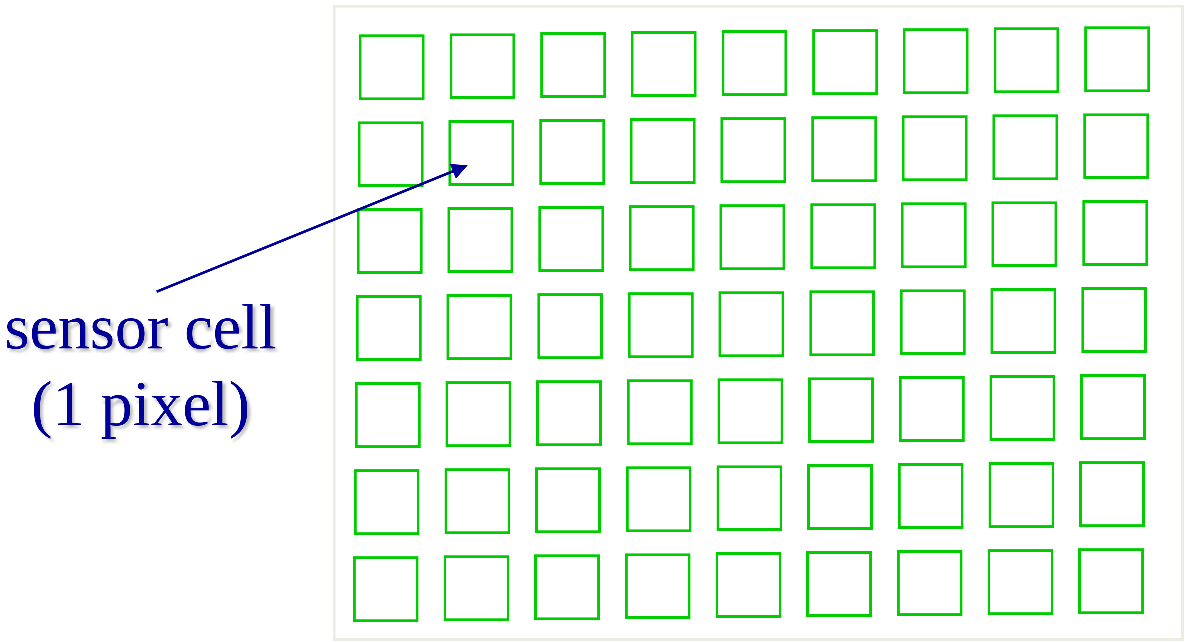
CSC320: Introduction to Visual Computing

Michael Guerzhoy

Some slides by Allan Jepson, Kyros Kutulakos, Derek Hoeim

The Imaging Sensor

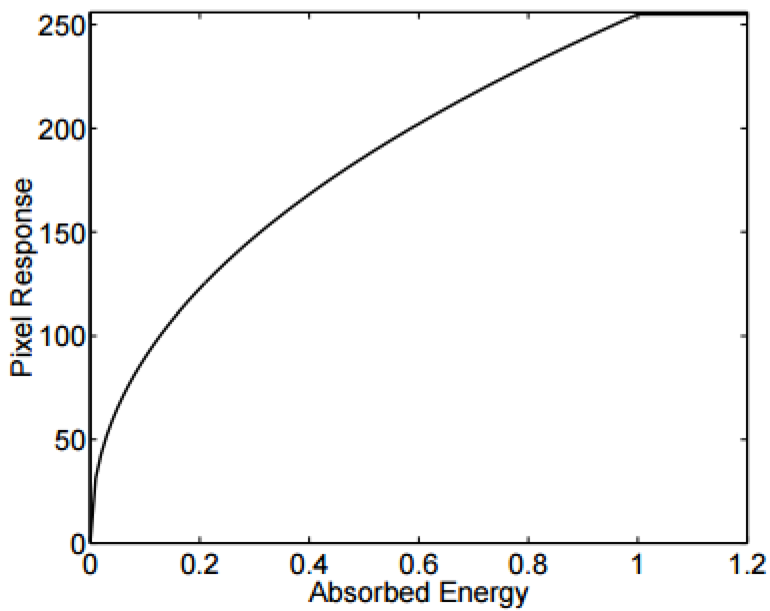
- An array of photo-sensitive cells (usually 2-dimensional), with each cell corresponding to one pixel (=picture element)



- Light falling onto a cell induces voltage that depends on the intensity of incident light and the frequency of the light
- Voltage converted to digital signal within a sensor-specific the range (usually an 8-, 10- or 14-bit number)

Converting Voltage to Intensity

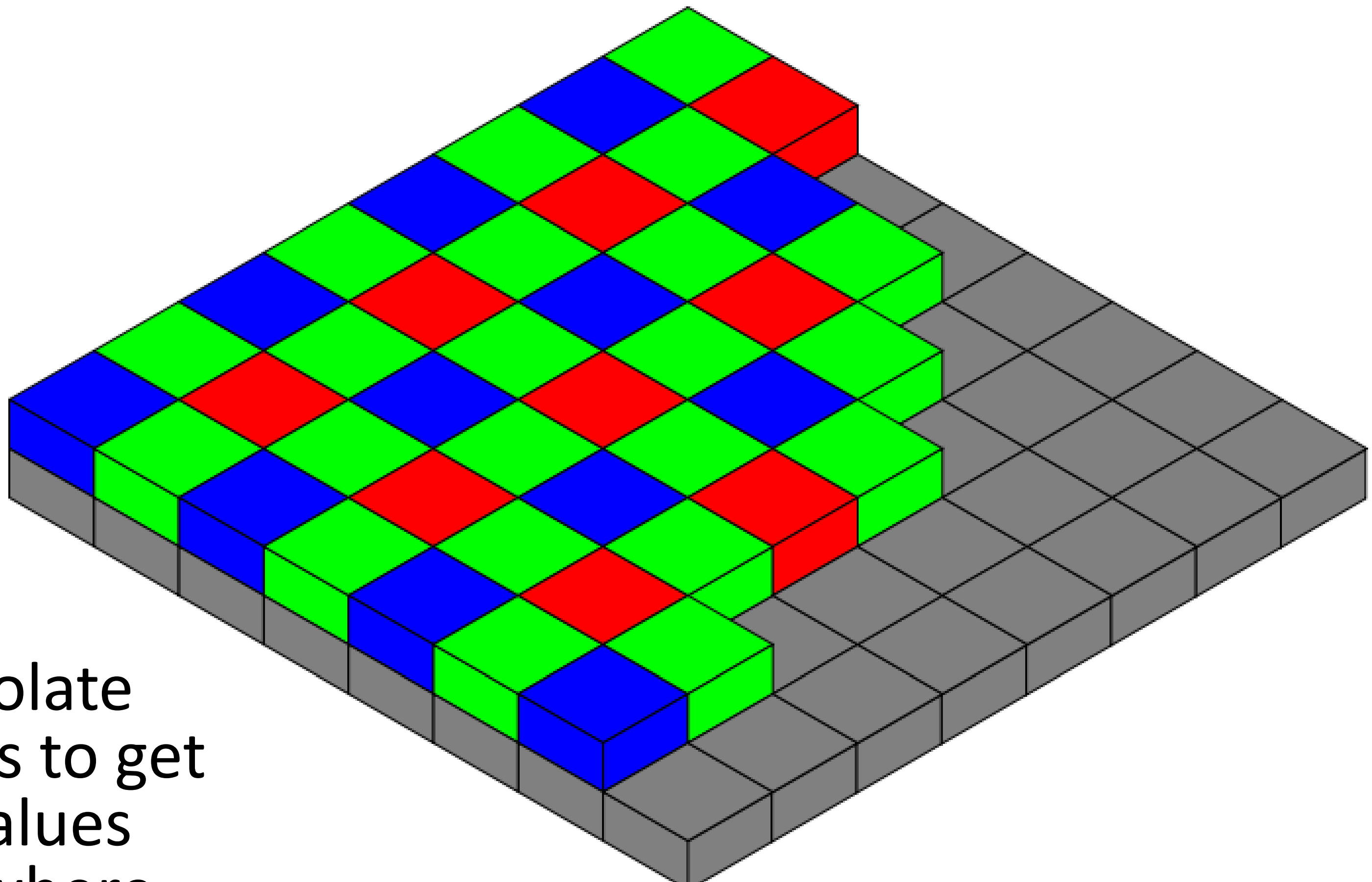
- Amount of absorbed light energy is proportional to exposure time and light energy
- The intensity recorded is a non-linear function of the absorbed energy



- Too much energy -> still 255

Capturing Colour

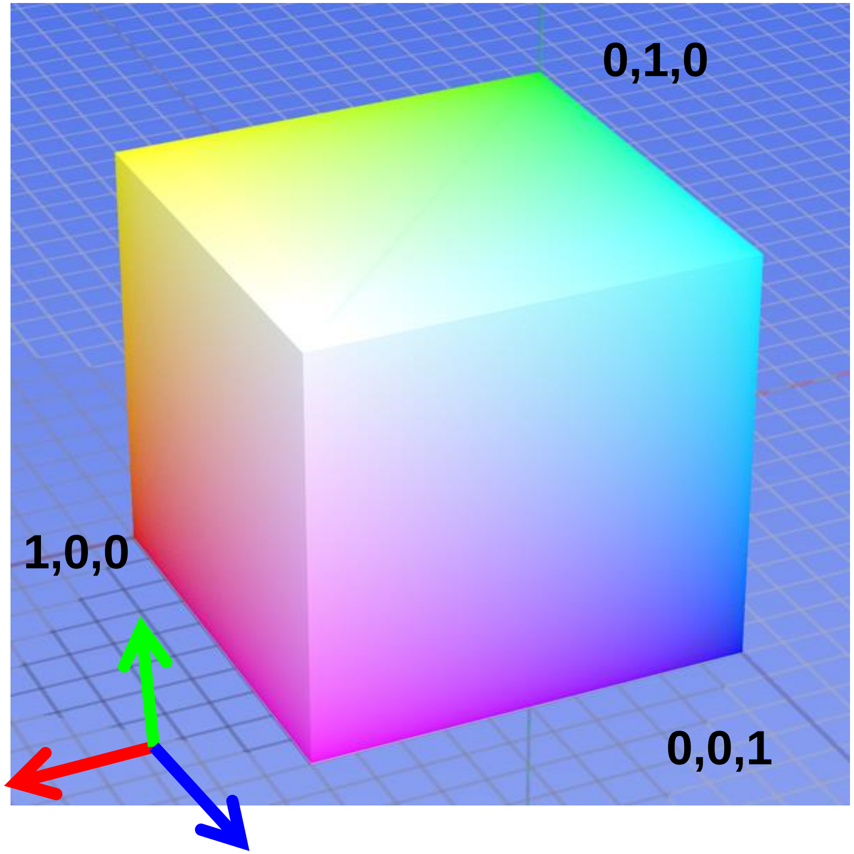
- A *Bayer Filter* is used so that different sensors only get red, green, and blue light



- Interpolate colours to get RGB values everywhere

Color spaces: RGB

Default color space



R
(G=0,B=0)

G
(R=0,B=0)

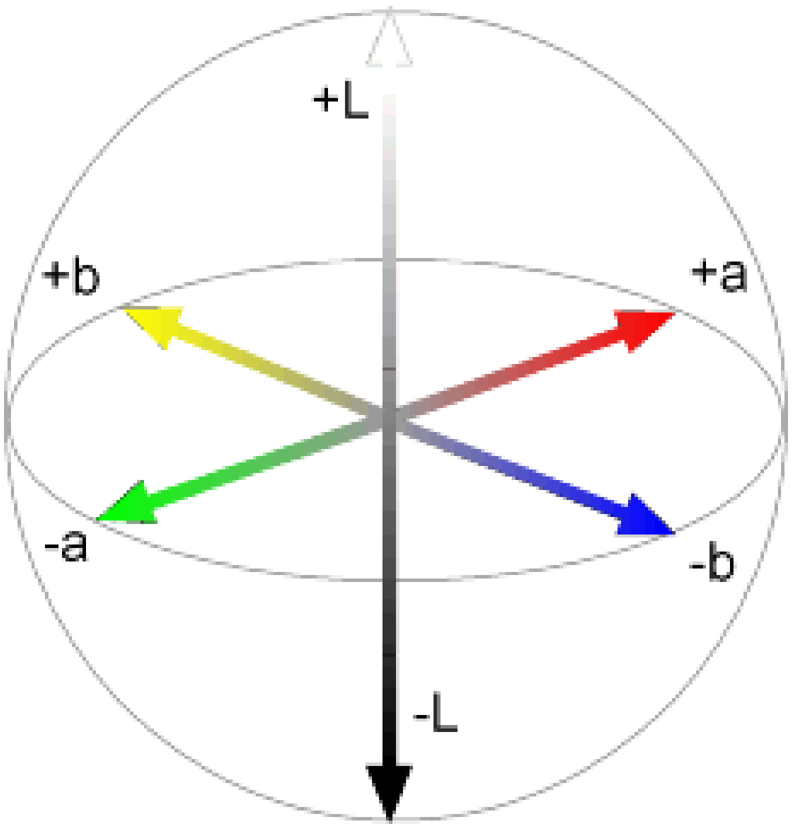
B
(R=0,G=0)

Some drawbacks
- Strongly correlated channels
- Non-perceptual

Image from: http://en.wikipedia.org/wiki/File:RGB_color_solid_cube.png

Color spaces: CIE L*a*b*

"Perceptually uniform" color space



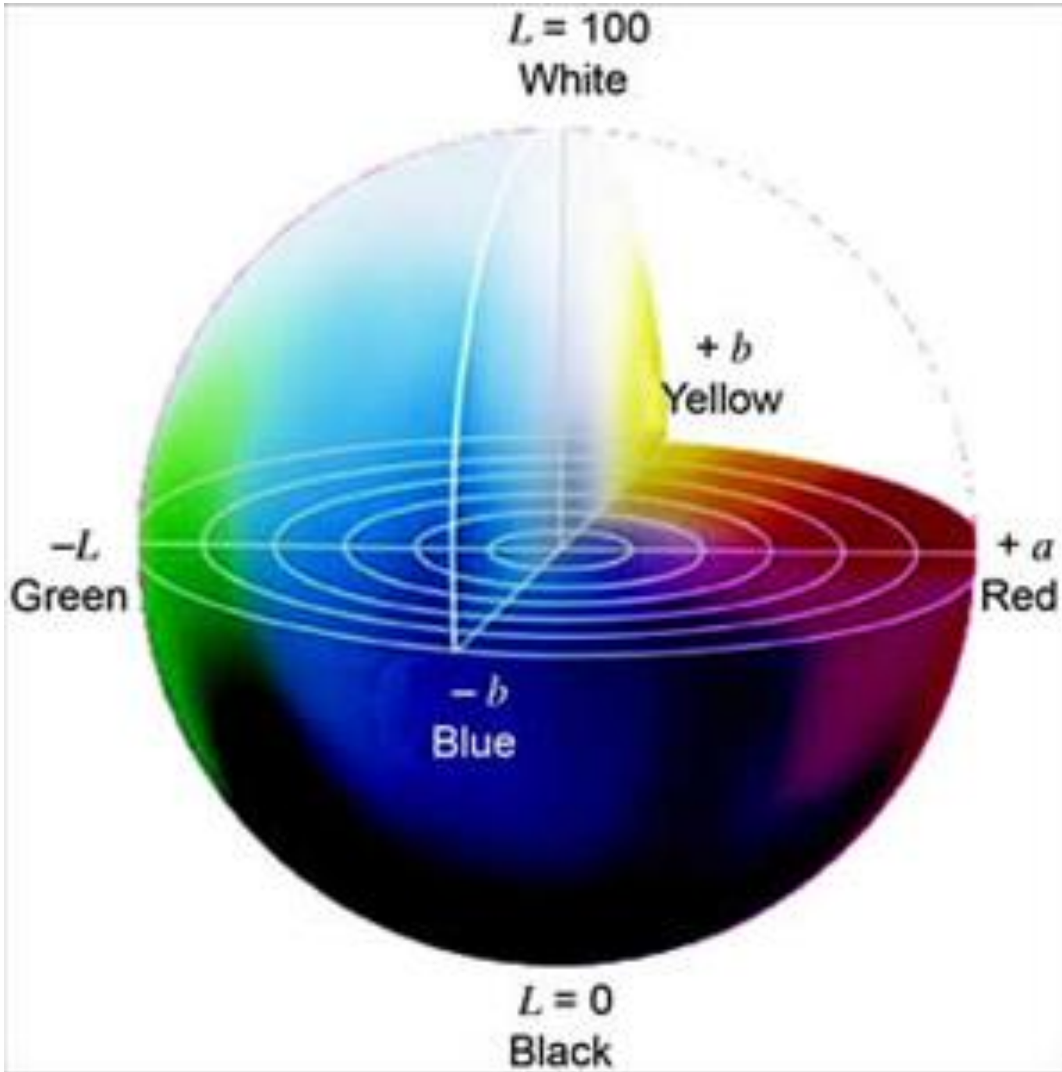
L
(a=0,b=0)

a
(L=65,b=0)

b
(L=65,a=0)

Luminance = brightness
Chrominance = color

CIE L*a*b



CIE L*a*b

- How to obtain the L*a*b coordinates of a colour?
  - It’s complicated, but we can just take it as given. Look at the diagram in the previous slide and interpolate
- “Perceptually uniform”:
  - Pairs of colours that are different by distance d in L*a*b space are all equally different perceptually
- Luminance component
  - Can change the luminance without changing the colour

If you had to choose, would you rather go without luminance or chrominance?

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Most information in intensity

Only color shown – constant intensity