Friedrich-Alexander-Universität
Technische Fakultät

## Lecture 2, Part 2

# Color 2/2

Computer Vision
Summer Semester 2023

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# What is color?

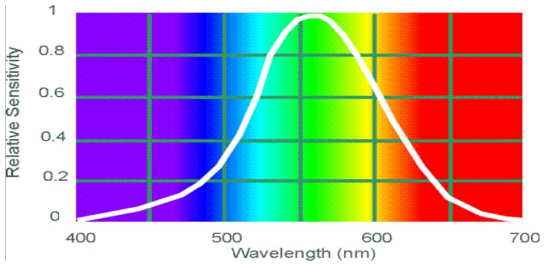
# Why do we even care about human vision in this class?

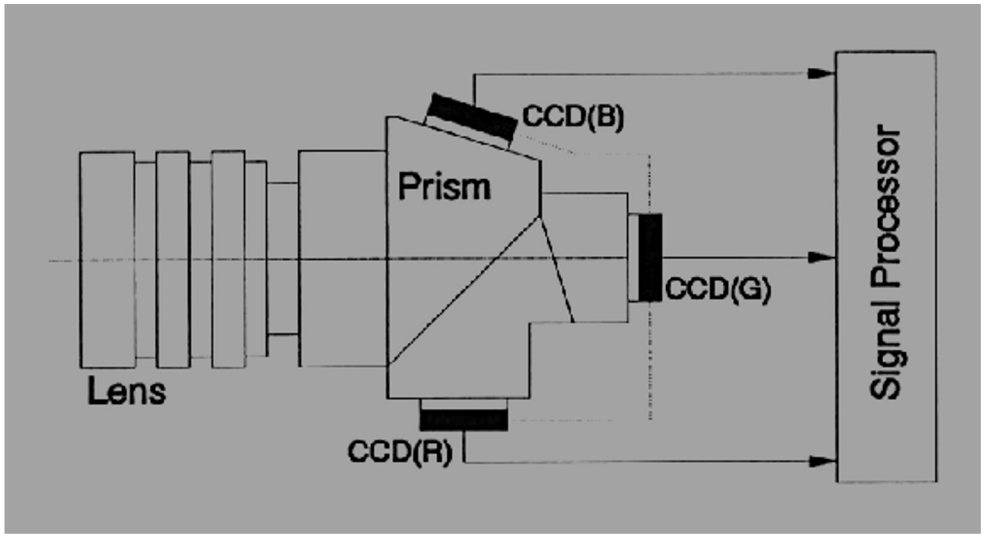
# Why do we care about Human Vision?

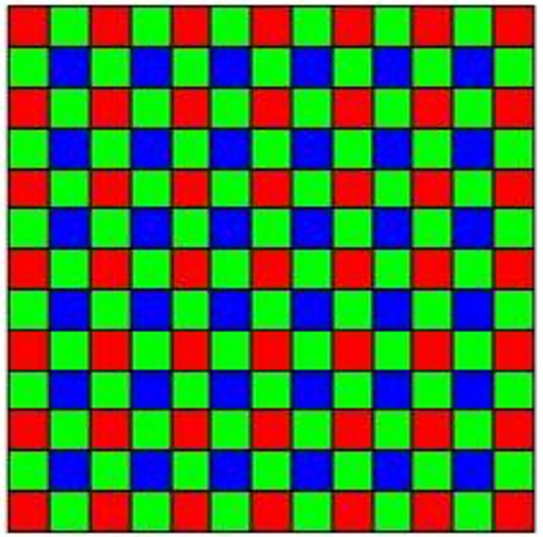
- We don't, necessarily.
- But biological vision shows that it is possible to make important judgements from images.
- It's a human world -> cameras imitate the frequency response of the human eye to try to see as we see.

# Color Sensing in Camera (RGB)

- 3-chip vs. 1-chip: quality vs. cost
- Why more green?



Bayer filter

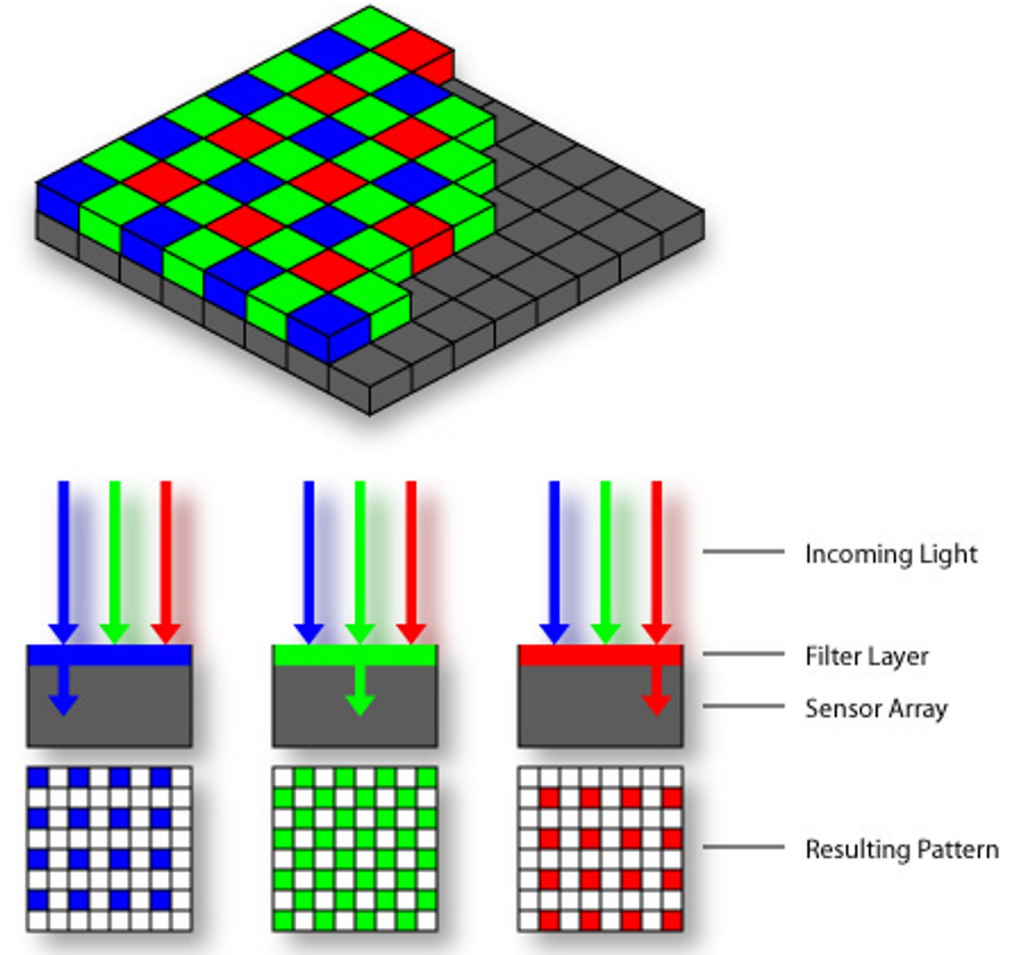
Why 3 colors?

http://www.cooldictionary.com/words/Bayer-filter.wikipedia

Steve Seitz

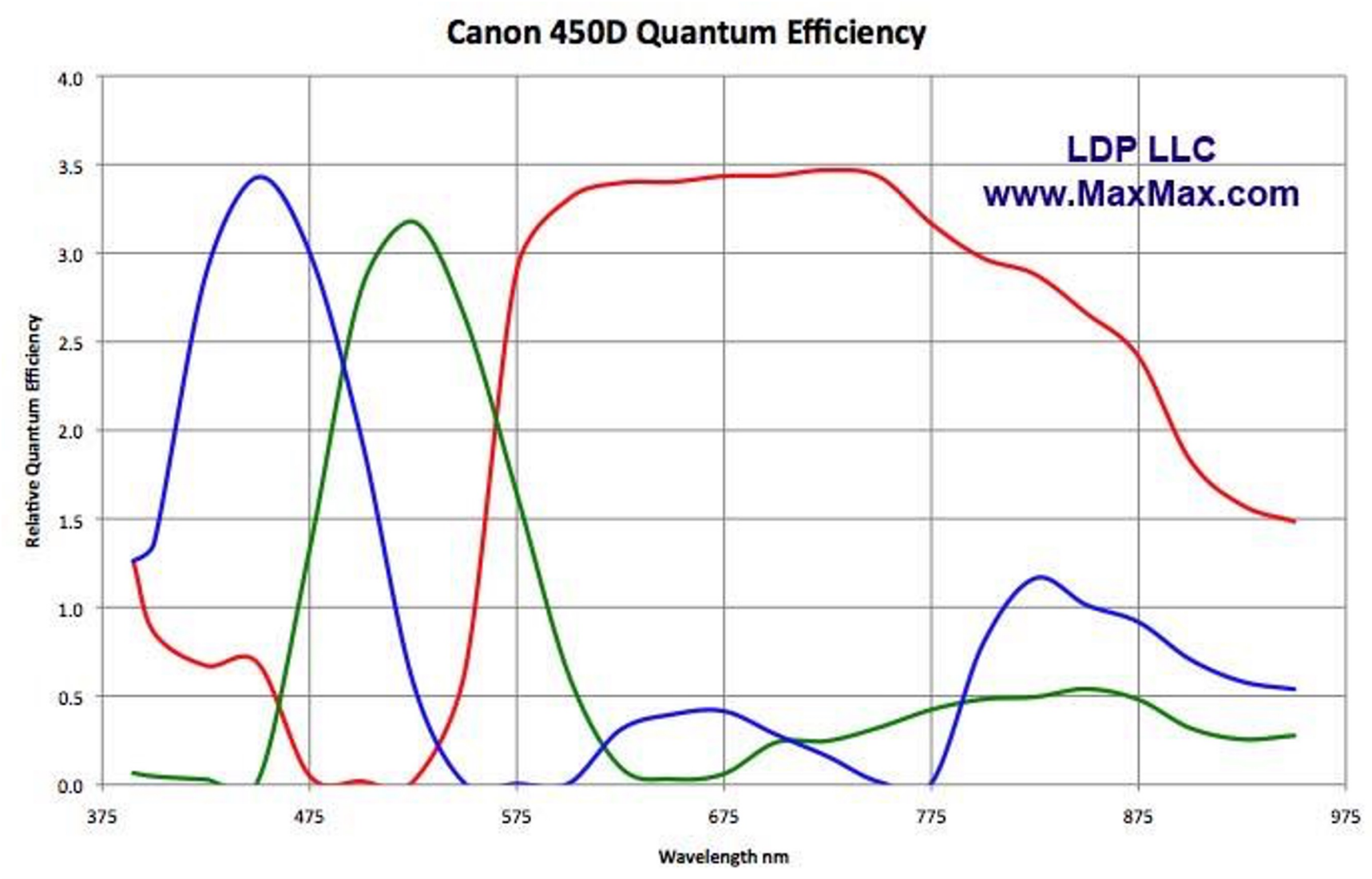
# Practical Color Sensing: Bayer Grid

- Estimate RGB
  at 'G' cells from neighboring values



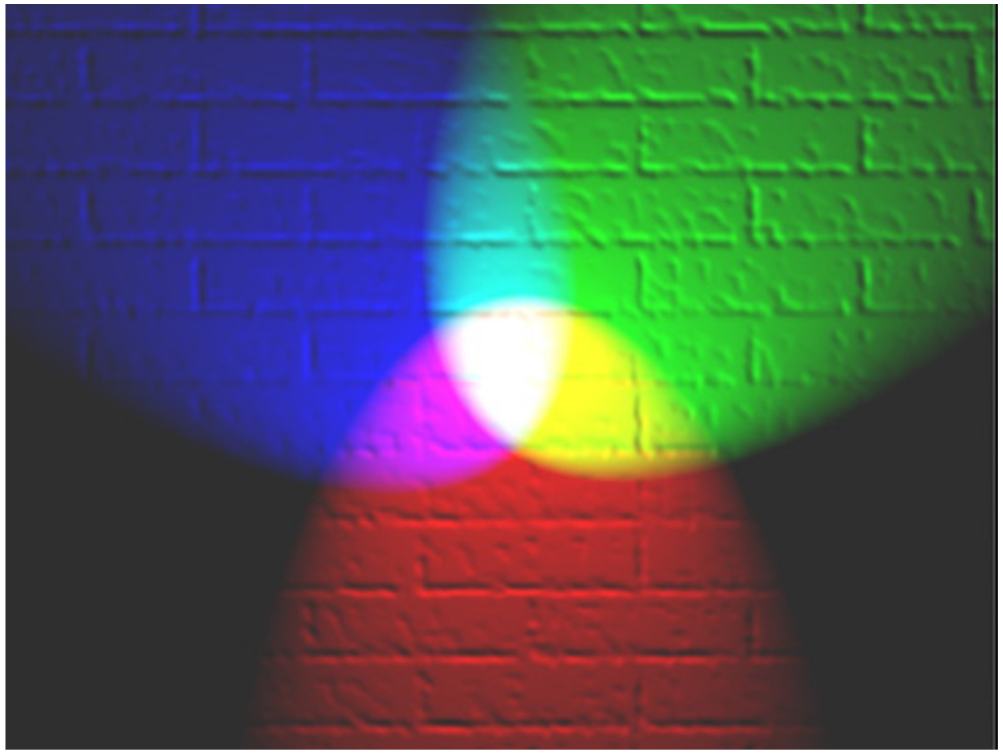

Steve Seitz

# Camera Color Response



# Color spaces

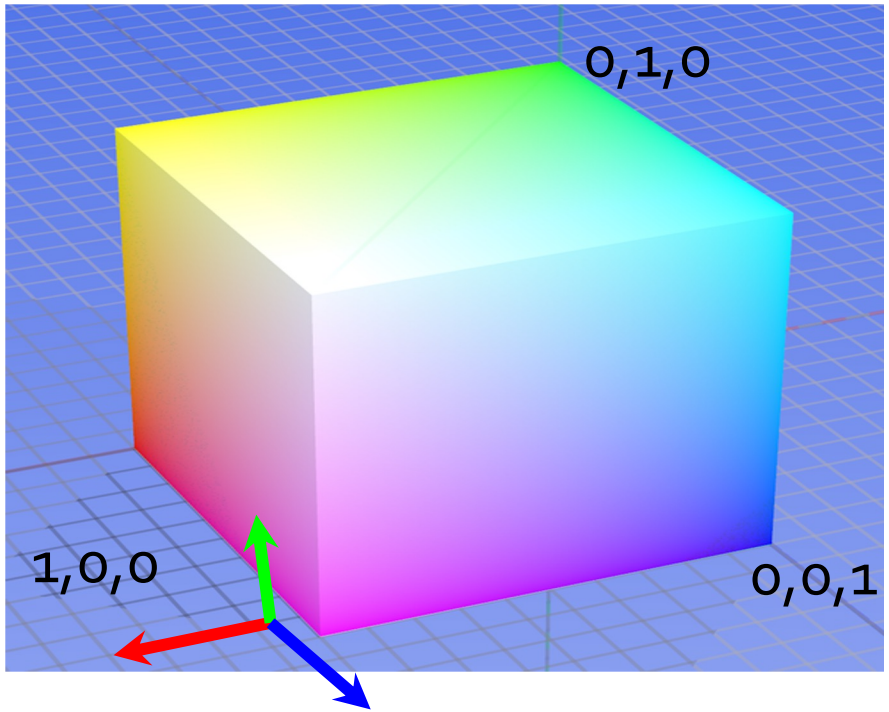
- How can we represent color?



# Default color space – RGB

Any color = r*R + g*G + b*B

- Strongly correlated channels
- Non-perceptual




R = 1
(G=0,B=0)

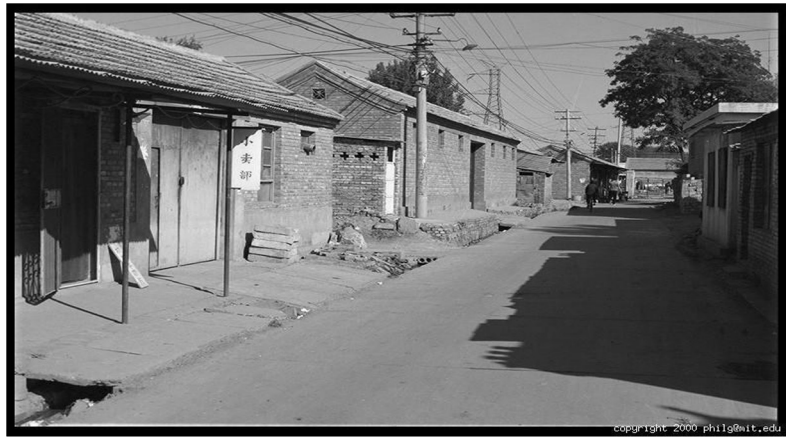
G = 1
(R=0,B=0)

B = 1
(R=0,G=0)

# Most information in intensity


Original image

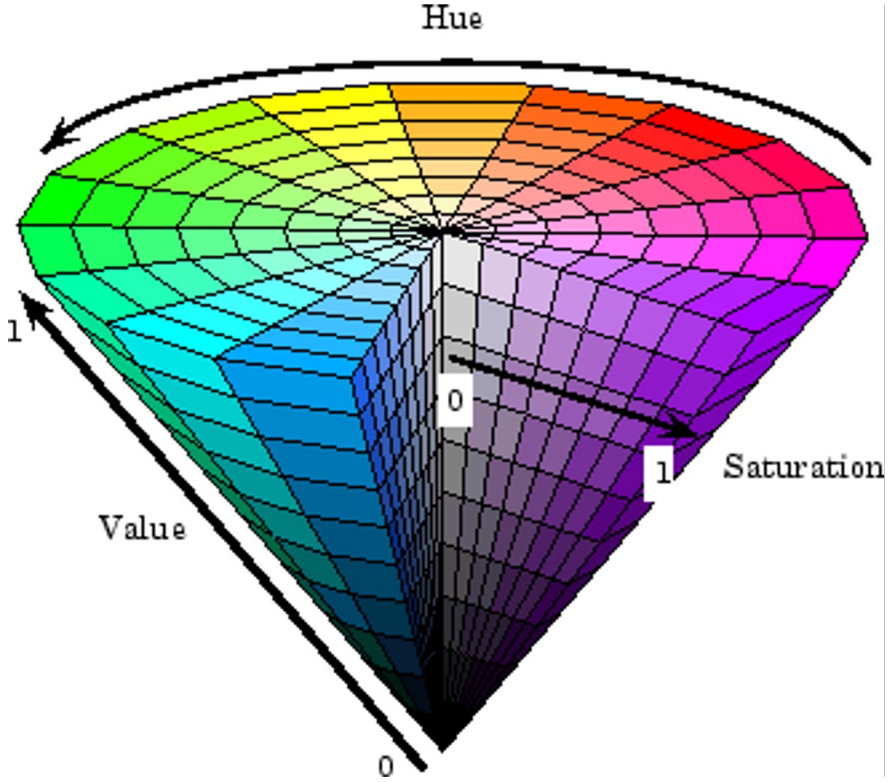
Only color shown – constant intensity

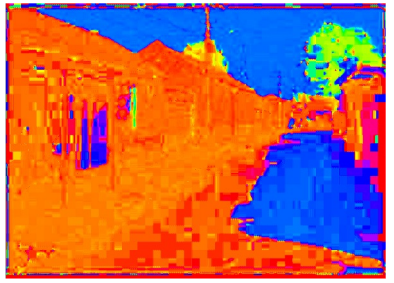



Only intensity shown – constant color

# Color spaces: HSV

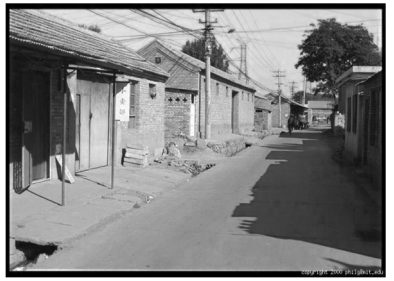
Intuitive color space



H
(S=1,V=1)

S
(H=1,V=1)

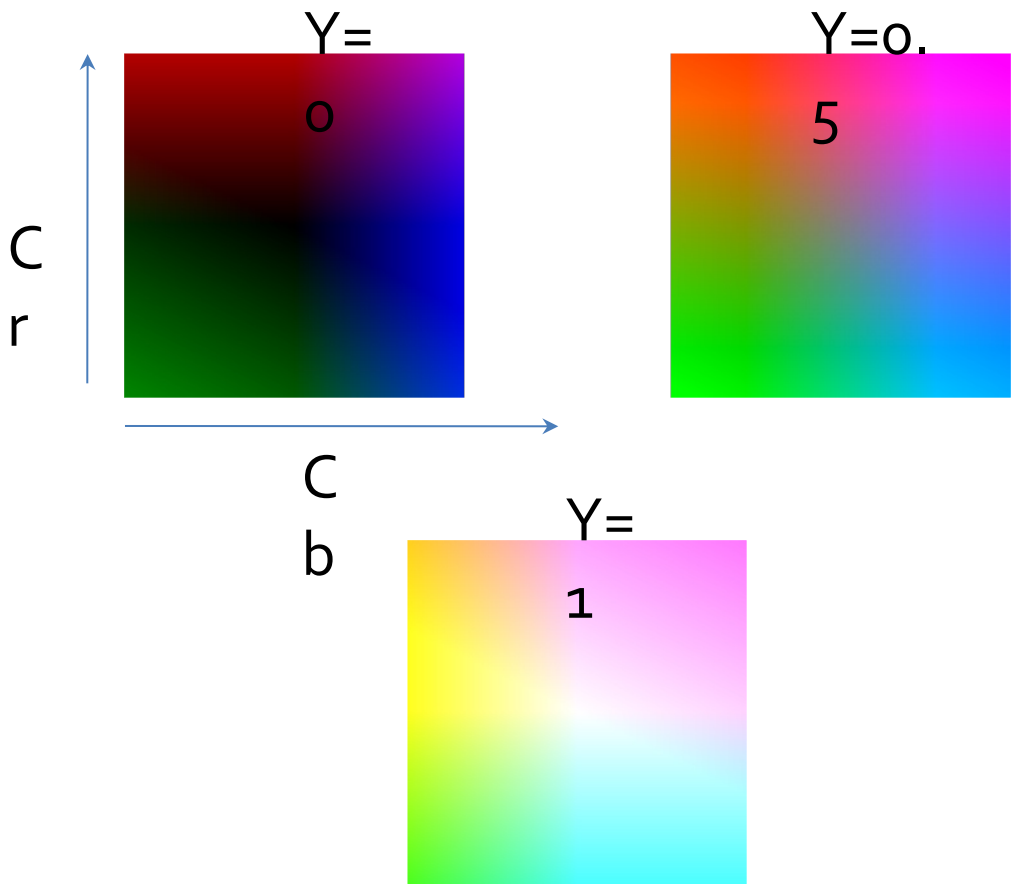


V
(H=1,S=0)

James Hays

# Color spaces: YCbCr

Fast to compute, good for compression, used by TV




Y
(Cb=0.5,Cr=0.5)

Cb
(Y=0.5,Cr=0.5)

Cr
(Y=0.5,Cb=0.5)

James Hays

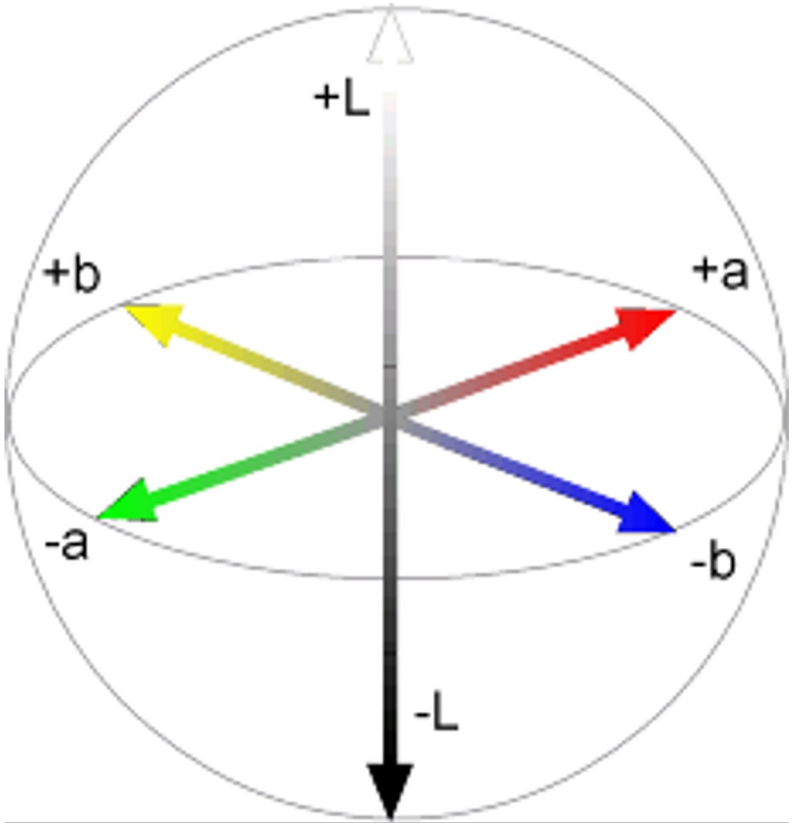
# Most JPEG images & videos subsample chroma

PSP Comp 3
2x2 Chroma subsampling
285K

Original
1,261K lossless
968K PNG

# Color spaces: L*a*b*

"Perceptually uniform"* color space




L
(a=0,b=0)

a
(L=65,b=0)

b
(L=65,a=0)

James Hays