Color Spaces
CNM 190, Spring 2010
Jeremy Huddleston & Dan Garcia

Terms (1)
- Chromaticity
- Hue, "base color"
- Saturation, "tint"
- Brightness, Luminance, Value, "shade"
- Complimentary -- add to white
- Gamut -- encodable subset

Spectral Analysis

CIE XYZ (1)
- Commission Internationale de l’Eclairage (1931)
- 2D slice with Luminance = 1
- Border consists of the spectral primaries

CIE XYZ (2)
- Gamut for 3 primaries (R,G,B) is their triangle
- Other colors would require "subtraction"
- Color = rR + gG + bB

CIE XYZ (3)
- Choose 3 imaginary primaries (X, Y, Z)
- Full Gamut
- C = XX + YY + ZZ
- L = X + Y + Z
- x = X / L
  y = Y / L
  z = Z / L
  x + y + z = 1

X = Cr, Y = Cg, Z = Cb
CIE XYZ (4)

- Another Typical Encoding: CIE xyY
- X = xY / y
- Y = Y
- Z = zY / y
- Z = (1 - x - y)Y / y

X = Cr, Y = Cg, Z = Cb


CIE XYZ (5)

Image ref: [SIGGRAPH ET 2005](http://www.youtube.com/watch?v=x0-qoXOCOow)

sRGB (1)

- Color = rR + gG + bB
- White point = D65
- "White Balance" is a linear transformation called the Von Kries transform


sRGB (2)

- Primary Colors: RGB
- Secondary Colors: CMY
- Complimentary Colors: RC, GM, BY


HSV, HSL (1)

- Hue: "base color"
- Saturation: "purity"
- Value: Luminance

Image ref: [Apple Keynote Screenshot](http://en.wikipedia.org/wiki/HSL_and_HSV)

HSV, HSL (2)

- Hue: "base color"
- Saturation: "purity"
- Lightness

HSV, HSL (3)

Terms (2)

- Additive Color Space (light)
- Subtractive Color Space (pigments)
- Tone
  - Shade -- adding black -- "value"
  - Tint -- adding white -- "saturation"

CMYK (1)

- Subtractive
- Primary Colors: CMY
- Secondary Colors: RGB
- Why do we need K?

CMYK (2)

- Black slightly increases our gamut
- Black saves us $$$ (one ink pass rather than 3)

Review

- Spectral Graphs
- CIE XYZ
- HSV
- HSL
- sRGB
- CMYK

Extras

- Homework
- BSpace
- Colored Frames on Monday
- Still looking for a reader
- Color Combination Aesthetics
  - http://kuler.adobe.com