lect 4. Color

Color Received = illumination spectrum. * reflection rate

monochromatic light ← light has only one wavelength

human eye { cone → color → fail to work when it is dim
rod → intensity

cone { S 440 ns 1
M 530 ns 5
L 560 ns 10

↑ most sensitive waveform length ↑ Ratio

Cone response. $R^{3\times 1}$ = Cone absorption $R^{3\times n}$ × Illumination $R^{n\times 1}$

metamers

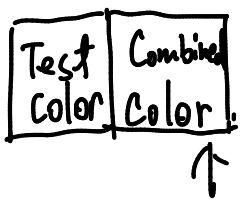
Human thinks two colors are the same. but they are not.

Application:

Assume counterfeit ink is different from real ink,
use a hyper-spectral camera to distinguish them

Color Match Test

use a color space (say, RGB) to reconstruct a certain color.



↑ use color in color space.

Problem for RGB space.

Sometimes, we could NEVER find a set of RGB to let the color on the right the same as color on the left.

We have to add color on Test color to simulate "negative" color.

RGB can not express all colors.

↓

Solution:

Use other color space, say CIE, HSV

Grassman Law

RGB color space is regarded as linear.

If color $C_1 = [R_1, G_1, B_1]$

color $C_2 = [R_2, G_2, B_2]$

Then

color $C_1 + C_2 = [R_1 + R_2, G_1 + G_2, B_1 + B_2]$

Linear Color Space.

Say RGB, CIE

Non-linear Color Space.

Say. HSV.