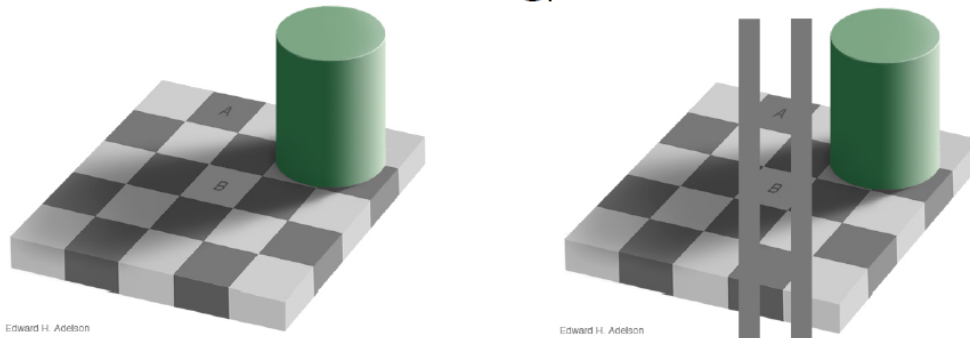


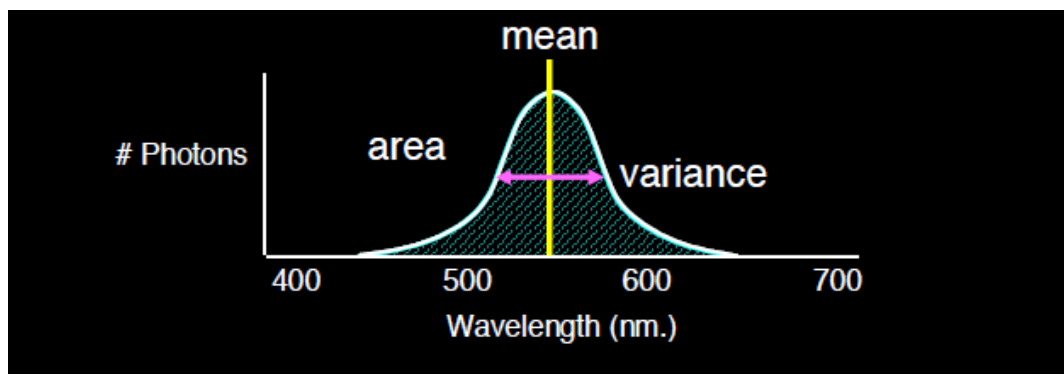
Color

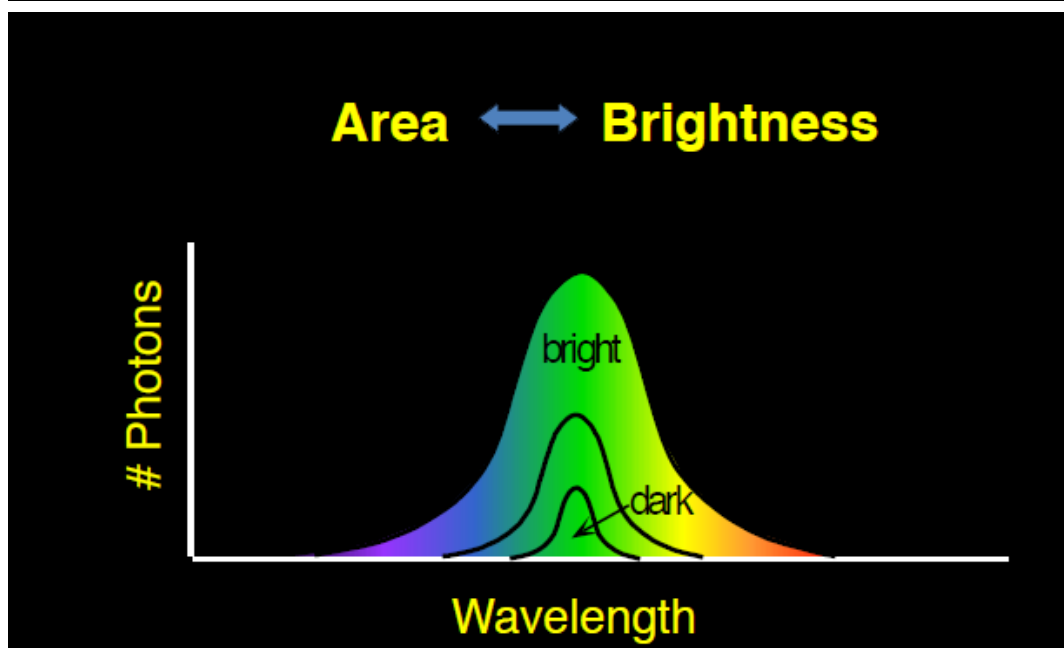
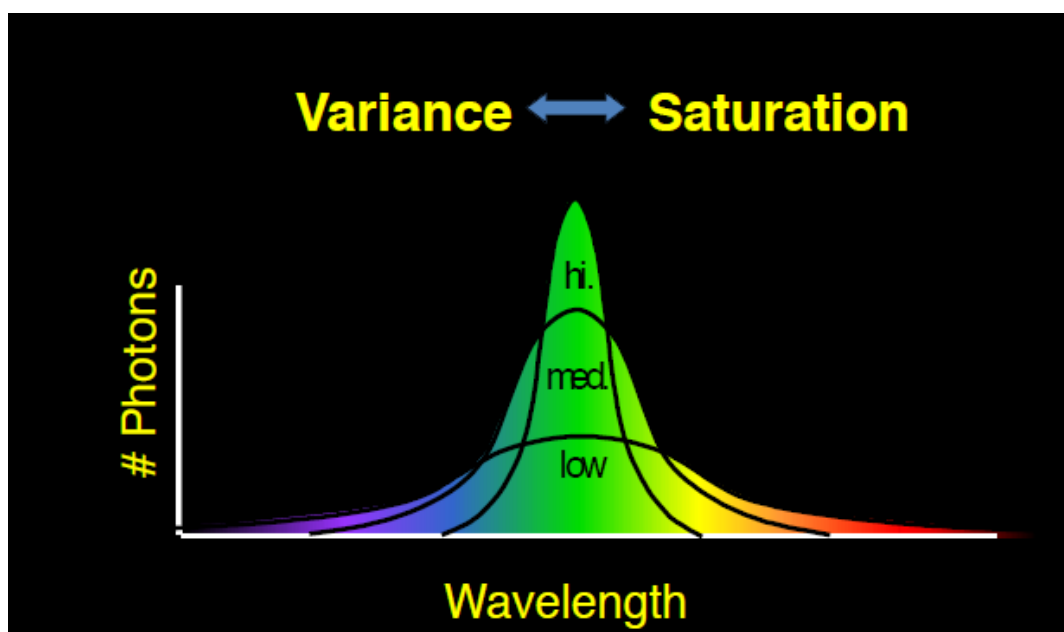
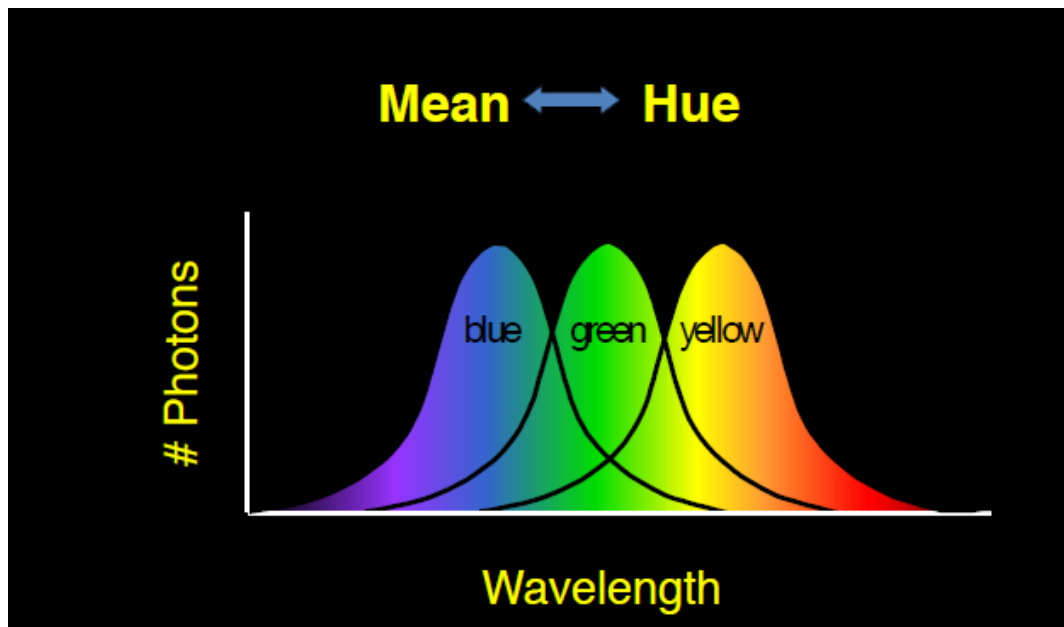
- Result of interaction between physical light in the environment and our visual system
- Psychological property of our visual experiences when we look at objects and lights, not a physical property of those objects or lights
- Checker Shadow Illusion

Checker shadow illusion Checker shadow illusion



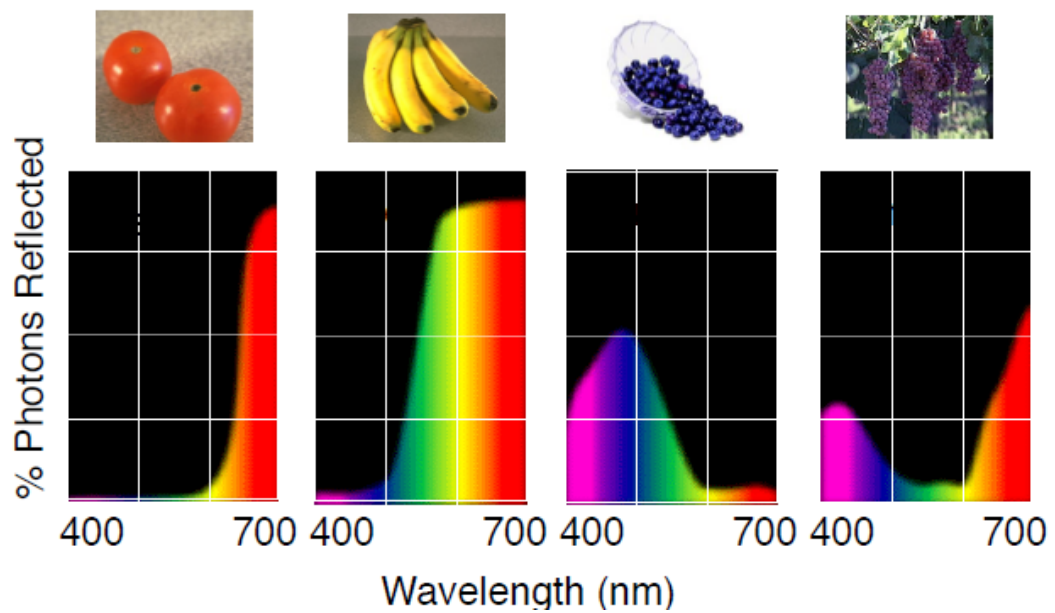
- Possible Explanations
 - Simultaneous contrast
 - Reflectance edges **VS** Illumination edges
- There is no simple functional description for the perceived color of all lights under all viewing conditions
 - Helpful Constraint : Consider only physical spectra with normal distributions



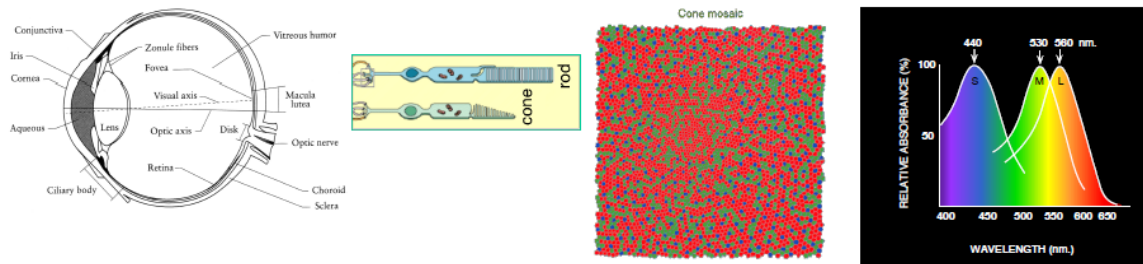


- The Physics of Light
 - Example of the reflectance spectra of surfaces

Some examples of the reflectance spectra of surfaces



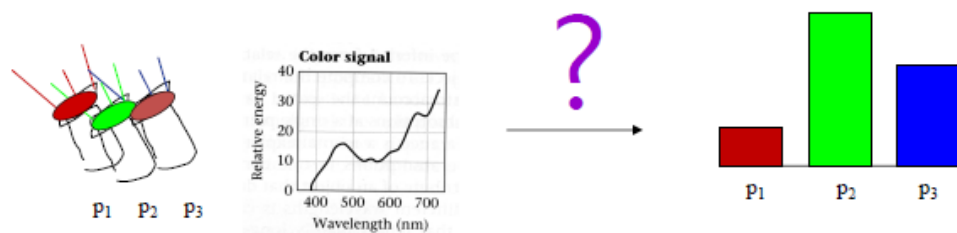
The Eye



- Ratio of **L** to **M** to **S** cones : Approx. **10:5:1**
- Almost no S cones in the center of the fovea

Linear Color Spaces

- How to compute the weights of the primaries to match any spectral signal?
 - Given : A choice of **three primaries** and a **target color signal**
 - Find : **Weights of the primaries** needed to match the color signal



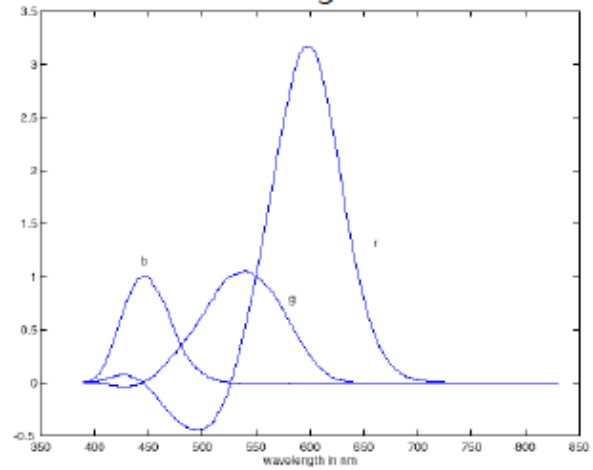
- Also need to specify **matching functions**
 - The amount of each primary needed to match a monochromatic(단색의) light source at each wavelength

RGB primaries



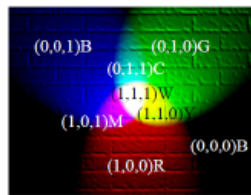
- $p_1 = 645.2 \text{ nm}$
- $p_2 = 525.3 \text{ nm}$
- $p_3 = 444.4 \text{ nm}$

RGB matching functions



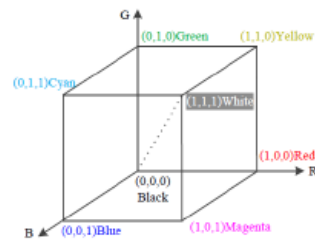
• RGB 모델

- 길이가 1인 정육면체로 색을 표현

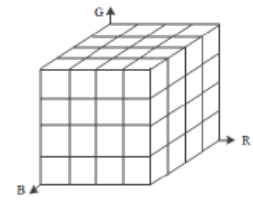


(a) 빛의 혼합

- (1,0,0)=Red
- (0,1,0)=Green
- (0,0,1)=Blue
- (0,1,1)=Cyan
- (1,0,1)=Magenta
- (1,1,0)=Yellow
- (0,0,0)=Black
- (1,1,1)=White



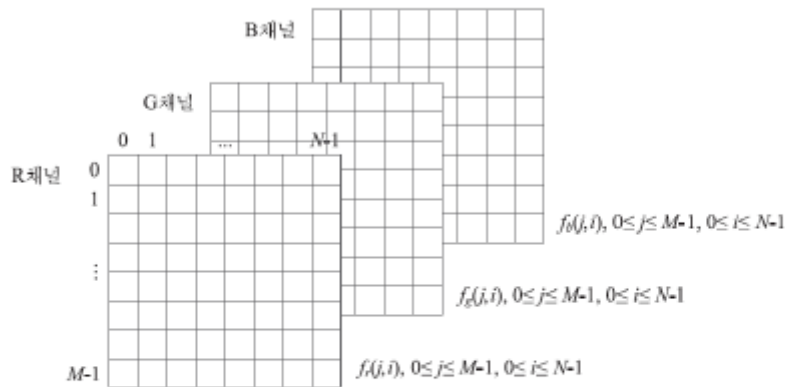
(b) RGB 큐브



(c) 양자화된 4×4×4 RGB 큐브

- 영상 표현

= f_r, f_g, f_b 의 세 채널로 표현



> RGB 영상(원래 영상)
> 그림 2-44 RGB 컬러 영상

• HSI 모델

- 이중 콘으로 색을 표현

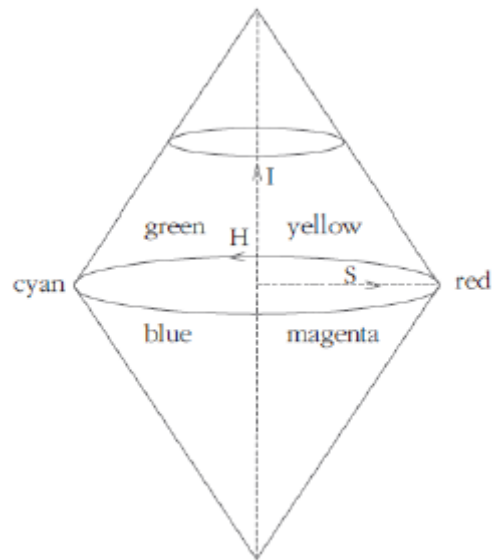
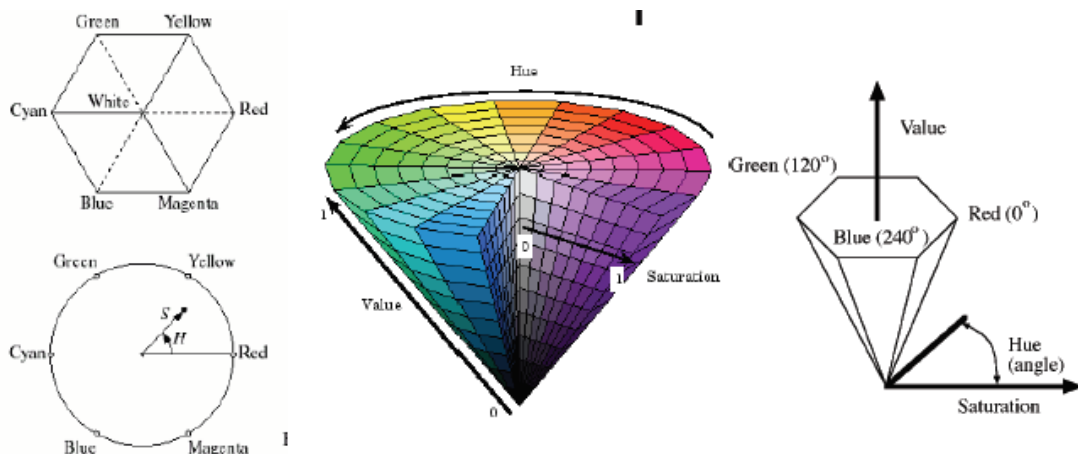


그림 2-45 HSI 컬러 모델

Nonlinear Color Spaces : HSV

- Perceptually meaningful dimensions : **Hue**, **Saturation**, **Value**(Intensity)
- RGB cube on its vertex(꼭지점)



컬러 영상 처리

- 가장 단순한 방법 : 세 채널을 독립적으로 처리



그림 2-46 RGB 영상에 가우시안 스무딩($\sigma=2.0$)을 적용한 결과



Uses of Color in CV

- Color histograms for **image matching**



- Multicolor



- Image Segmentation

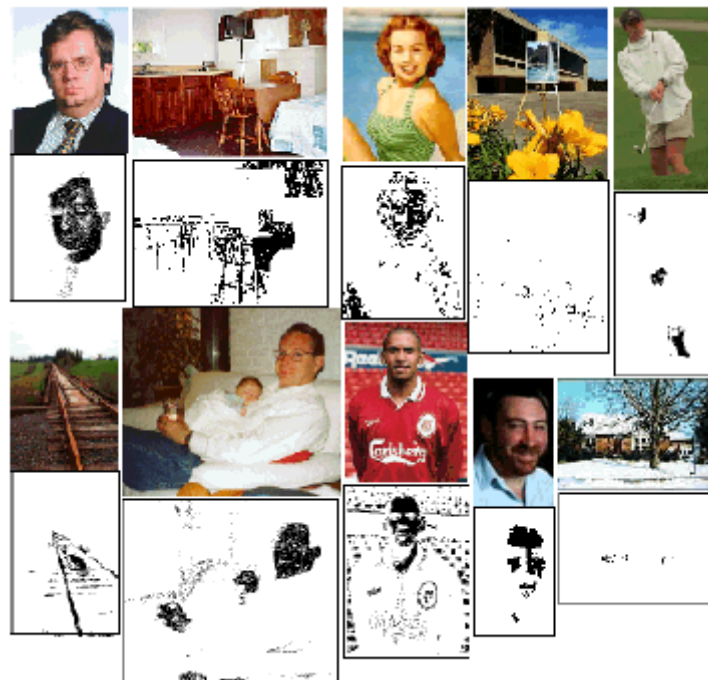
Query image: 108019 Query blobs

Blob and feature importances					
	blob (overall)	color	texture	location	shape
blob 2	very	very	somewhat	not	not
blob 1	somewhat	very	somewhat	not	not

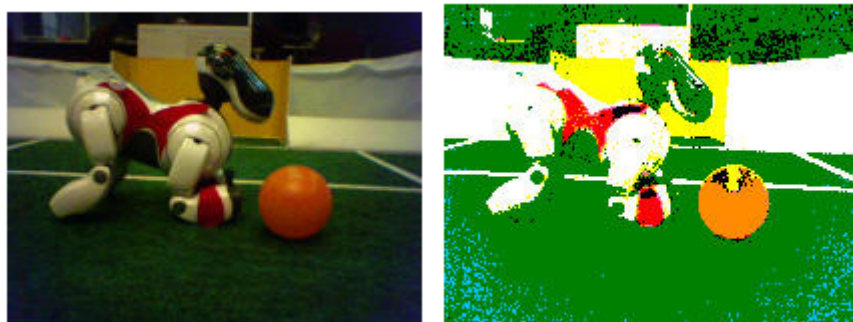
Querying from 10000 images (full search).

1: 108084 (score = 0.94221)			2: 108029 (score = 0.94236)		
3: 108023 (score = 0.94175)			4: 108066 (score = 0.93994)		
5: 108044 (score = 0.93944)			6: 108051 (score = 0.93904)		
7: 103004 (score = 0.87714)			8: 258012 (score = 0.67656)		

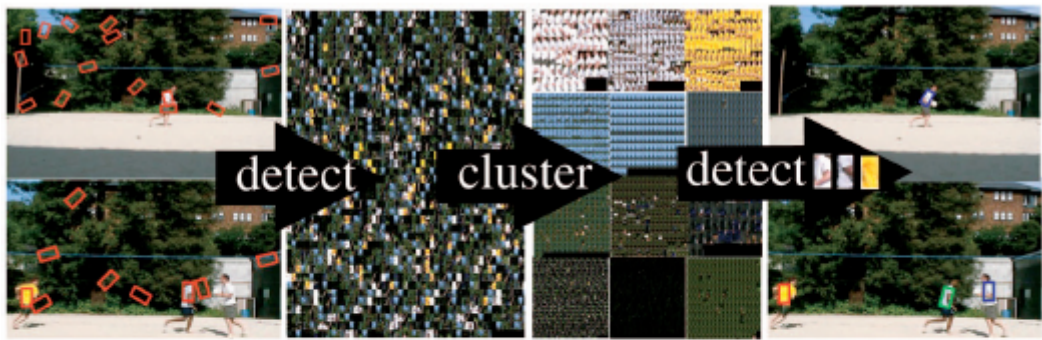
- Skin Detection



- Robot Soccer



-



model
build

