Color

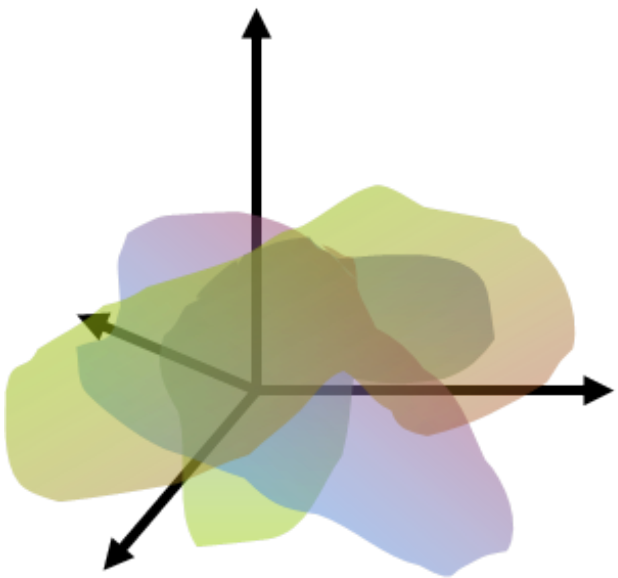
CVFX @ NTHU

26 Feb 2015

Outline

Color spaces

- RGB
- HSV
- Basis?
- Dimension?



Properties of color spaces

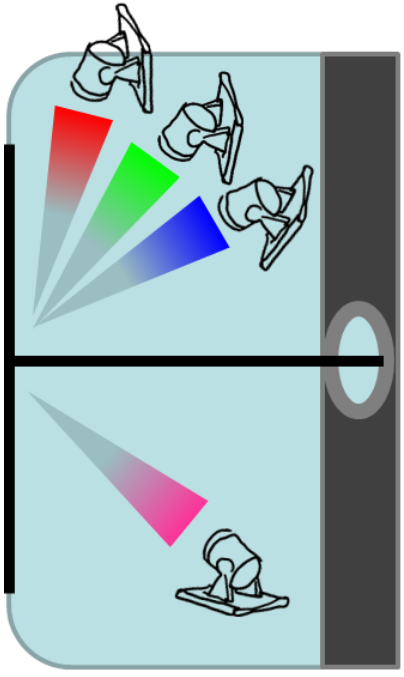
Grassman's laws

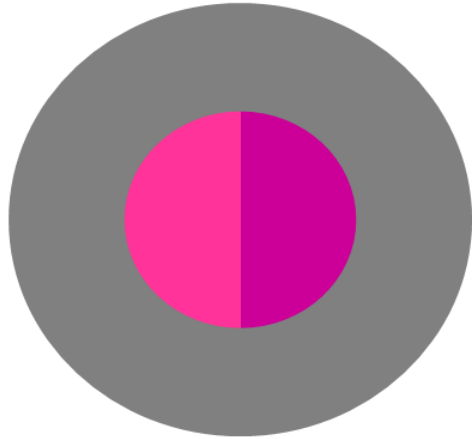
- Linearity

Trichromacy

Color matching functions

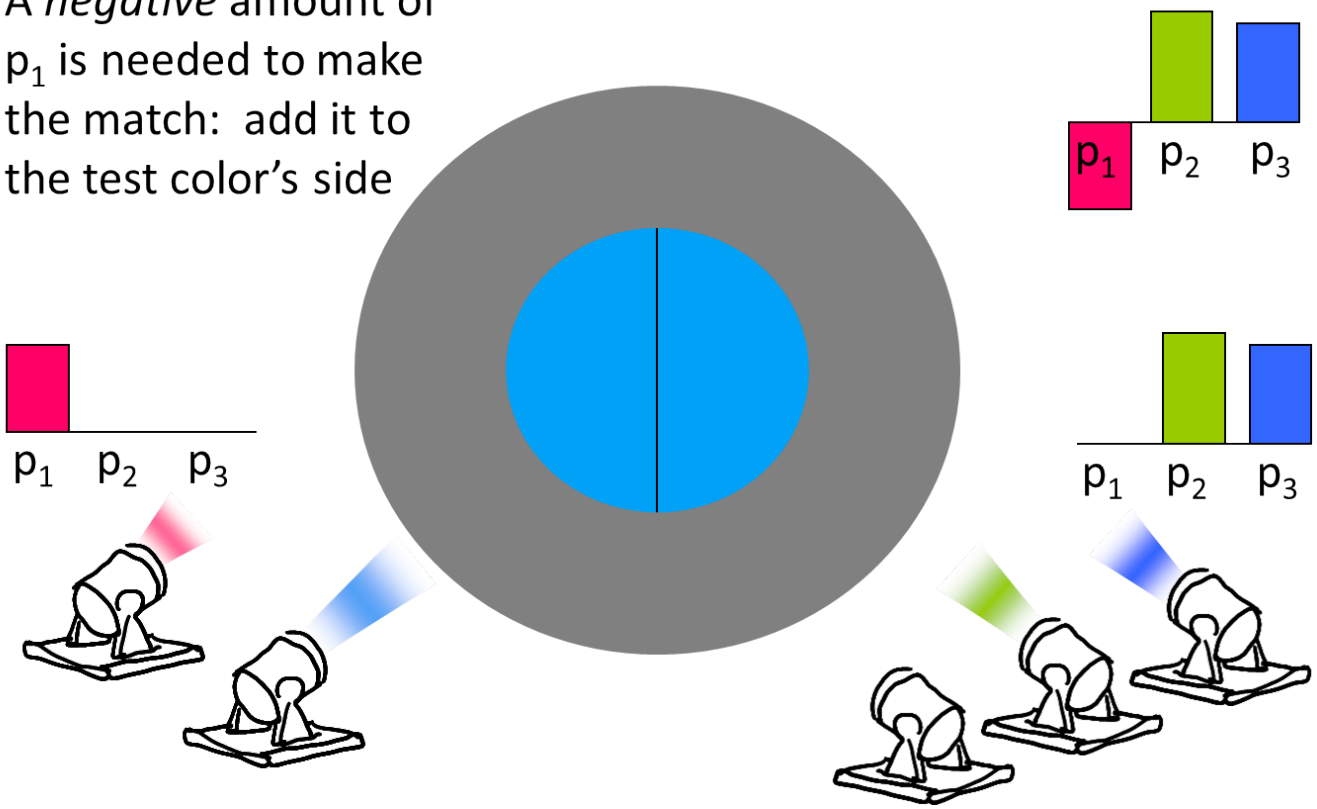
Color matching



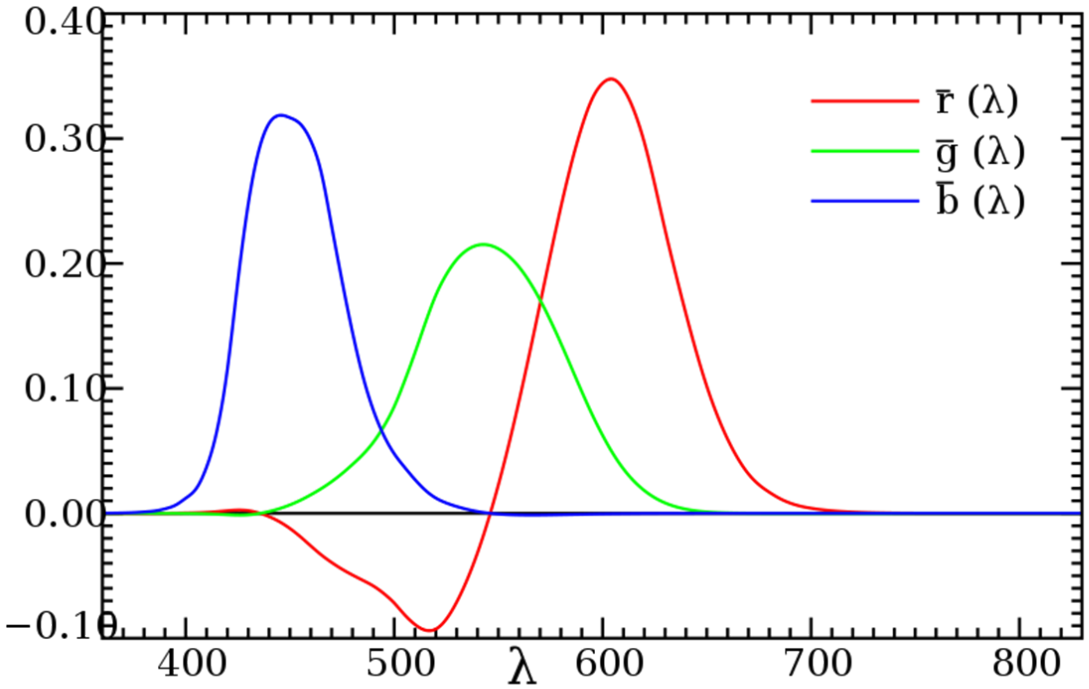


Color matching experiment

A *negative* amount of p_1 is needed to make the match: add it to the test color's side



CIE 1931 RGB Color Matching Functions



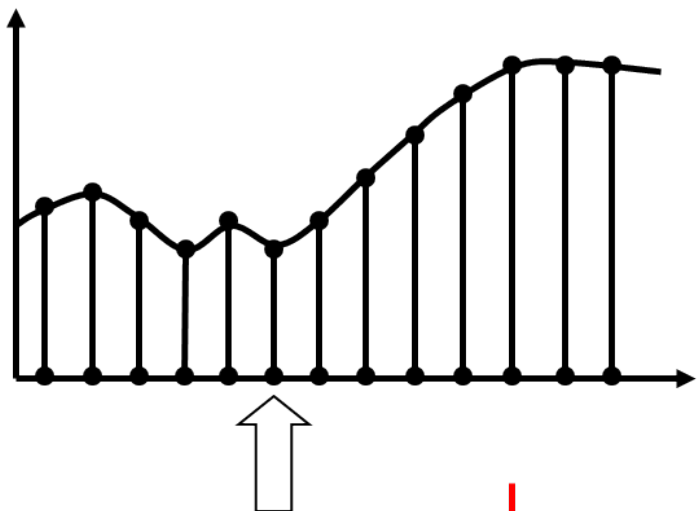
700 .0nm
546.1 nm
435.8 nm

[Wikipedia]

Deriving the Match Weights (Discrete Version)

$$c_1 \left| \quad + \quad c_2 \right| \quad + \quad c_3 \left|\right.$$

$$= \sum_k w_{k1} \left| \quad + \sum_k w_{k2} \right| \quad + \sum_k w_{k3} \left|\right.$$



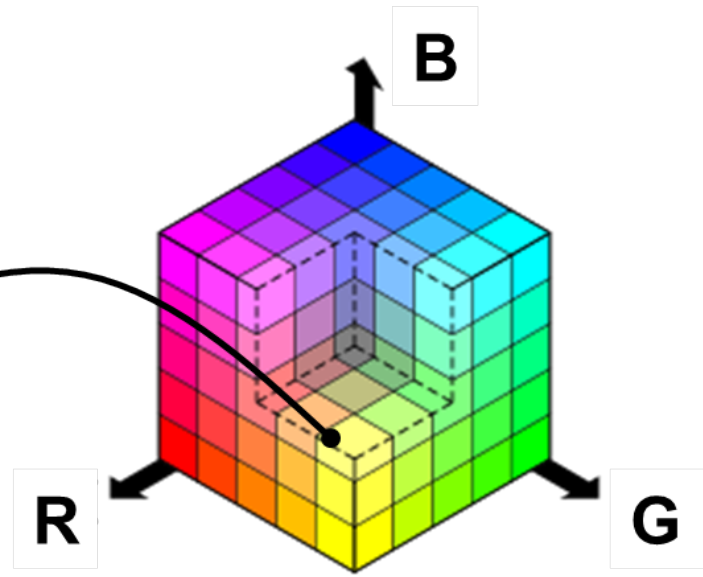
$$= \quad w_{k1} \left| \quad + \quad w_{k2} \right| \quad + \quad w_{k3} \left|\right.$$

RGB

32-bit mode

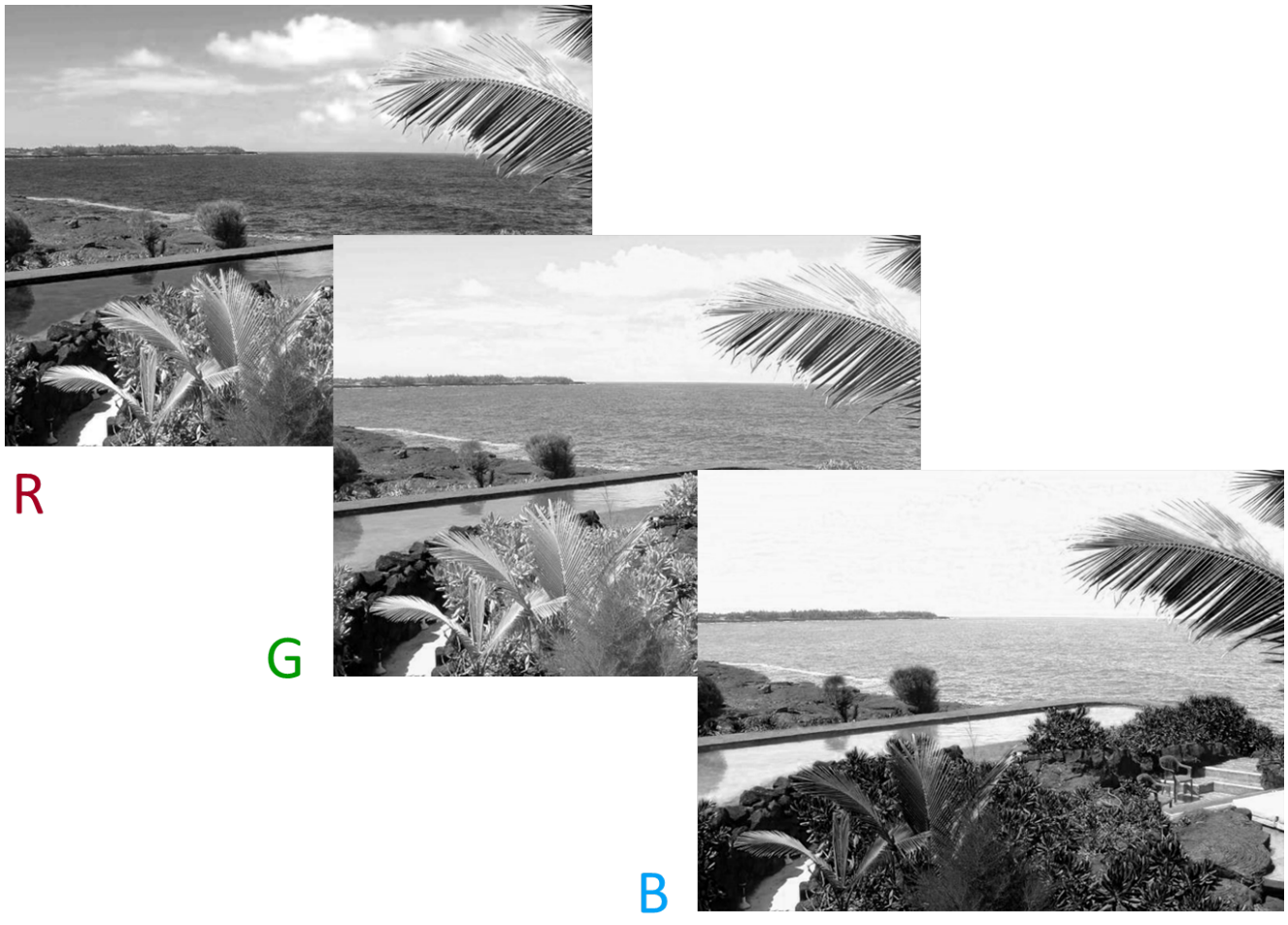
- Only 24 bits are used
- 8 bits each channel

(c_1, c_2, c_3)

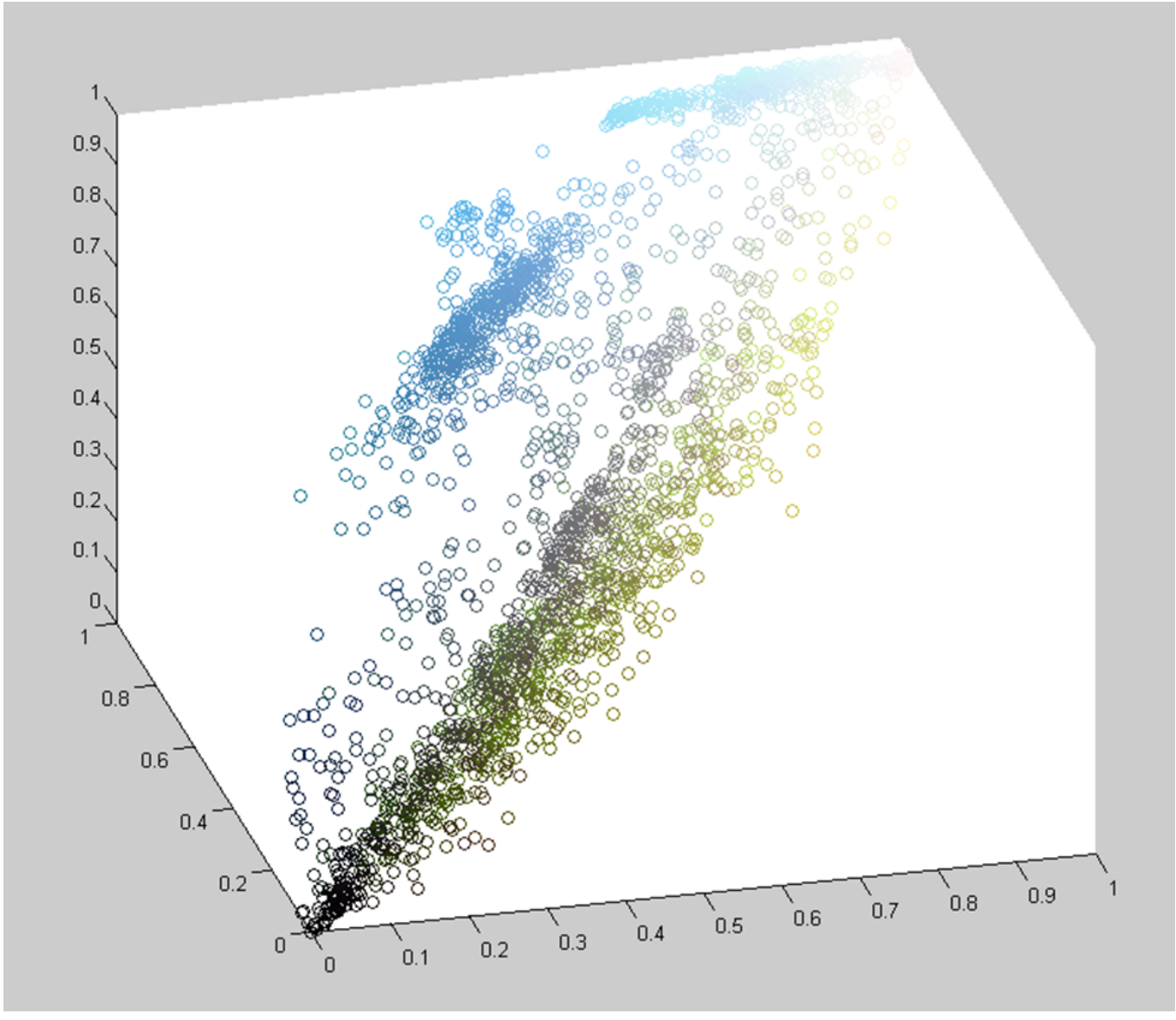


Euclidean distance in RGB space

Individual channels



Color distribution in RGB space



Blurred R channel

Color image with blurred R channel

Blurred G channel

Color image with blurred G channel

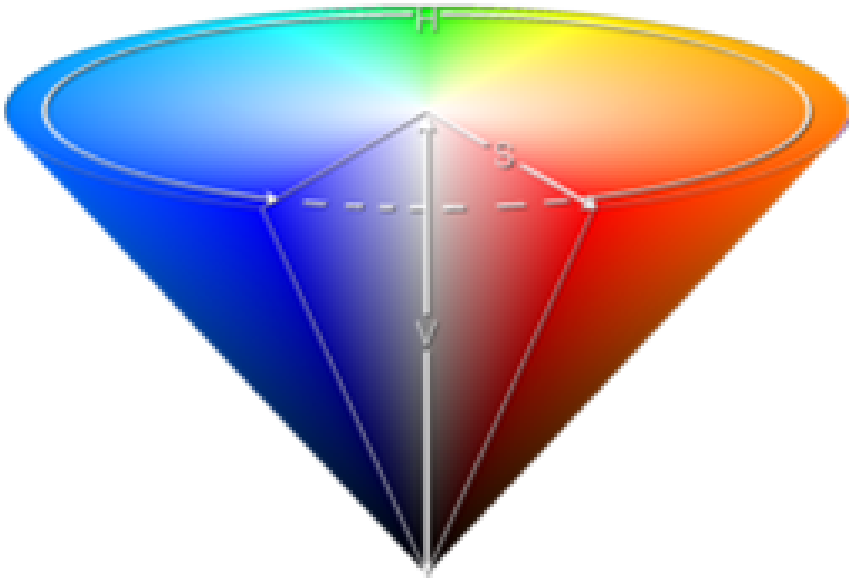
Blurred B channel

Color image with blurred B channel

Explanation?

HSV color space

- Hue, saturation, value
- Non-linear



An example

Color Harmonization

Daniel Cohen-Or Olga Sorkine Ran Gal Tommer Leyvand
Tel Aviv University*

Ying-Qing Xu
Microsoft Research Asia†

original image harmonized image

Figure 1: Harmonization in action. Our algorithm changes the colors of the background image to harmonize them with the foreground.

In grayscale

Color Harmonization

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Figure 1: Harmonization in action. Our algorithm changes the colors of the background image to harmonize them with the foreground.

Color to gray

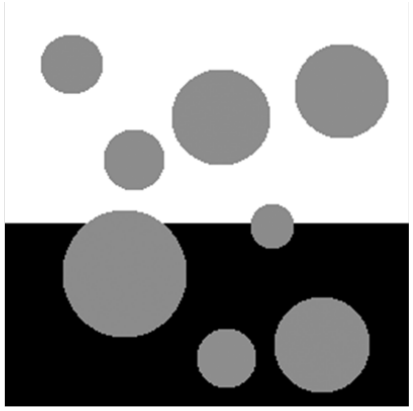
- Color2Gray: Salience-Preserving Color Removal
- Gooch et al., SIGGRAPH 2005

Photoshop

Color2Gray

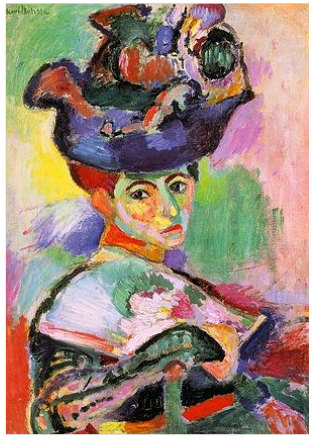
Isoluminant colors

Color



Grayscale

http://en.wikipedia.org/wiki/Woman_with_a_Hat



by Henri Matisse

Color image to grayscale conversion

- http://www.cs.northwestern.edu/~ago820/color2gray/images.html
- http://www.e56.de/c2g.php