THE HONG KONG UNIVERSITY OF SCIENCE AND TECHNOLOGY

Department of
Electronic & Computer
Engineering
電 子 及 計 算 機 工 程 學 系

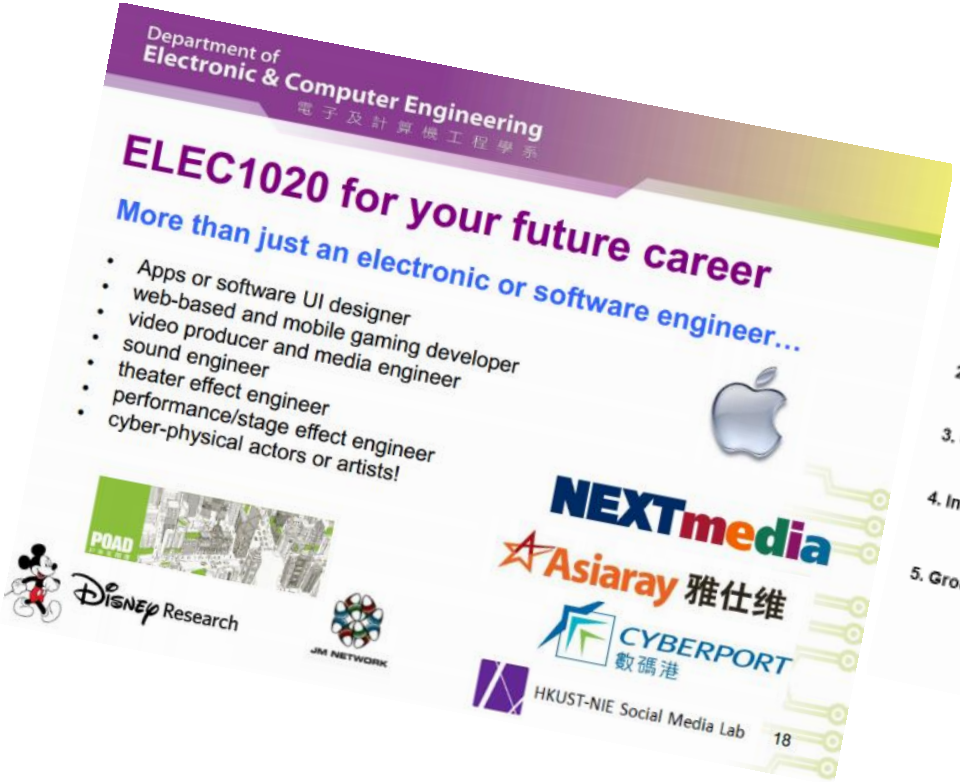
ELEC 1020

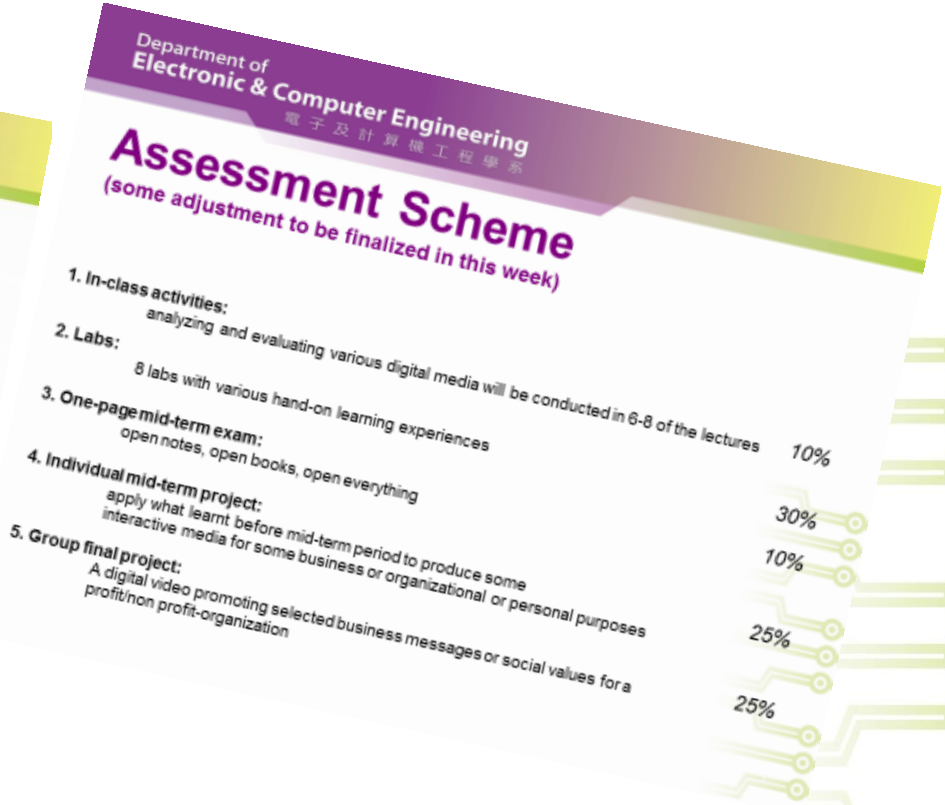
Media Production: Technology and Design

Lecture 2

Prof. James She (*james.she@ust.hk*)

Last lectures





Last lectures

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What's Media? Is it…

7

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Design Principles

Maximize the marketing impacts

A piece of marketing message from a company, individual or charity → The multimedia marketing thing you designed → The perceived message by a group of audience

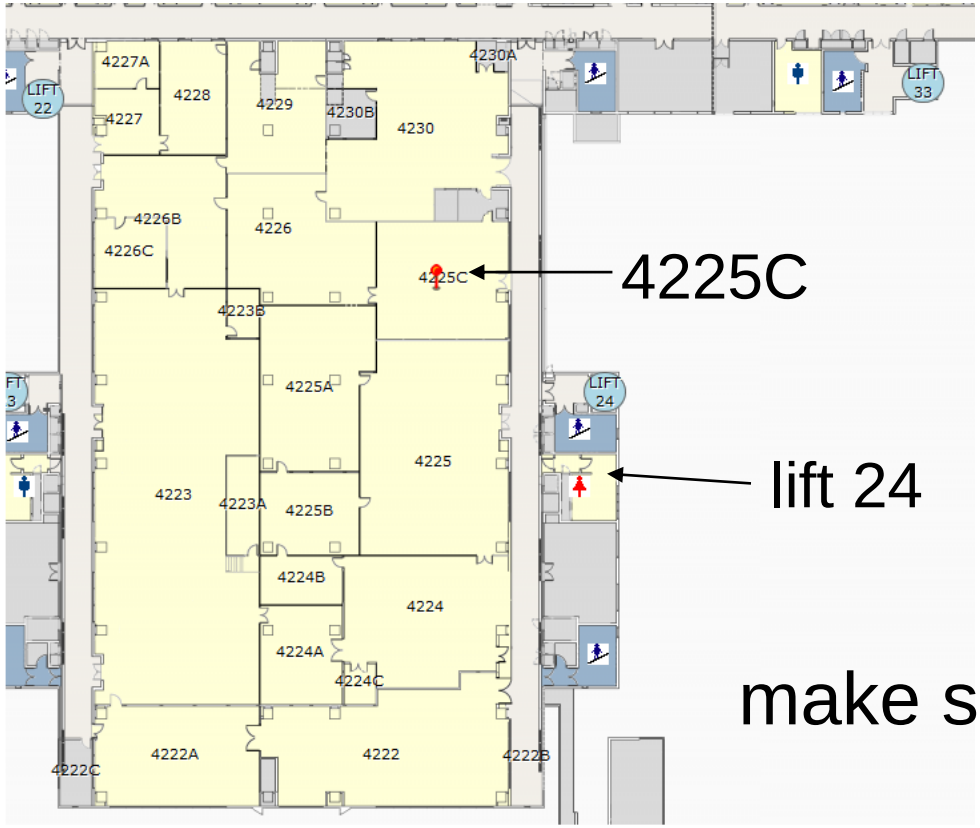
Is the perceived message
1. correct?
2. clear and complete?
3. reaching the right group of audience?
4. covering enough audience?
5. sticky to the audience (i.e., people get impressed and remember)?

➔ The more 'Yes' above, the audience have more perceived impacts.

36

Announcement – 1

- Lab 1 starts this week @ 4225C



4225C

lift 24

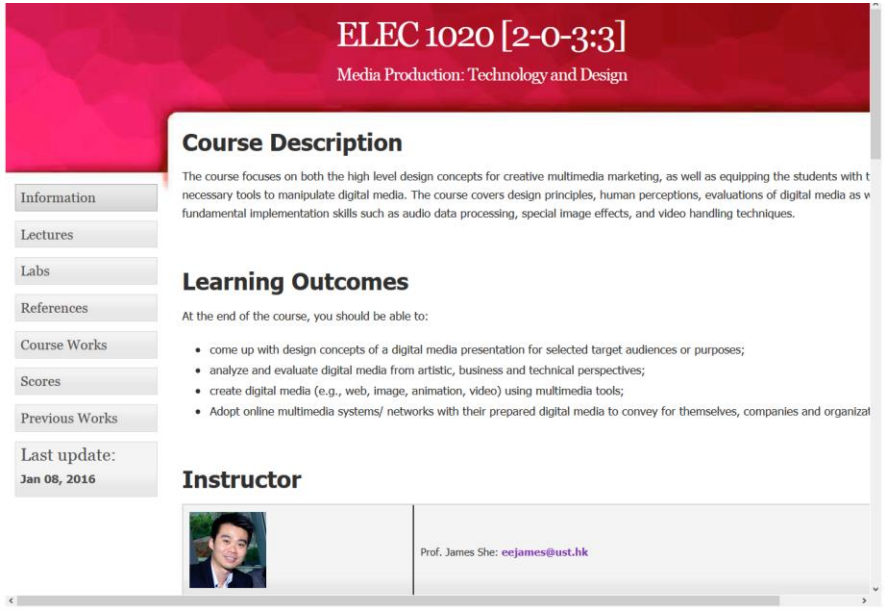
make sure you know the way

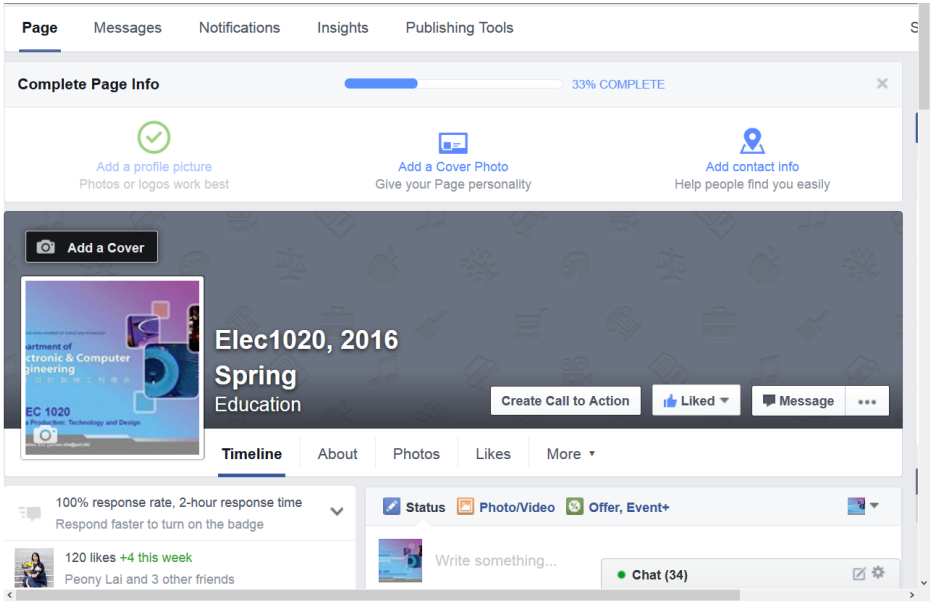
Announcement – 2

In case you have just registered:

course website: http://course.ee.ust.hk/elec1020

course Facebook: https://www.facebook.com/2016springelec1020





Announcement – 3 (Next Lecture)

Guest Speaker:

- Carmen Ng, Creative Lead @ JM Network

Topics:

- Difference between Design and Art
- Outdoor Media Advertising

In-class Activity: What's Media?, suggested answer

Medium
1. wooden board
2. furniture
3. metal frame and pole

Content
1. IKEA
2. JOY
3. Decorate for the holidays
4. Or any reasonable Messages you perceived

Outdoor Billboard Media

What's Media? Content and Medium

An example

Digital Billboard Network

Medium
1. Digital display
2. Wireless access
3. Metal frame and pole

Content
1. REMAX
2. Sales Performance
3. The slogan, "Nobody…"

Coming Lab. 1

Similar to billboard ad., but an online ad. banner

1. Your TA will tell your session to work on one of these

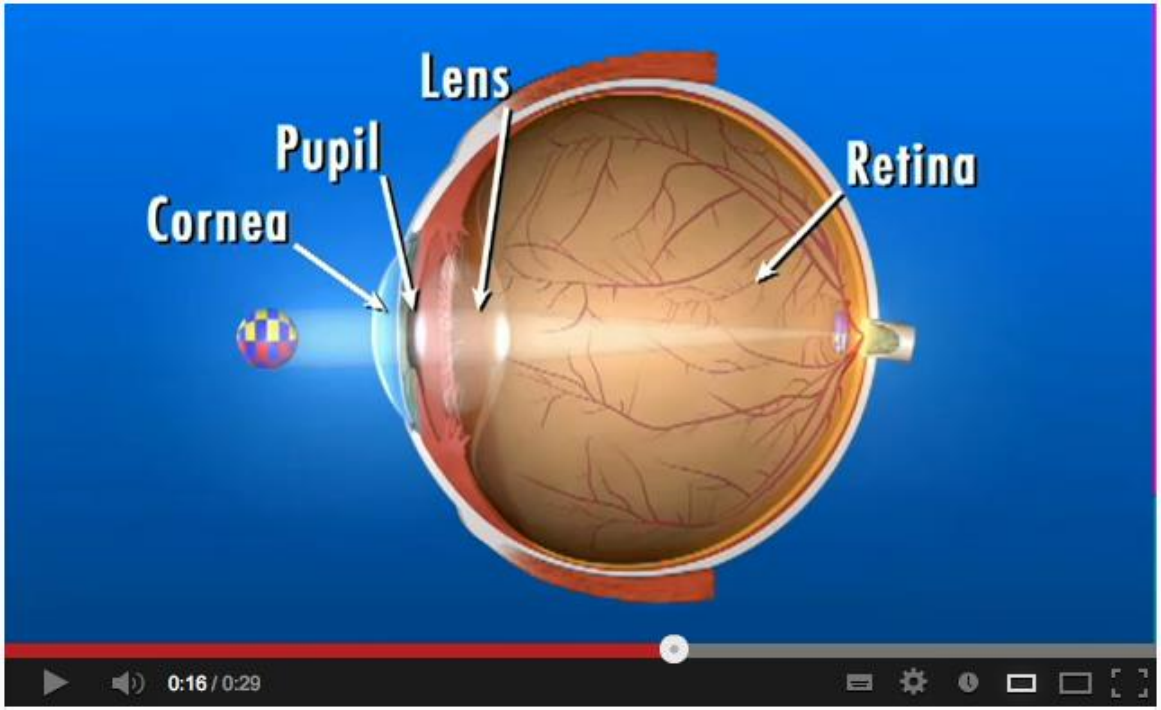
2. Targetted audiences and messages will be provided. (Recall Design Principles)

Outcomes from this lecture

1. Vision and digital image
2. Digital Image Processing
3. Color Representations

How does your eye works?

All about lights intensity…



https://www.youtube.com/watch?v=LpjbOhtcD0A&list=PL03E688C1696F94F4&index=11

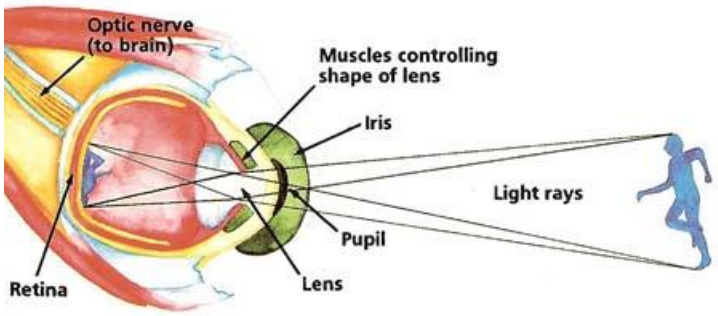
Image Representation

Analog (physical) form

- *Intensity of light reflected on painting, photograph, film-based negative, etc.*

Given a digital display

How we could see an image like the analog (physical) form?



Digital Image Representation

Simulating the physicals

Amplitude domain: the light intensity at a spatial location represented by a number

Spatial domain: a sequence of numbers recorded to represent light intensity at a grid of spatial locations
(i.e., pixels on a display)

0	12	100
0	86	255
100	28	255

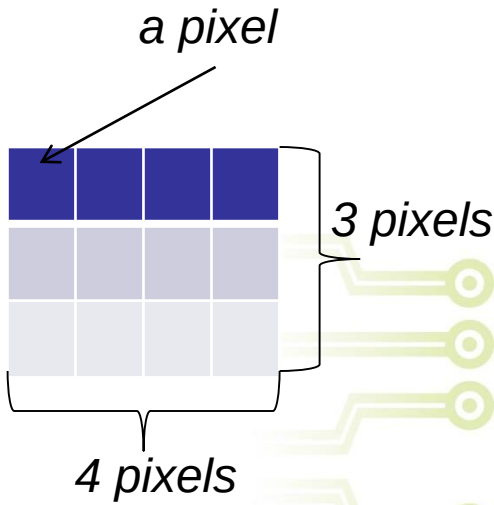
Pixel -
The basic unit that form an image on a display

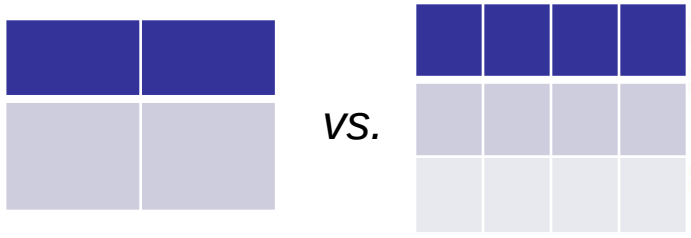
0	12	100
0	86	255
100	28	255

Pixel

The basic unit of an image

- Any digital image on a display is represented by a set of pixels
- Pixel not necessary to be a square; Image not necessary to be regular shape
- Number of pixels in a given size of image or display defining resolution





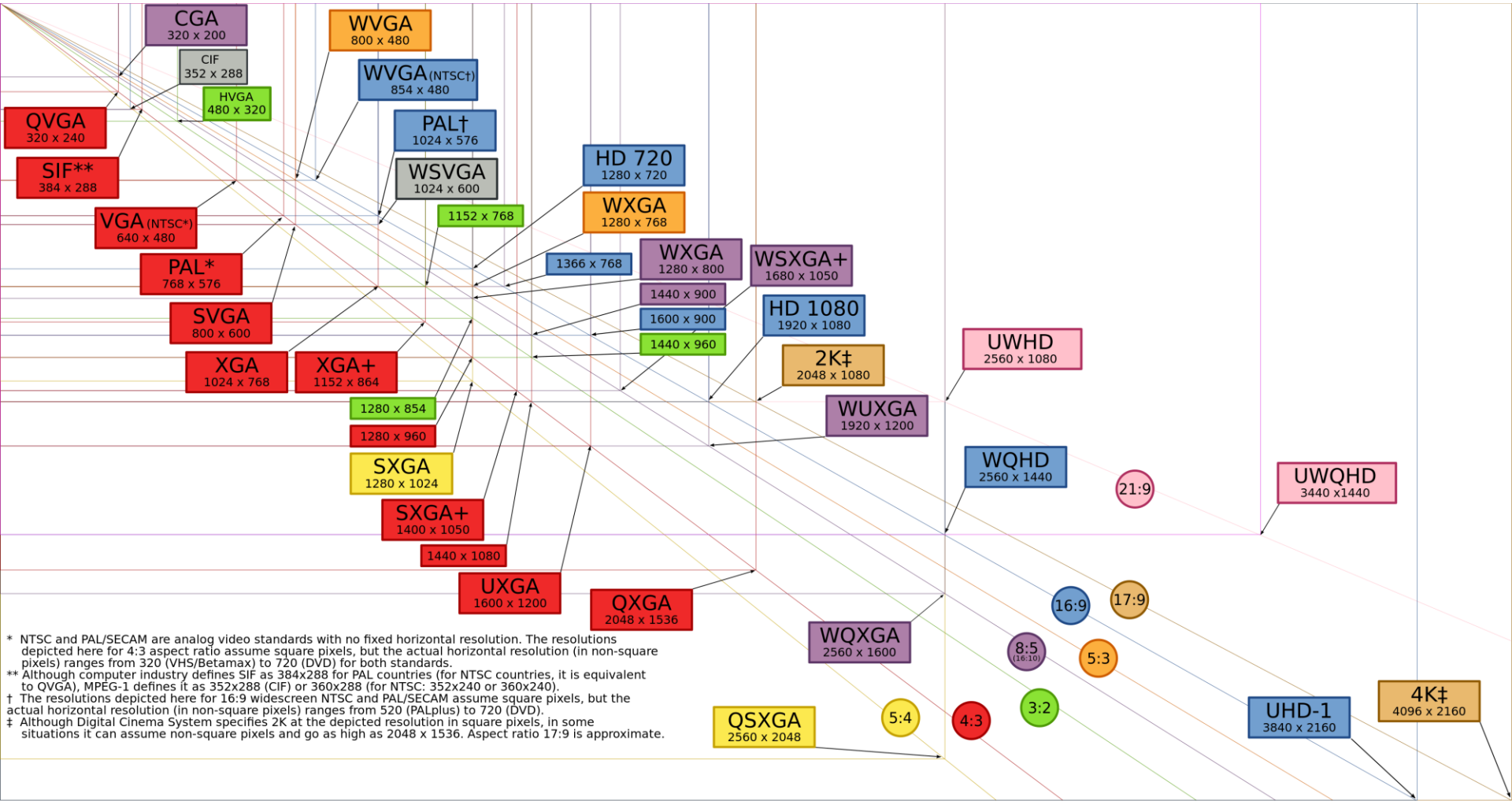
Pixel vs Resolution

Given a display area

iPad 3

iPad 2

Resolutions & Pixels



* NTSC and PAL/SECAM are analog video standards with no fixed horizontal resolution. The resolutions depicted here for 4:3 aspect ratio assume square pixels, but the actual horizontal resolution (in non-square pixels) ranges from 320 (VHS/Betamax) to 720 (DVD) for both standards.
** Although computer industry defines SIF as 384x288 for PAL countries (for NTSC countries, it is equivalent to QVGA), MPEG-1 defines it as 352x288 (CIF) or 360x288 (for NTSC: 352x240 or 360x240).
† The resolutions depicted here for 16:9 widescreen NTSC and PAL/SECAM assume square pixels, but the actual horizontal resolution (in non-square pixels) ranges from 520 (PALplus) to 720 (DVD).
‡ Although Digital Cinema System specifies 2K at the depicted resolution in square pixels, in some situations it can assume non-square pixels and go as high as 2048 x 1536. Aspect ratio 17:9 is approximate.

Resolution of an image

More the better on the same size

lowest resolution

highest resolution

Resolution of an image

More the better on the same size

lower resolution

higher resolution

Can you tell the differences from a distance?

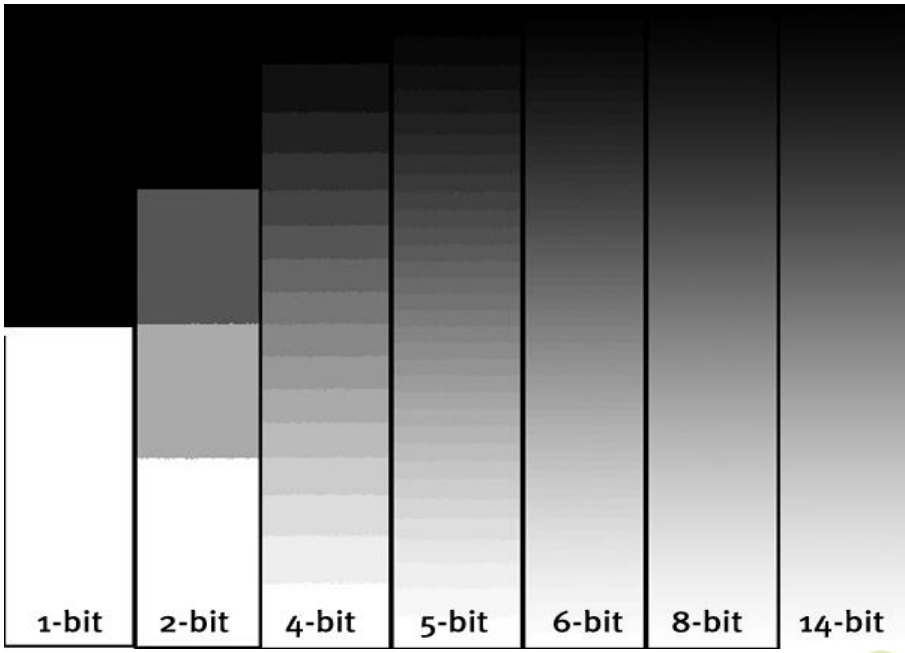
Full High Definition (1920 x 1080)

Pixel (for B/W or gray-scale image)

Define a pixel by light intensity (through # of bits)

A pixel can be represented a simple value of light intensity:
1 bit: "0"=black, "1"=white;
8 bits: "0"=black, "255"=white;

Differences between using?
1) 2-bit and 8-bit per pixel
2) 8-bit and 14-bit per pixel



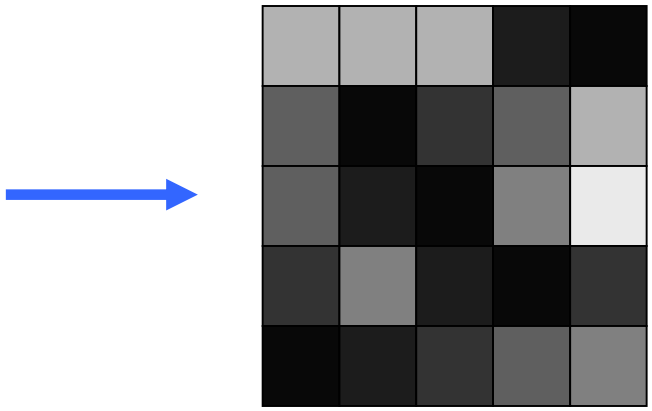
- **Which case is worth putting 6 additional bits?**
- **When to invest more bits on a pixel to enrich the digital representation of an image?**

Bitmap - 1

Bitmap representation (Gray-scale)

- An image is formed by pixels
- Some computer memory is allocated to each pixel to store the intensity of that pixel
- e.g., 3-bit gray scale bitmap representation (how many level?)

6	6	6	2	1
4	1	3	4	6
4	2	1	5	7
3	5	2	1	3
1	2	3	4	5



- Painting tools using bitmap: Photoshop, Microsoft Paint, …

Bitmap - 2

Gray scale image

- Common natural images: 8 bits
- e.g., 8 bit, “0”=black, “255”=white

- Medical images: 12 bits

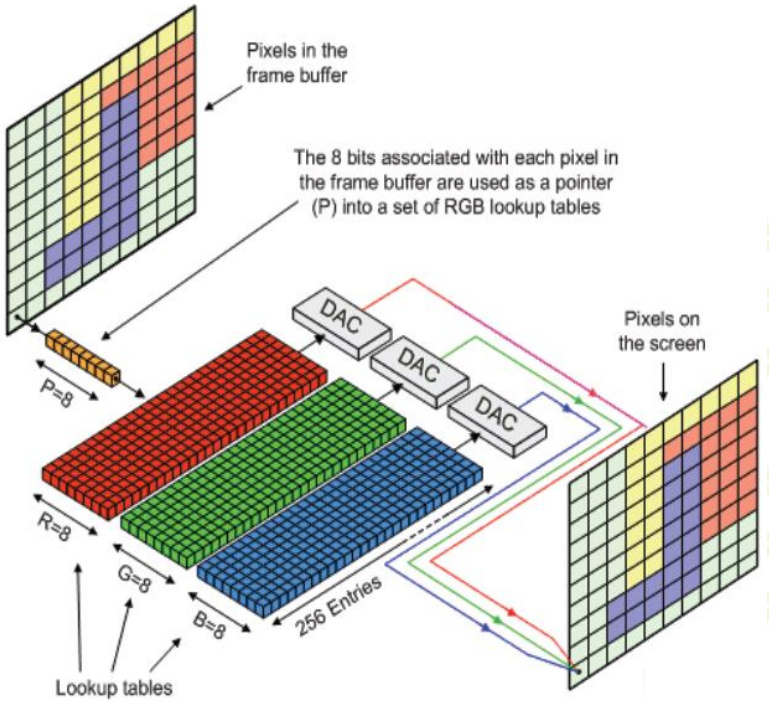
- Adjacent pixels are typically similar, except across edges and in texture regions

Bitmap - 3

Bitmap representation (color)

For each pixel:

- 3 primary colors: red, green, blue
- 3 color values (3 memory allocations)
- 8 bits for each color value
  - 24 bits or 3 bytes per pixel
  - 256 x 256 x 256 ➔ 16,777,216 different colors

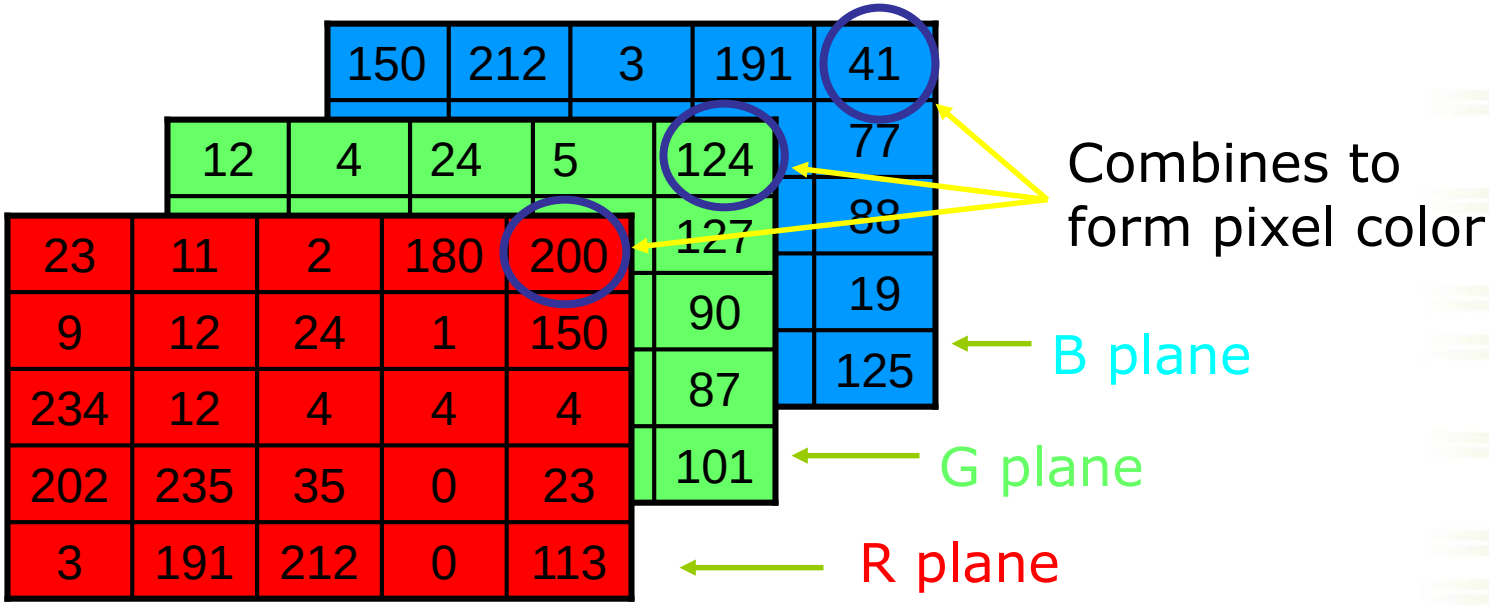


Graphical representation of 8-bit color

Bitmap - 4

24-bit RGB bitmap image

- Each color component forms a plane
- e.g.,

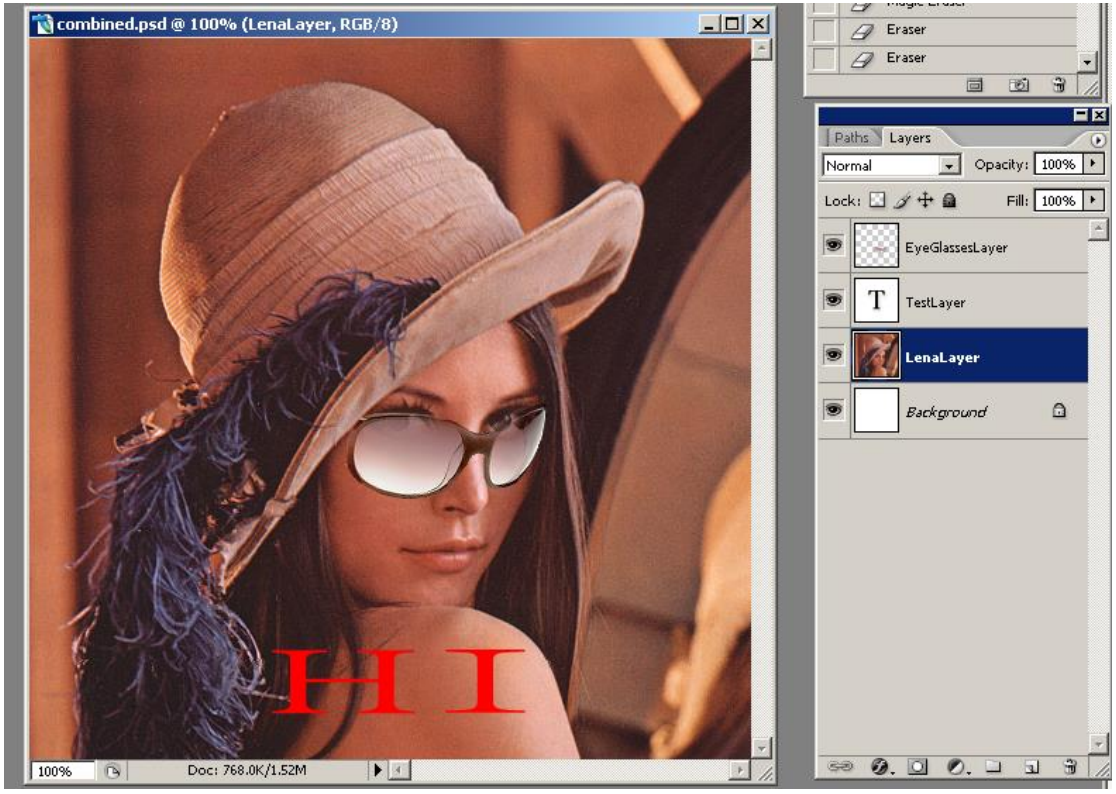


10 min break

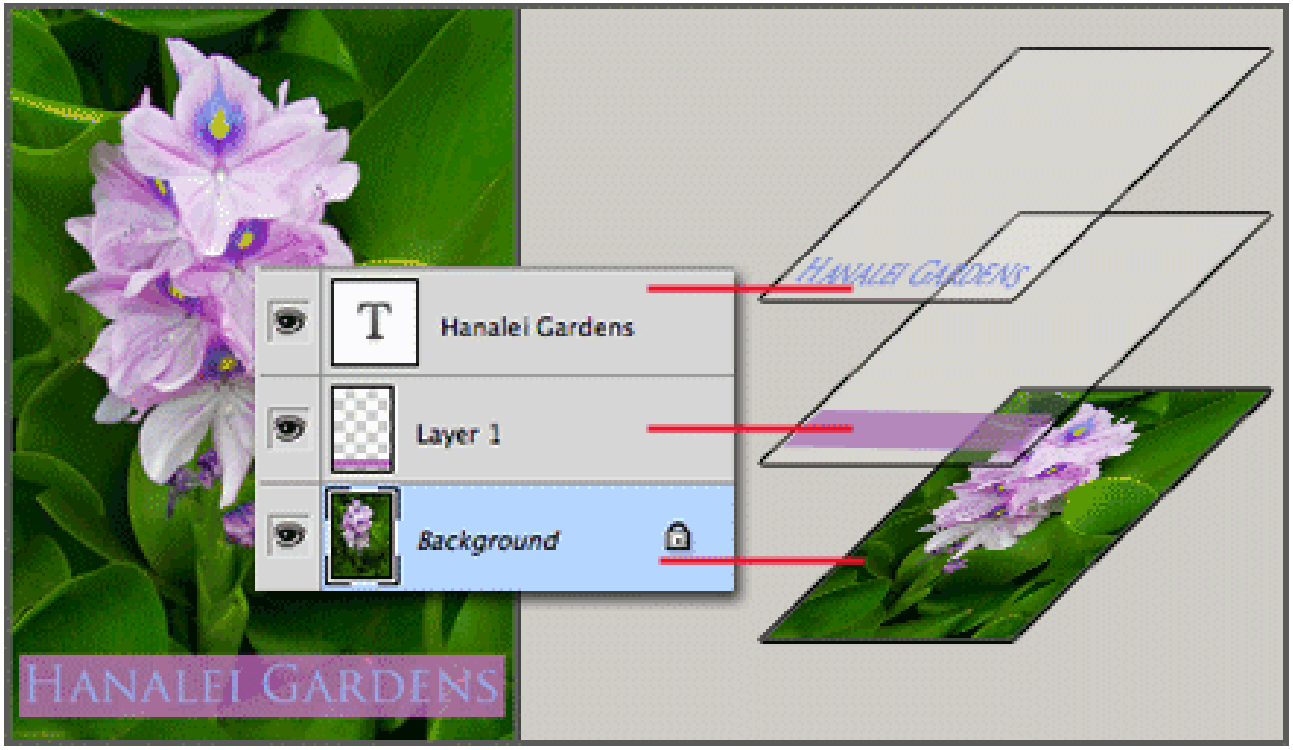
Outcomes from this lecture

1. Vision and digital image
2. Digital Image Processing
3. Color Representations

Layers for Image Editing/ Processing



Layers – independent operations



Layers in Editing Tools

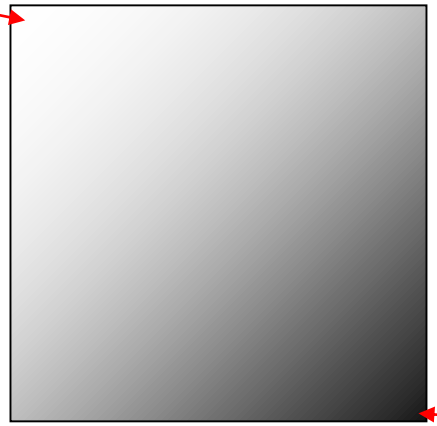
- Layers: like a stack of transparent slide
- Each layer: stores parts of the final image
  - objects, effects, details, etc
- Editing operations on pixels across layers could be
  - 1) independent; 2) interrelated
  - editing/processing tools using layers: Photoshop

Digital Image Processing

Alpha channel (recall your lab1)

- white acts as the visible area;
- black acts as the transparent area
- white area: allow you to see the background behind the image when displayed

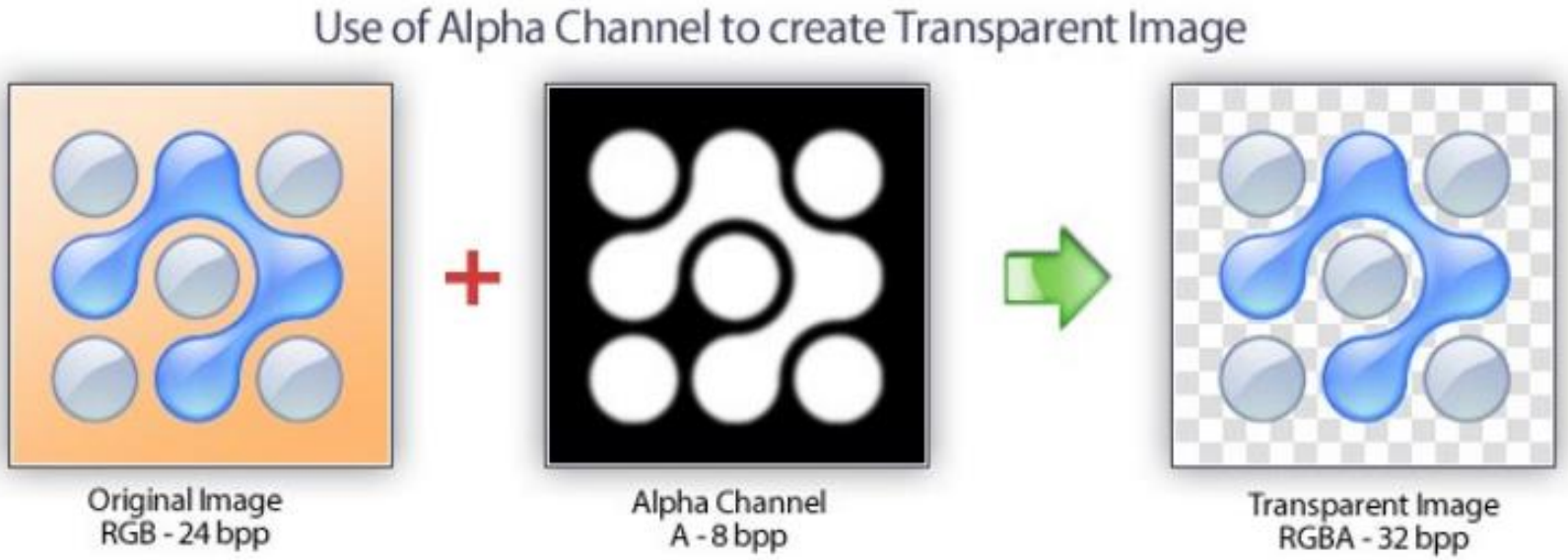
The 8-bit alpha α = 255 (i.e., 11111111)



The 8-bit alpha = 0
(i.e., 00000000)

Digital Image Processing

Example use of Alpha channel - 1

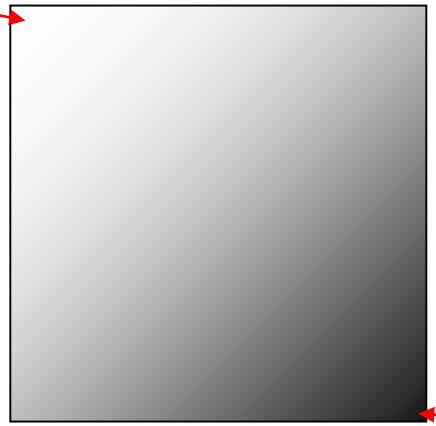


Digital Image Processing

Alpha channel (an operational mask)

- 8-bit `gray scale' alpha channel plane represents the degree of transparency
- Level of gray in between determines the level of visibility.
  e.g., 50% gray ➔ 50 percent visibility.
- usually used with 16.8M color RGB images. The resulting image is called RGBA (RGB+A, A means alpha channel).
  i.e., 24-bit color + 8-bit alpha channel ➔ 32 bits per pixel

The 8-bit alpha = 255 (i.e., 11111111)



The 8-bit alpha = 0
(i.e., 00000000)

Digital Image Processing

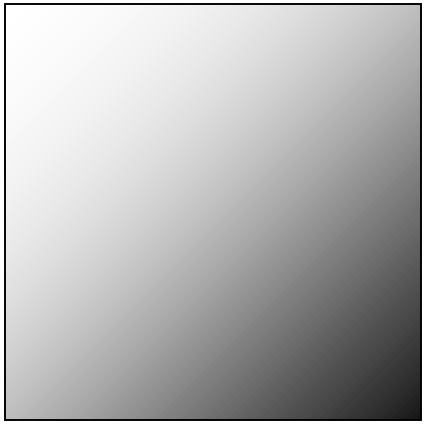
Example use of Alpha channel - 2

Image 1

+

Image 2

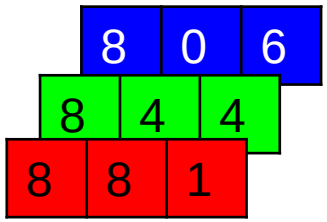
α channel



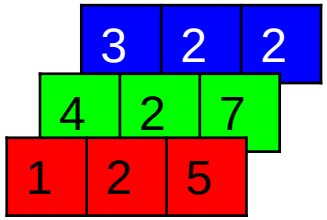
i.e., Image 1 x $\alpha/255$ + Image 2 x $(255 - \alpha)/255$

Layers – interrelated operations

layer 1

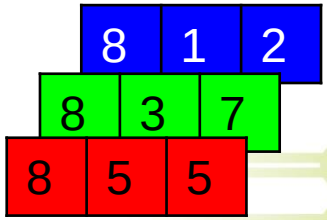


layer 2



layer 1 x α/255+ layer 2 x (255 - α)/255

Result



Alpha value (α)

255	128	0

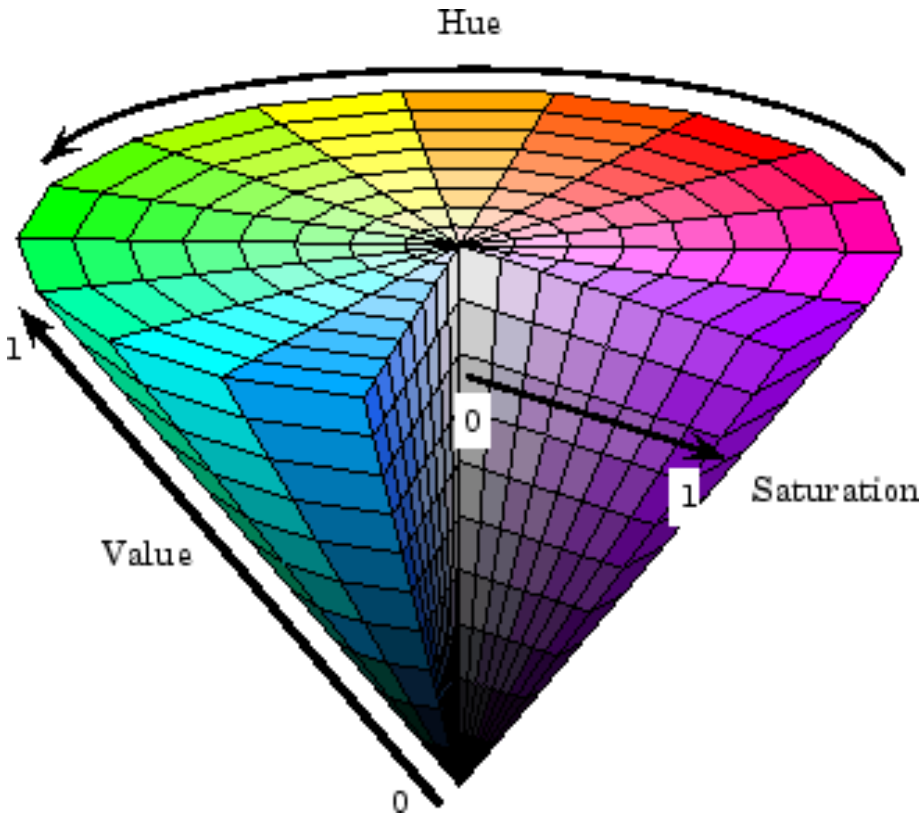
Outcomes from this lecture

1. Vision and digital image
2. Digital Image Processing
3. Color Representations

Other Practical Color Representations

- *any other representation beside RGB?*

Representation of color



Other Parameters of Color Representations

- Hue (H)

  - represents color, from 0 degrees to 360 degrees.

- Saturation (S)

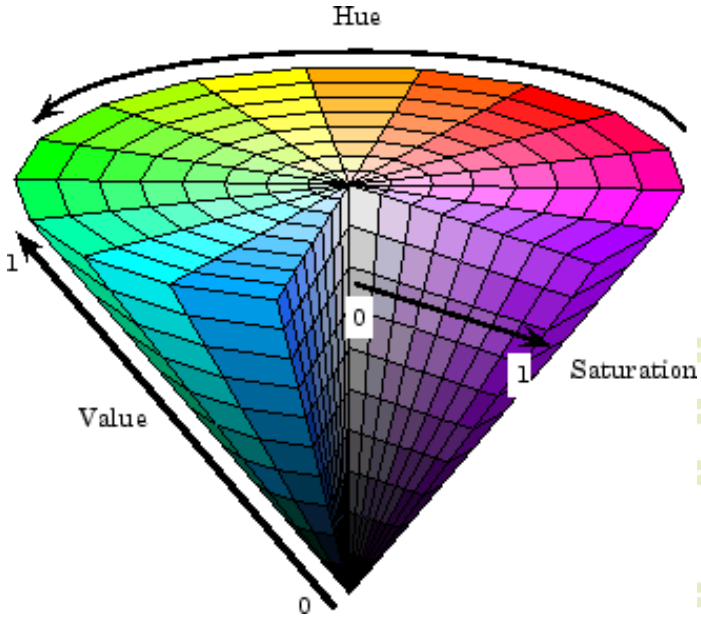
- represents the gray-scale of a color space, from 0 to 100%.

- Brightness Value (V)

  - represents brightness of a color, from 0 to 100%.

Hue

Ordering	Formula
$R \geq G \geq B$	$60 * \frac{G-B}{R-B}$
$G > R \geq B$	$60 * \left(2 - \frac{G-B}{R-B}\right)$
$G \geq B > R$	$60 * \left(2 + \frac{B-R}{G-R}\right)$
$B > G > R$	$60 * \left(4 - \frac{G-R}{B-R}\right)$
$B > R \geq G$	$60 * \left(4 + \frac{R-G}{B-G}\right)$
$R \geq B > G$	$60 * \left(6 - \frac{B-G}{R-G}\right)$



http://www.csgnetwork.com/csgcolorsel4.html

R: 64
G: 64
B: 128

R: 64
G: 128
B: 64

Examples

$$V = \max(R, G, B)$$

R:	32	64	96	128
G:	32	64	96	128
B:	64	128	192	255
H:	240	240	240	240
S:	50%	50%	50%	50%
V:	25%	50%	75%	100%

$$S = \left(1 - \frac{[\min(R, G, B)]}{V}\right) * 100\%$$

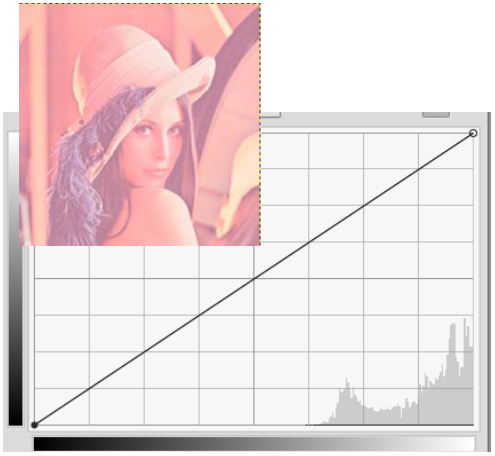
R:	96	64	32	0
G:	96	64	32	0
B:	12	12	12	12
	8	8	8	8
H:	240	240	240	240
S:	25%	50%	75%	100%
V:	50%	50%	50%	50%

Image Perception and HSV

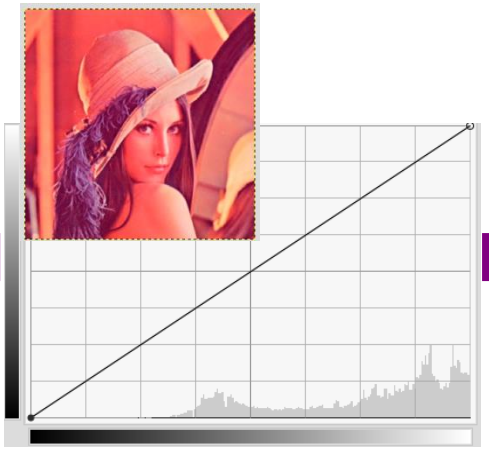
Contrast

The differences of V across pixels

- Human eyes: more sensitive to the contrast, rather than absolute colors
- Contrast = the differences of ***V*** across pixels in an image
- The bigger the contrast seems looking “nicer”!



V *values*



V *values*

V *values*

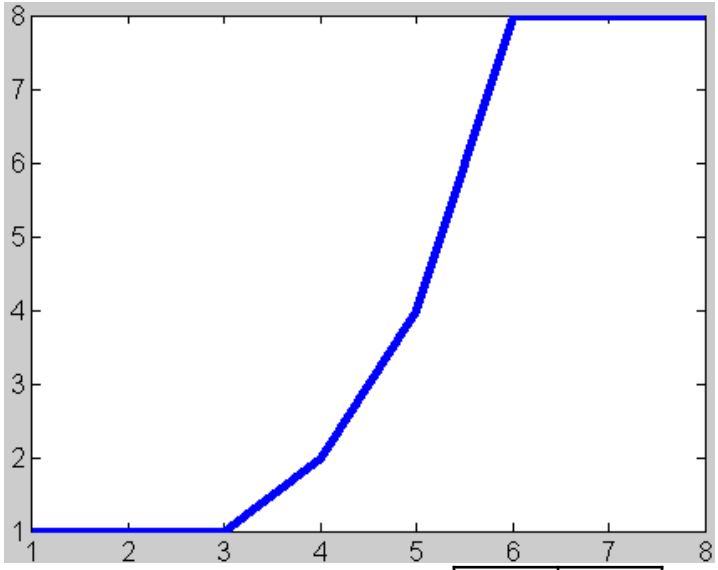
Photoshop Curves

- Adjust *Vs* for a better perception of an image

- Mapping the corresponding RGB values automatically

Output value

1	1
4	8

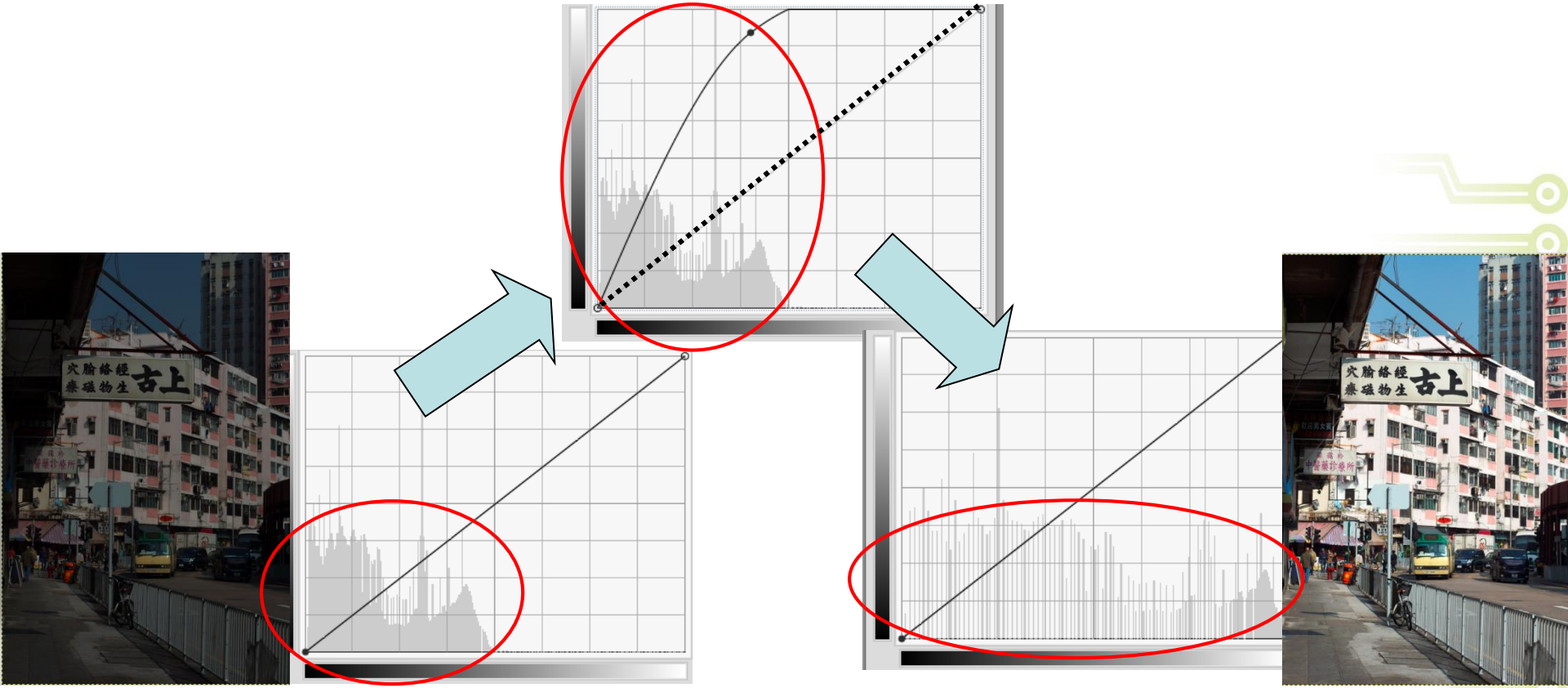


Input value

1	2
5	8

Photoshop Curves

- Improving image by increasing the contrast

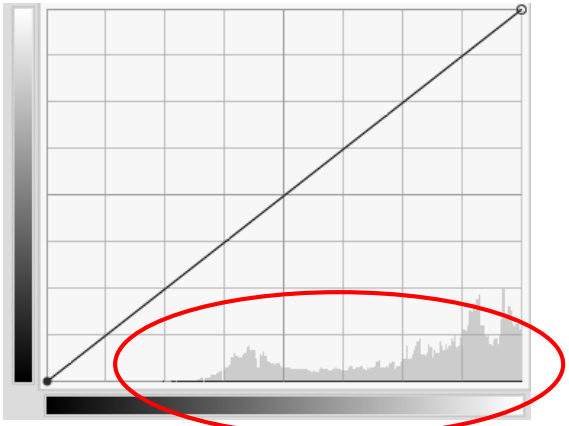


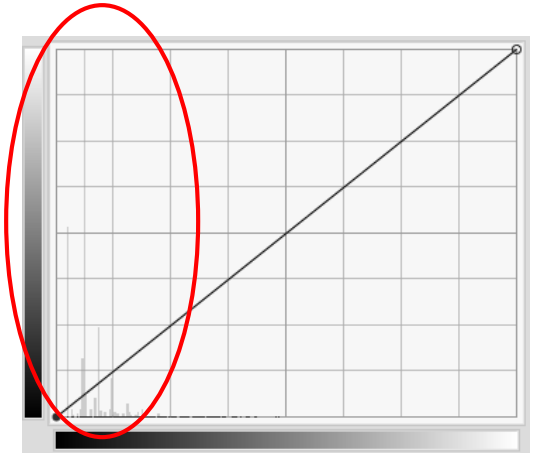
Keying – one of the applications

However,…

+

=



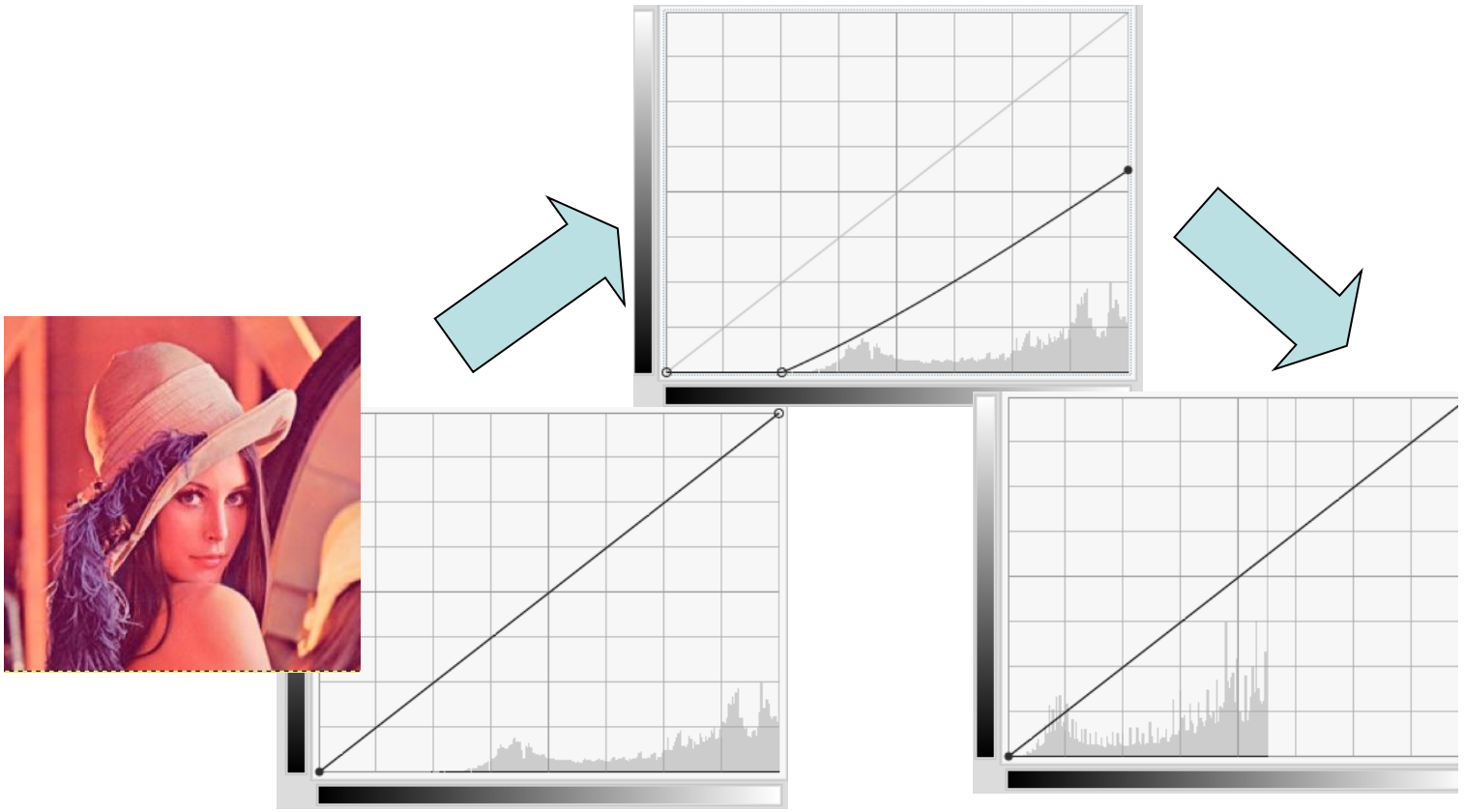


something wrongs….

The range of the image is different

Photoshop Curves for Keying

- Changing the value to match the background



Photoshop Curves for keying

Plus other adjustments…

More practical uses in Photoshop

1. http://www.youtube.com/watch?v=ORM6AZY19pw

2. http://www.youtube.com/watch?v=N-TG0-qpZvs

Questions? Comments?

- End of Lecture 2 -