MULTIMEDIA SYSTEM
BITM 1113
IMAGE

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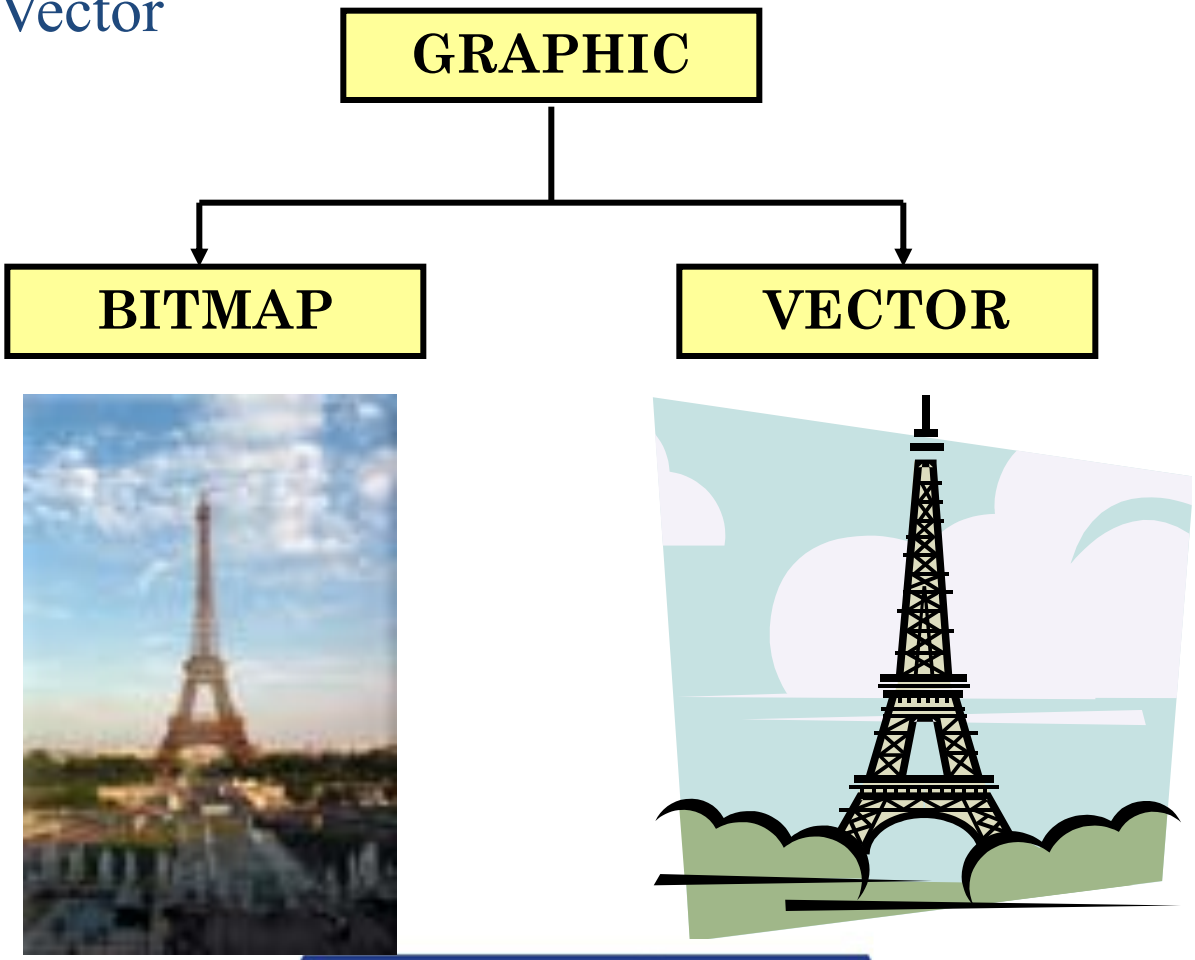
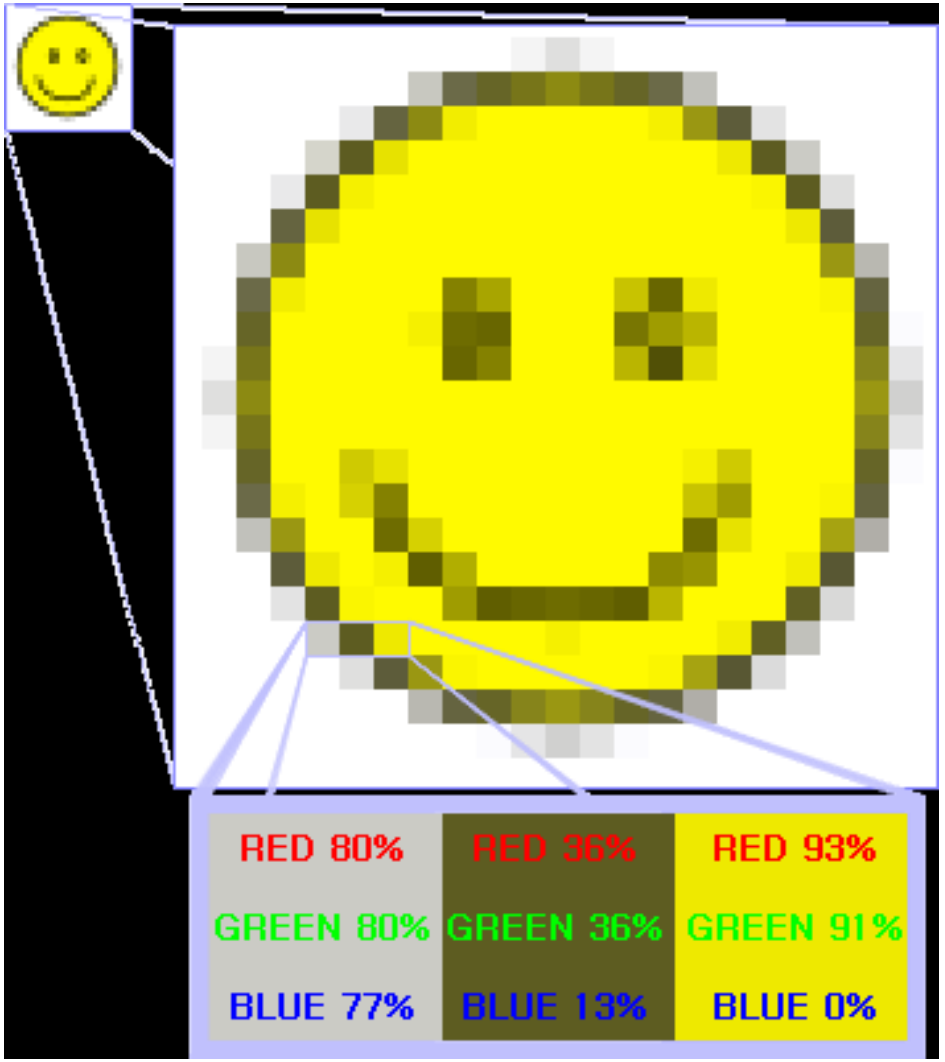
Type of Images (Revision from week 4)

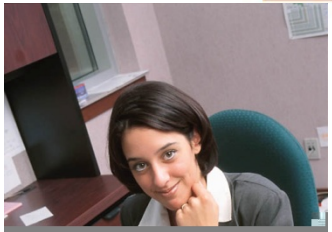
- Images can be divided into 2 categories : Bitmap & Vector



BITMAP

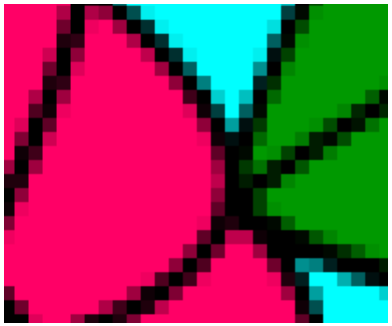
- A bitmap represent an image as an array of dot, named pixel.
- The screen is made up of a grid, and each part of the grid is a picture element (pixel).
- Colour details is called colour depth, recorded for each pixel. Depend on the number of colours use, the bitmap file can be relatively small or big.

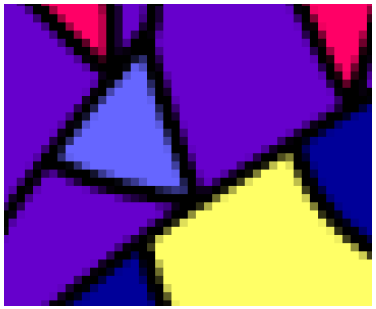


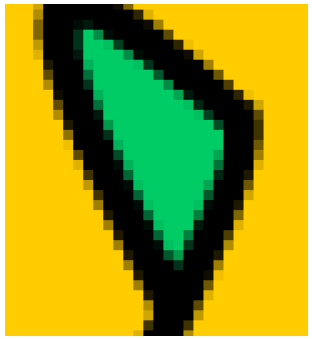


Key Points for Bitmap Images

1. Are composed of pixels
2. Are resolution dependent
3. Improve in quality as size increase
4. Decrease in quality as size decrease
5. Provide little support for transparencies
6. Are suitable for photo-realistic images





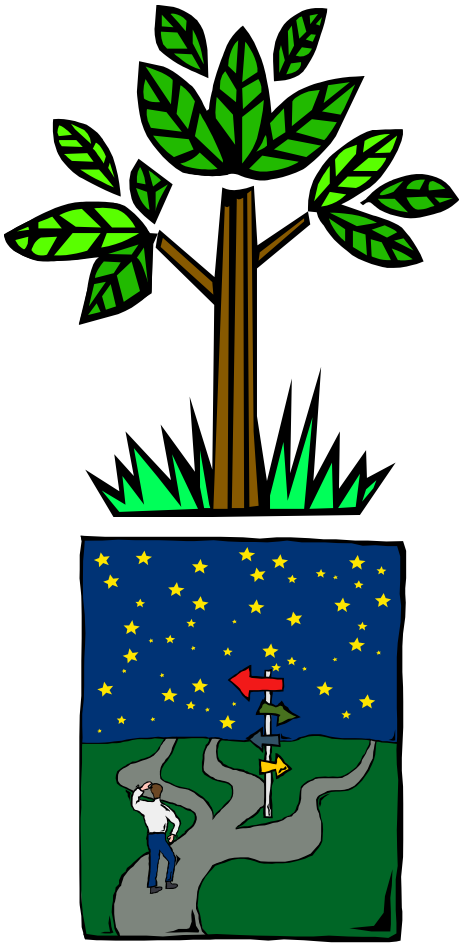


VECTOR

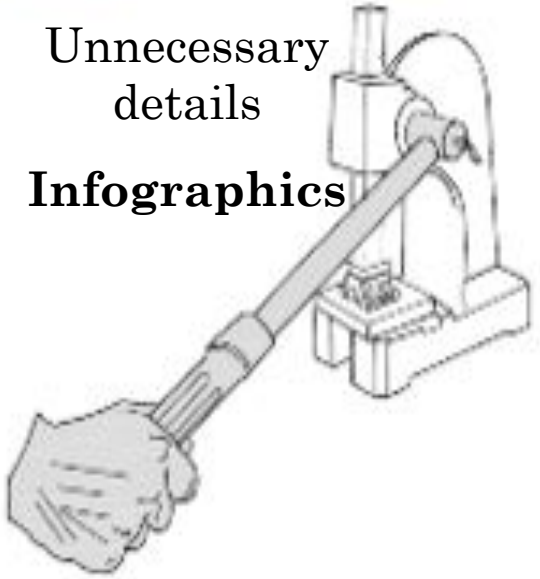
- It is also known as *Draw-type graphics*
- Vector images are stored as a set of mathematical equations called algorithms the define the curves, lines and shapes in a picture. It represent an image as a geometric shape made up of straight lines, ovals and arcs.
- Example a diagonal line : A bitmap stores each point along the diagonal as an RGB color value. A vector image, on the other hand, simply stores the line's starting point, direction, length and color. When a line is drawn, a set of instructions is written to describe its size, position and shape.
- The ability to resize and rotate a graphic without distortion is a major advantage of vector graphics
- For images that do not contain a lot of continuous color changes, vector are more efficient way to store the image than the bitmaps.
- Vector images have two advantages over bitmaps:

  Vector images are scalable, meaning that you can use graphics programs to enlarge or reduce the size of the image without any loss of quality.

  Because of vector images normally have smaller file sizes than bitmapped graphics, vector download more quickly over the internet.



- One of the downside of vector graphics are they cannot display photorealistic quality.
- Also when the vector graphics increase the complexity, the bigger the file size and the longer it take to display on the screen.



Bitmap Vs Vector

- Adobe Illustrator uses vector graphics, while Adobe Photoshop works with bitmaps. See the difference ?

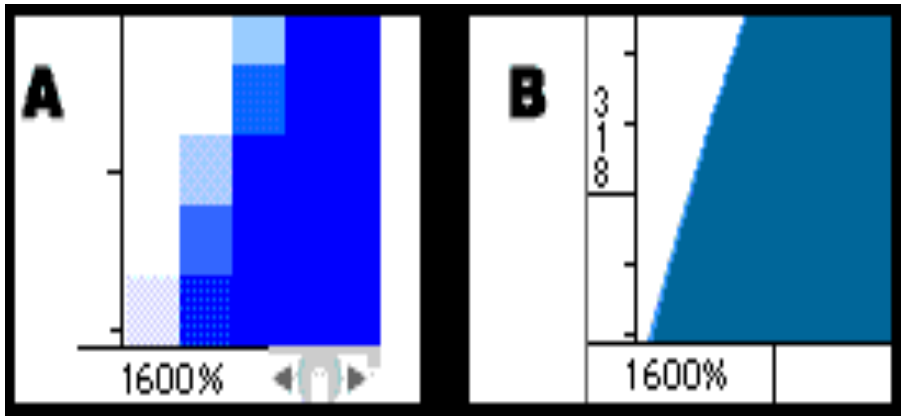


Image A :

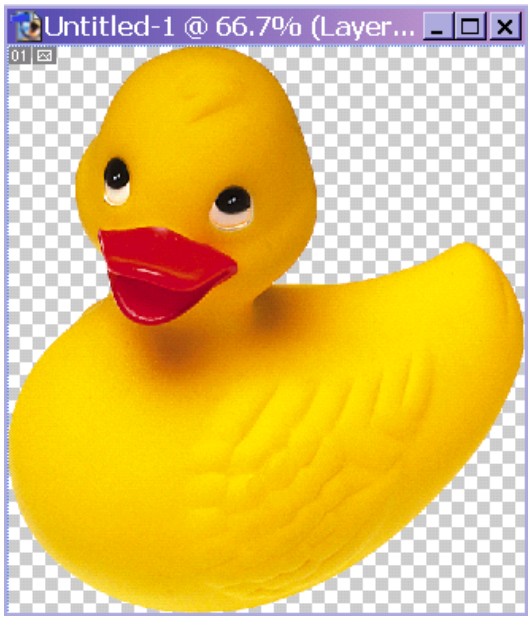
Using Adobe Photoshop and zoom 1600%

Image B :

Using Adobe Illustrator and zoom 1600%

Graphic File Format

- .jpg and .gif are the best format to use for presentation & web since it is compressed in file size.



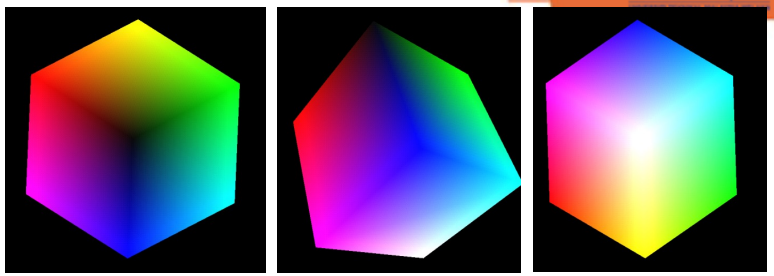
- Uncompressed format like .tif is best for print, however, there are many other format like :

Others image file format :

BITMAP	DESCRIPTION
***.tif**	Best to use for printing project like pamphlet & poster
***.wpg**	Corel Presentation format
***.bmp**	windows preferred image format
***.psd**	use in Adobe Photoshop layered file format
***.cpt**	use in Corel Photopaint layered file format

VECTOR	DESCRIPTION
.cdr	CorelDraw format. MSPowerPoint always have difficulty reading it.
.wmf	“windows metafile” format. this format is widely accepted by program which use vector like MSPowerPoint & MSWord.
.fla	Use in Macromedia Flash in creating animated vector file
***.psd**	layered file format use in Adobe Photoshop
***.cpt**	layered file format use in Corel Photopaint

Colour Depth



- Also refer to as bit depth is the number of bit use to explain the color of every one pixel. Greater bit depth allowed a greater range of colors or shade of grey to be represent by a pixel, e.g.

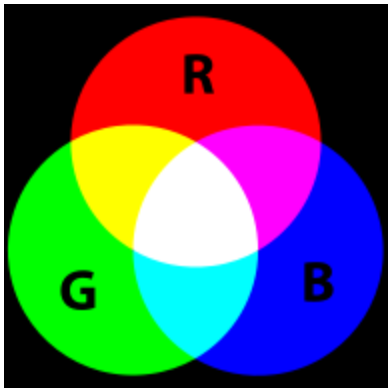
  - 1bit is black or white (on or off)
  - 8bit gray scale is 256 shades of grey
  - 8bit colors is 256 color
  - 16bit colors is 65,536 color
  - 24bit colors resolution is 16.7 million color
  - 30bit or higher colors is billions of color

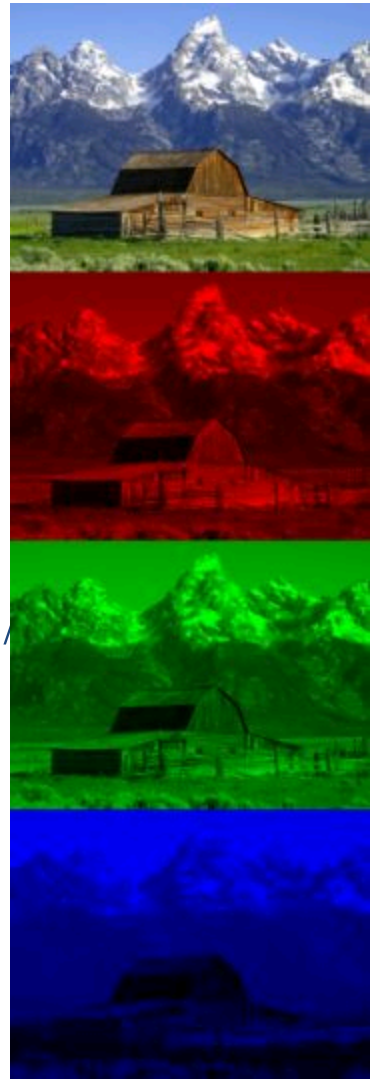


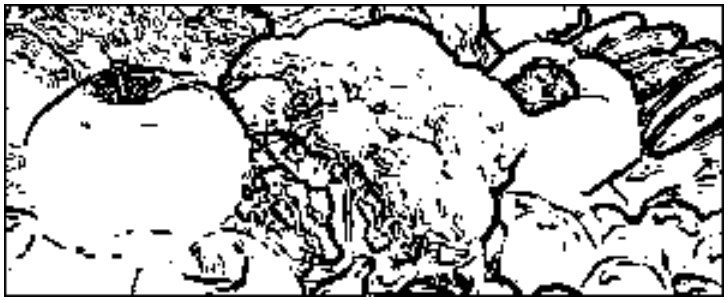

Bitmap Categories

- Bitmaps can be divided into 4 main categories :

1. **Line-Art** – Image that have ONLY 2 colors (Black&White)
2. **Grayscale Image** – Image consist of variation colors of gray, black and white
3. **Multitones** – Image consist of 2 or more colors
4. **FullColor** – The full information colors of RGB / CMYK

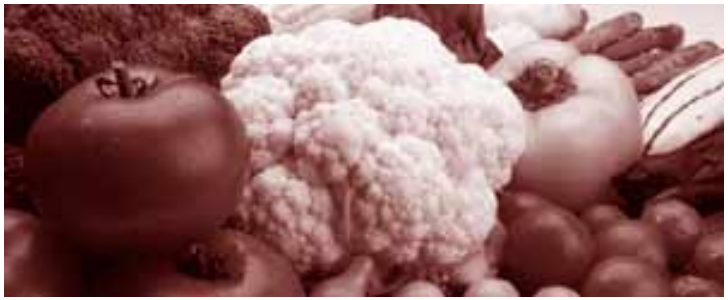






Line-art

Imej Grayscale

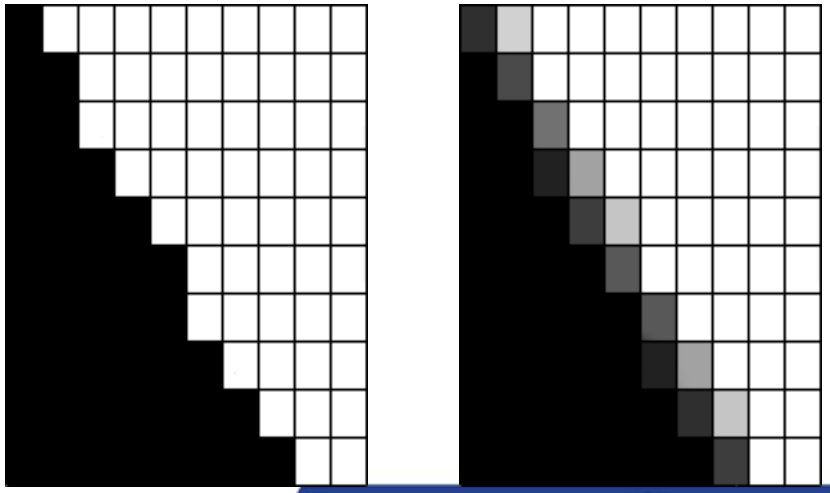


Multitones

Full Colour

Anti-aliasing

- Anti-aliasing is a process of making the edges of the image blur.
- The purpose is to eliminated those jagged lines becoming smoother.
- As a result, this will make the images look better through the human eyes.



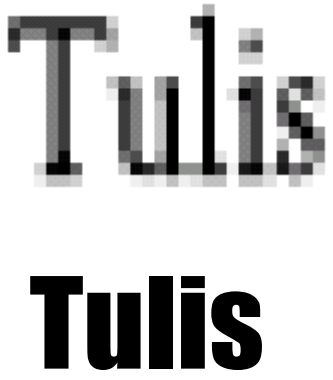


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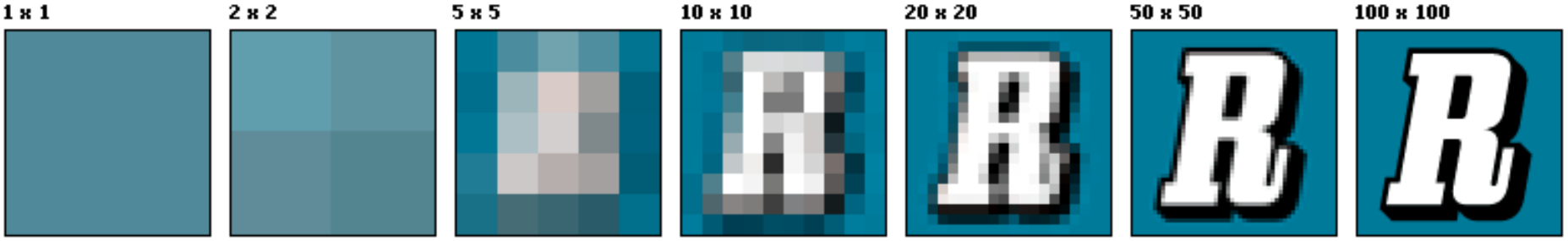
Image Resolution

- Image resolution of a graphic is measured in dot-per-inch (dpi) or pixel-per-inch (ppi).
- The higher this number, the higher the resolution, the clearer the image, and the larger the graphic file size



Resolution quantifies how close dots can be to each other and still be visibly resolved.

- Graphics programs, such as Photoshop and Paint Shop Pro, allow you to change the ppi
- Note : Always use 72 ppi for web graphics or anything viewed on the computer screen – Quality aspect

Examples of Image Resolution

300 x 220 image

30 x 22 image

30 x 22 image

At the left is a 300 x 220 image.

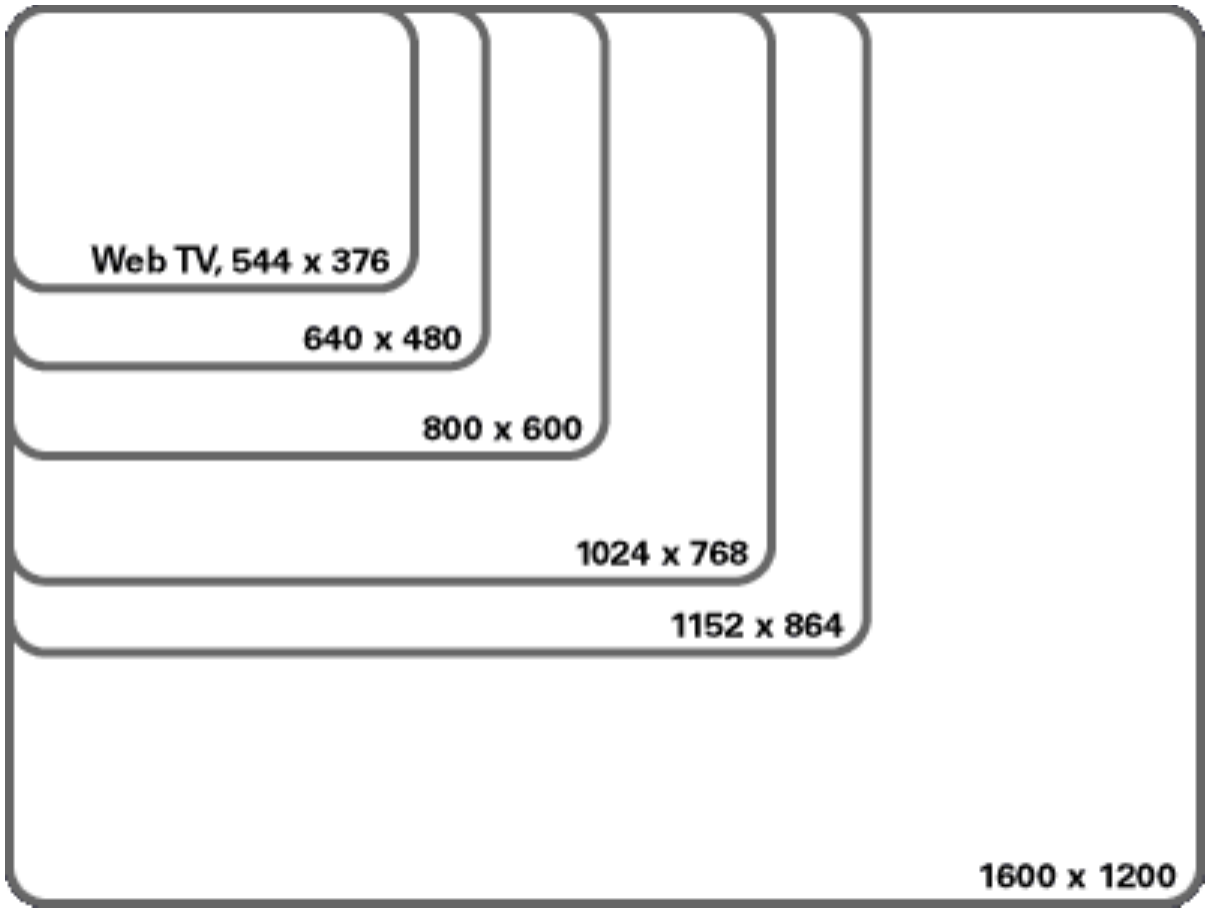
The middle picture is 30 x 22 image -- the pixel were enlarge to give it the same size as the previous one: it represent 10times low resolution.

The right picture is the similar picture as the middle one, but represent in the same resolution as the left one: one image pixel per screen pixel. The resolution of the right hand picture is the same as the left, the definition is the same as the middle.

Screen Resolution

- Screen Resolution is the pixel dimensions the user's computer screen is set to.
- This number varies with the user of the computer and is noted in pixels per inch (ppi) on the screen. Most computer displays have resolutions configured between 72 to 80 pixels per inch (ppi).
- A graphic file with an image resolution of 72 ppi and is a square containing 72 by 72 pixels will be equivalent to a one-inch square on a monitor which has a screen resolution of 72 pixels per inch.

- Almost all monitor are able to be adjust to displays specific numbers of pixel (small coloured dot) on the monitor. Since we had a 17inch monitor, it does not mean our display present a set number of pixel. The diagram below illustrate the common displays setting measure in pixel.



Calculating the size of a raster image

$$\text{size in bytes} = \frac{width \times height \times colour\ depth}{8}$$

- Where:
  - Width of the images measured in pixels
  - Height of the images measured in pixels
  - Colour depth is the number of bits used for color measured in bits per pixel

- Remember:
  - 1024 bytes = 1 kilobyte (KB)
  - 1024 kilobytes = 1 megabyte (MB)

Image Compression

- Image, 1024pixels x 1024pixels x 24bits, with no compression, will need 3MB storage & 7 minute for transmission, utilize a higher speed, 64Kbit/s, ISDN lines.
- When image is compress at a 10 : 1 compression ratios, the storage needed is reduce to 300KB & the transmission duration decrease to below 6 sec.
- Compression is a crucial component of the solution available to create file size of managing and transmitting dimension.
- 2 category of data compression algorithm could distinguished by:

    1. **Lossless**
    2. **Lossy**

Lossless

- The main goal of lossless compression is to reduce the no of bit require to represent the original images sample with no any information loss.
- Almost bit of every sample should be re-constructed completely while decompression. This type of compression is the one used by data compressors like zip and ace.

- For image compression, small information loss is normally accept for 3 reason:

1. The loss could be tolerate through human visual system with no interfere with perception of the scenes contents.

2. Almost all case, input of digital to the compression algorithms is itself is not perfect representation of the realworld scene. It is true if the image sample value are quantize versions of underlying real value quantity.

3. Lossless compression normally not capable in achieving the higher compression requirement of many storage and distribution application.

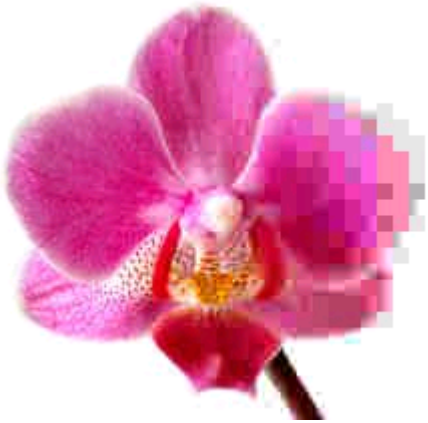
4. compression of lossless would be well use in application which the image is to be extensive edit and recompress in which the accumulation of error from various lossy compression is not acceptable.

Lossy

- A compression type that produce the lossing a part of the original data.
- Lossy compression trade the potential for the loss of several images quality for the opportunity for more compression.
- On the other hand, lossless compression produce a compression ratio of 2 : 1, lossy compression of image data can lead to ratio between 10:1 & 50:1 with no visibly degrading image quality.
- JPEG & MPEG are example of lossy compression technique.

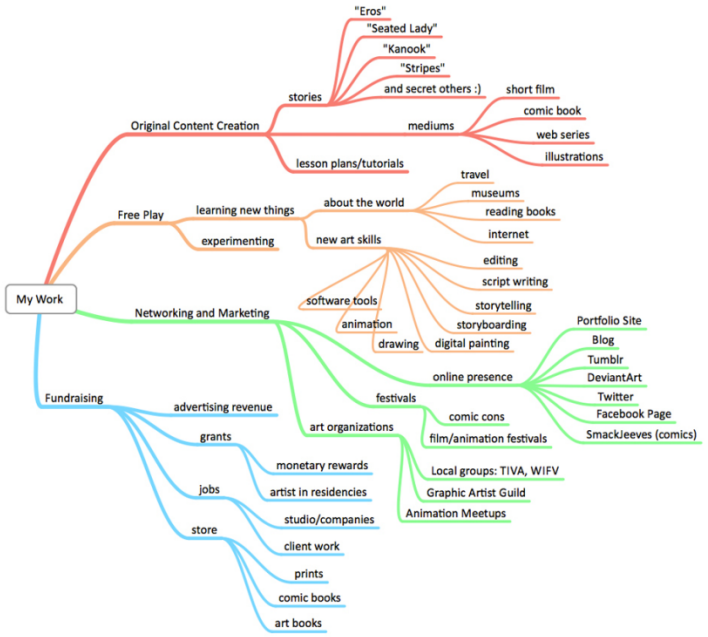
Lossy coding techniques

- Transform coding (DCT/Wavelets/Gabor)
- Vector quantisation
- Methods of segmentation & approximation
- Method of Spline approximation (Bilinear Interpolation / Regularisation)
- Fractal coding (texture synthesis, iterated functions system [IFS], recursive IFS [RIFS])



Group XTVT: By using popplet lite inside the iPad, create a mind map.

Instruction: I want each group to summarize today's lecture by creating a mind map of your own. Examples of mind map is as below. Be as creative as possible, use different colours (if you have). Not necessary wording, you can draw picture if you like.



Any Question?




Thank You…