

Image and Image File Formats



Picture format

- In the so-called raw format, the file contains only the gray values of the pixels.
- Bits/picture = **Rows** x **Columns** x **bits/pixel**
- Bytes/picture = **Rows** x **Columns** x **bytes/pixel**
- Example (the next slide):
 - 256 rows, 256 columns, 1 byte per pixel.
 - Bytes = $256 \times 256 \times 1 = 65536$
- The quality largely depends on its **resolution**

Picture format



1	2	3	..	256
257	258	259	..	512
513	514	515	..	768
...
65,280	65,281	65,536

Picture format

256x256, 4 bit, 32 kB



256x256, 1 bit, 8 kB



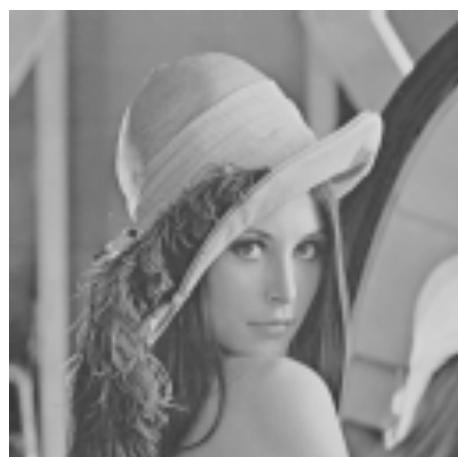
256x256, 4 bit, 32 kB



256x256, 2 bit, 32 kB



128x128, 4 bit, 16 kB



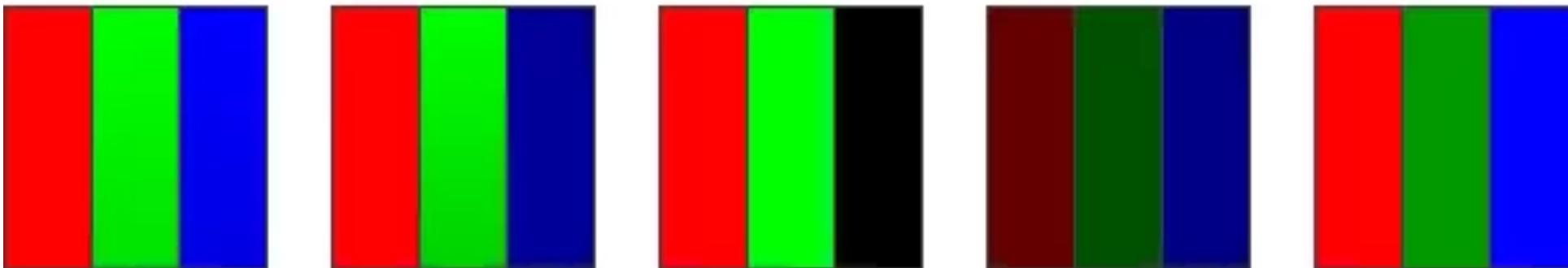
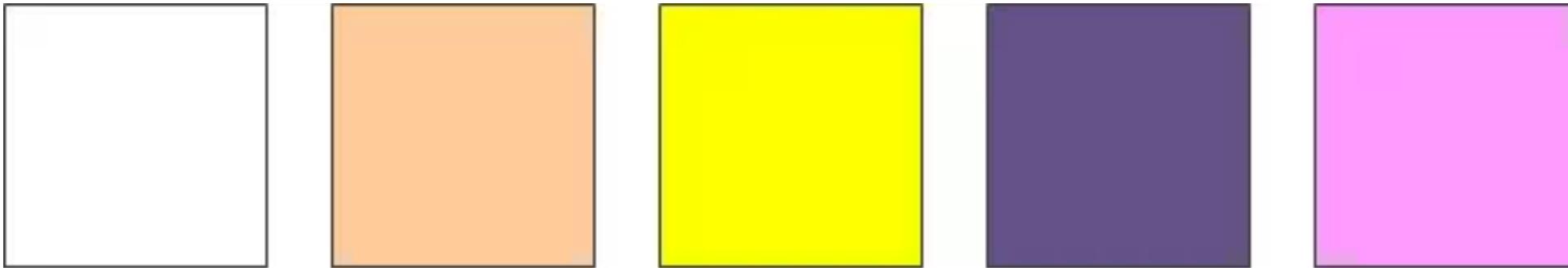
256x256, 8 bit, 65 kB



Picture format

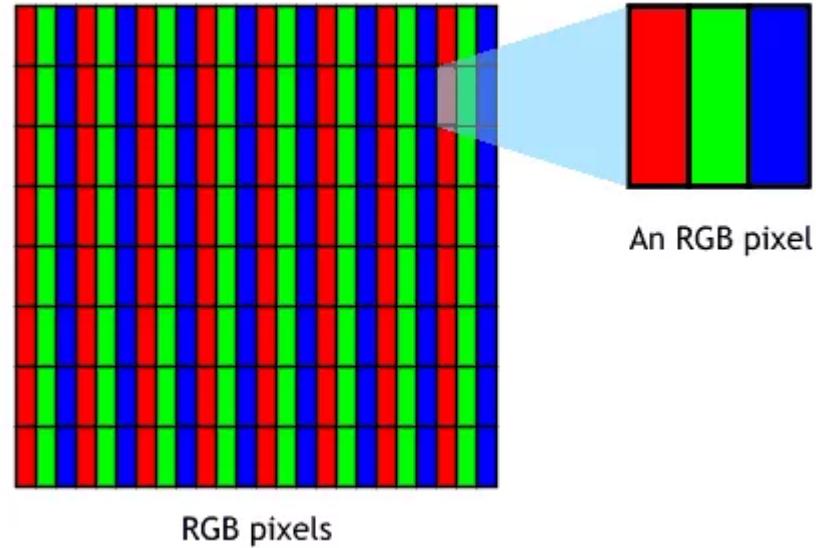
- Color is represented on a computer by using varying amounts of red, green and blue light
- These are the primary colors of what's called "additive" color - by adding percentages of red, green and blue, any color can be created
- In the simplest sort of bitmapped image, each pixel is represented by three numbers to store the amounts of red, green and blue light that define the color of the pixel in question

Picture format



- The different color intensities can be used to make different colors

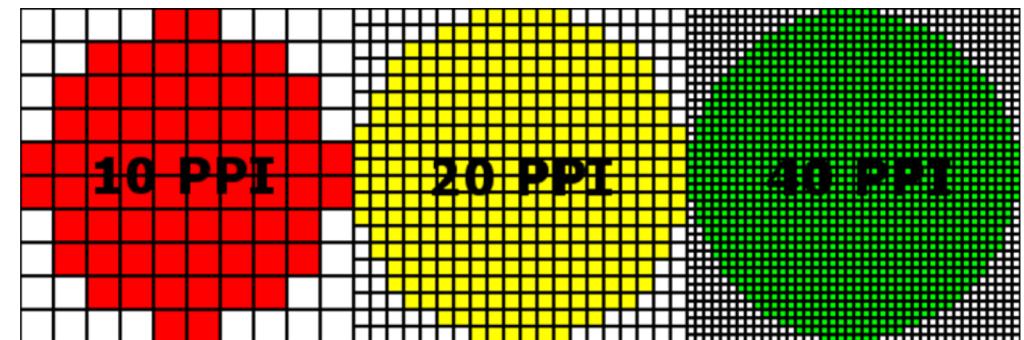
Pixel



- Short for *Picture Element*, a pixel is a single point in a graphic image
 - The word "pixel" was first published in 1965 by Frederic C. Billingsley
 - The word *pix* appeared in *Variety* magazine in 1932

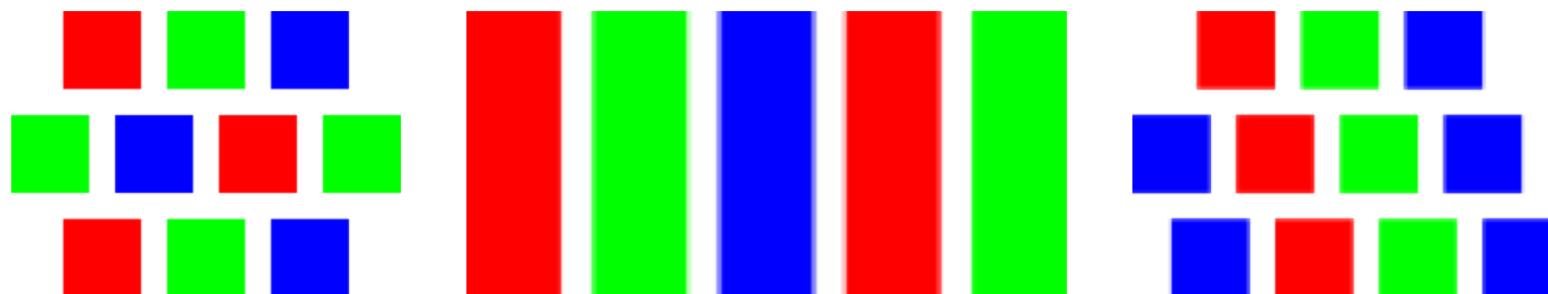
Pixel (BPP)

- The number of **bits** used to represent each **pixel** determines how many colors or shades of gray can be displayed.
 - **1 bpp**, $2^1 = 2$ colors (monochrome)
 - **2 bpp**, $2^2 = 4$ colors
 - **3 bpp**, $2^3 = 8$ colors
 - ...
 - **8 bpp**, $2^8 = 256$ colors
 - **16 bpp**, $2^{16} = 65,536$ colors ("Highcolor")
 - **24 bpp**, $2^{24} = 16,777,216$ colors ("Truecolor")



Pixel geometry

- On color monitors, each pixel is actually composed of three dots -- a red, a blue, and a green one. Ideally, the three dots should all converge at the same point, but all monitors have some convergence error that can make color pixels appear fuzzy.



JPEG

Joint Photographic Experts Group

- The most used image file format
- JPEG applies lossy compression to images, which can result in a significant reduction of the file size
- JPEG 2000 is enabling both lossless and lossy storage



JPEG

- Works very badly on text, line art or other types of mechanical graphics
- Does not support transparency or multiple images
- Cannot be used for animation
- Ideal for photographic, paintings

TIFF

Tagged Image File Format

- TIF is lossless which is considered the highest quality format for commercial work
- Normally saves eight bits or sixteen bits per color (red, green, blue) for 24-bit and 48-bit totals
- Can be lossy or lossless
- **Not supported by web browsers**
- The most versatile: widely accepted as a photograph file standard in the printing business

GIF

Graphics Interchange Format

- GIF was designed by CompuServe in the early days of computer 8-bit video, before JPG
- LZW (Lempel-Zev-Welch) compression
- Normal use limited to an 8-bit palette, or 256 colors
- Most suitable for storing graphics with few colors, such as simple diagrams, shapes, logos, and cartoon style images



PNG

Portable Network Graphics

- Was created as an improved, non-patented replacement for GIF
- Additional feature of PNG is transparency for 24 bit RGB images
- PNG files are a little smaller than LZW compression in TIF or GIF
- Slower to read or write
- Not support by old browsers



Difference in photo and graphics images

- **Photo images** have continuous tones
 - Adjacent pixels often have very similar colors
 - Normally this is 24-bit RGB color, or 8-bit grayscale
 - A typical color photo may contain a hundred thousand RGB colors, out of 16 million colors in 24-bit RGB color
- **Graphic images** are not continuous tone
 - Are drawings, not photos
 - They use few colors, often less than 16 colors in the entire image