
SEND
M = 5.9736 × 1024 kg
H2O

Graphics and Image Representations

Lecture 02

CONTENTS

1 Graphics/Image Data Types

2 Popular File Formats

3 Summery

CONTENTS

1 Graphics/Image Data Types

2 Popular File Formats

3 Summery

Graphics/Image Data Types

- The number of file formats used in multimedia continues to proliferate.

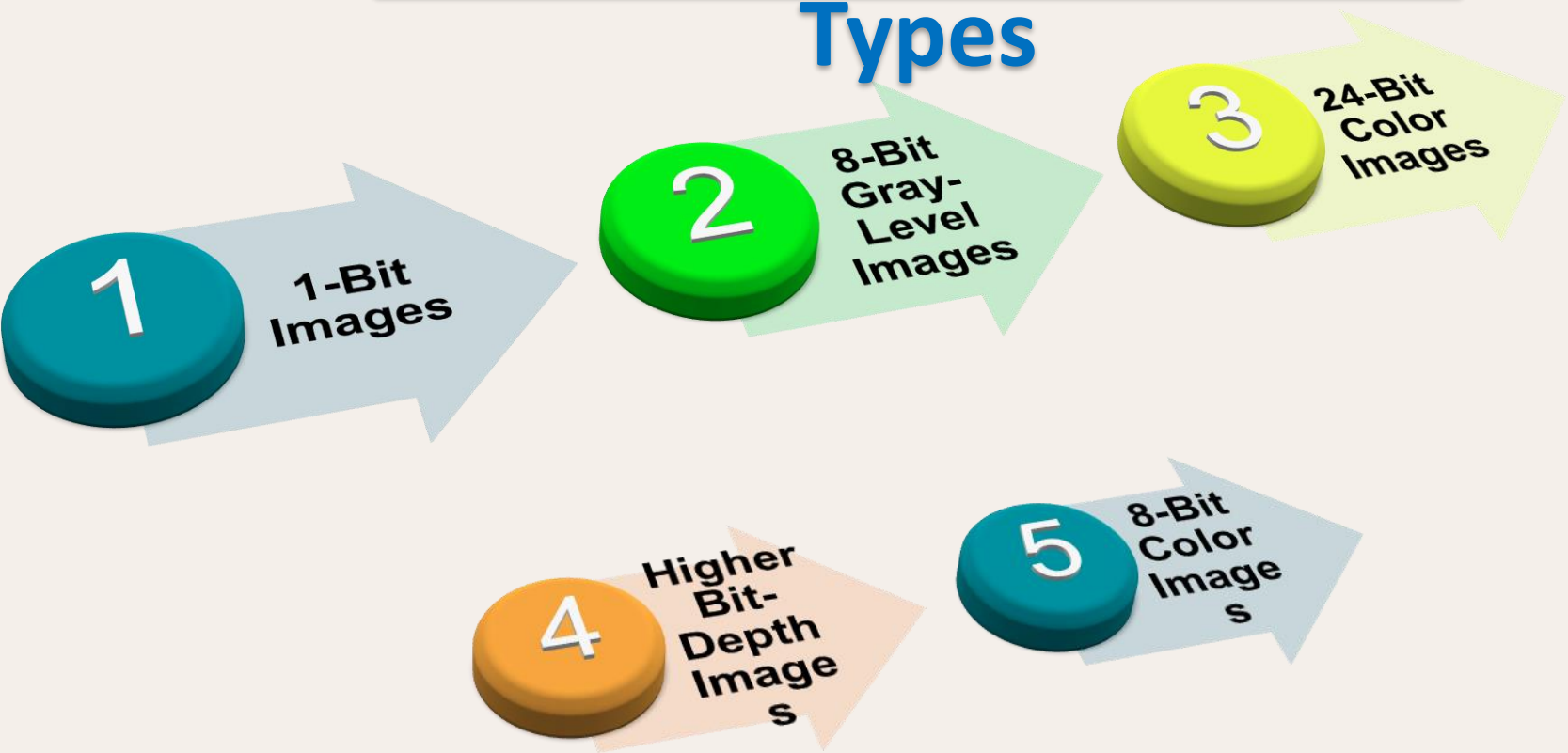
Table 3.1 Some popular Adobe Premiere file formats

Image	Audio	Video
BMP, DIB,	AIFF, AAC,	AVI, DV,
GIF, HEIF,	AC3, BWF,	FLV, HEVC,
JPG, PICT,	MP3, M4A,	M4V, MOV, MP4,
PNG, PSD,	WAV, WMA	MPG, MTS, MXF,
TGA, TIF		SWF, WMV

Graphics/Image Data Types

- We shall concentrate on GIF and JPG image.
- **GIF** file format is one of the simplest
- **JPG** file format is the most important overall

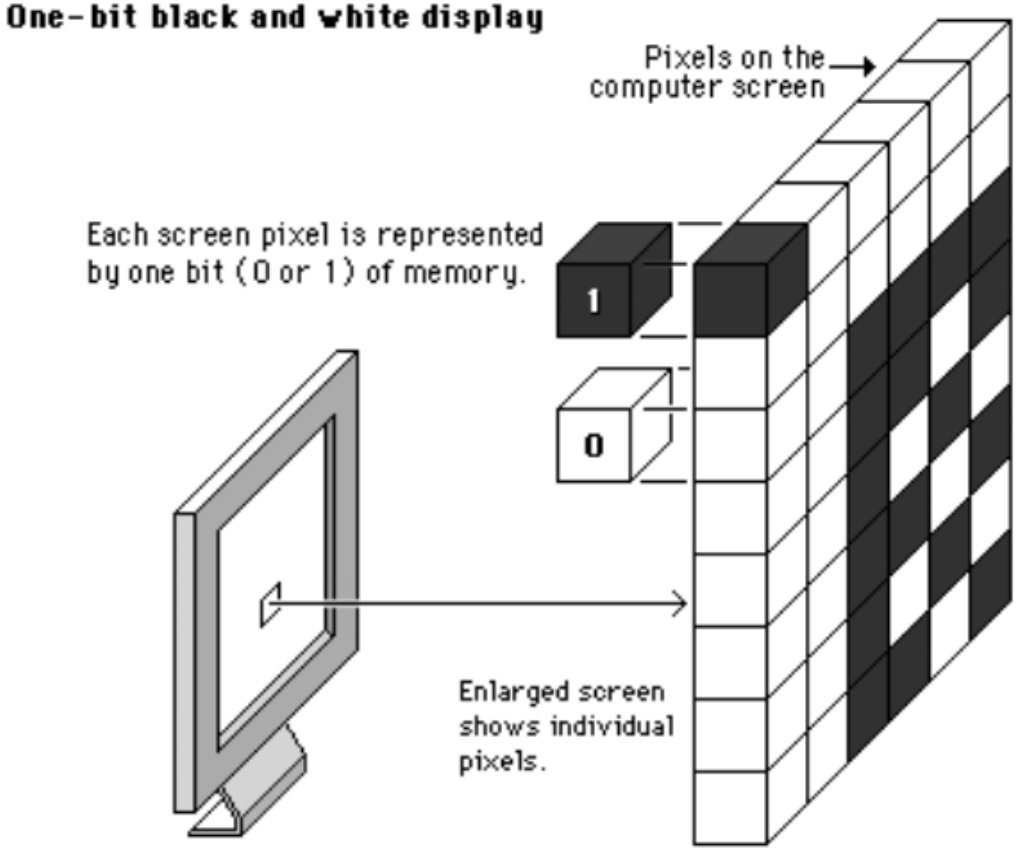
Graphics/Image Data Types



1 1-Bit Images

- **A 1-bit image:** consists of on and off bits.
- Each pixel is stored as a single bit (0 or 1).
- Referred to as a **binary** image, **1-bit** image or **monochrome** image
- Monochrome 1-bit images used in fax machines

1 1-Bit Images



TEST YOUR KNOWLEDGE!

- The opposite figure is to a 640 ×480 1-bit Lina image of answer the follow.

Lena Image
a 1-bit monochrome image

Size: 640 ×480 =307,200 pixel

Storage: ≅ 38.4 kilobytes (kB)

Why:

- 640 ×480 = 307,200 bit
- 307,200/ 8 = 38,400 byte
- 38,400/1000 = 38.4 kb

2

8-Bit Gray-Level Images

- **8-bit image**: each pixel represents by 8 bits (single byte)
- Each pixel has a gray value between 0 and 255.
- Image resolution refers to the number of pixels in a digital image
- The entire image can be thought of as a two-dimensional array of pixel values referred to as a bitmap .
- Such an array must be stored in a frame buffer called video card

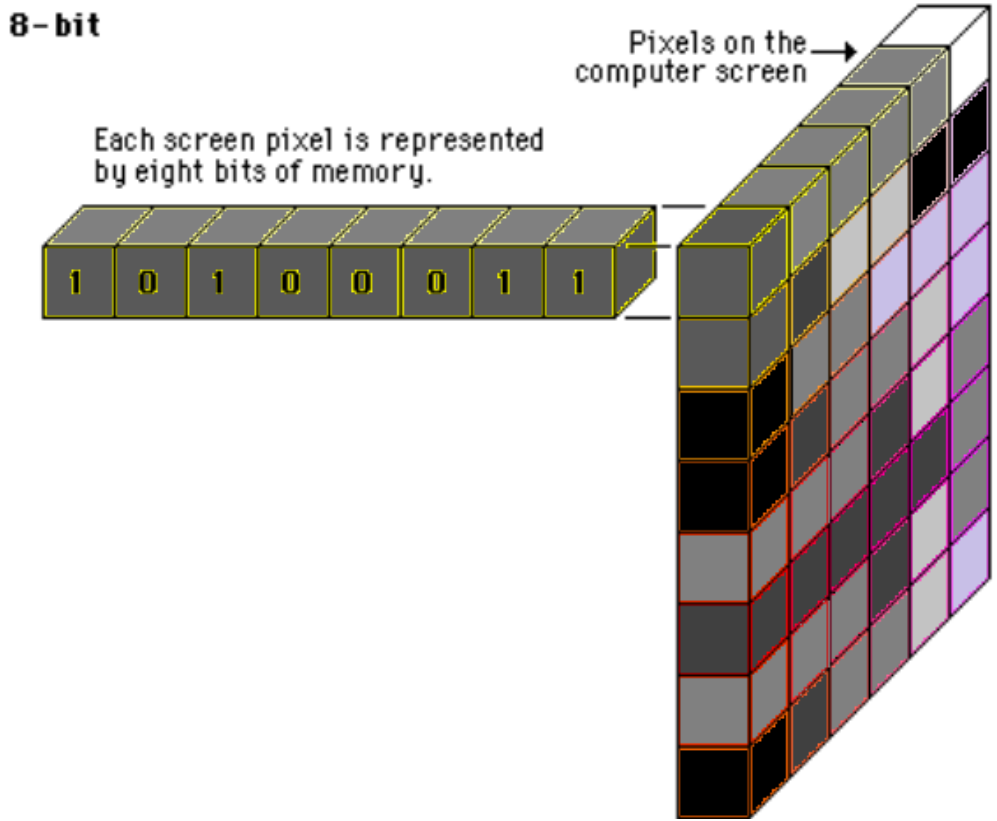
2

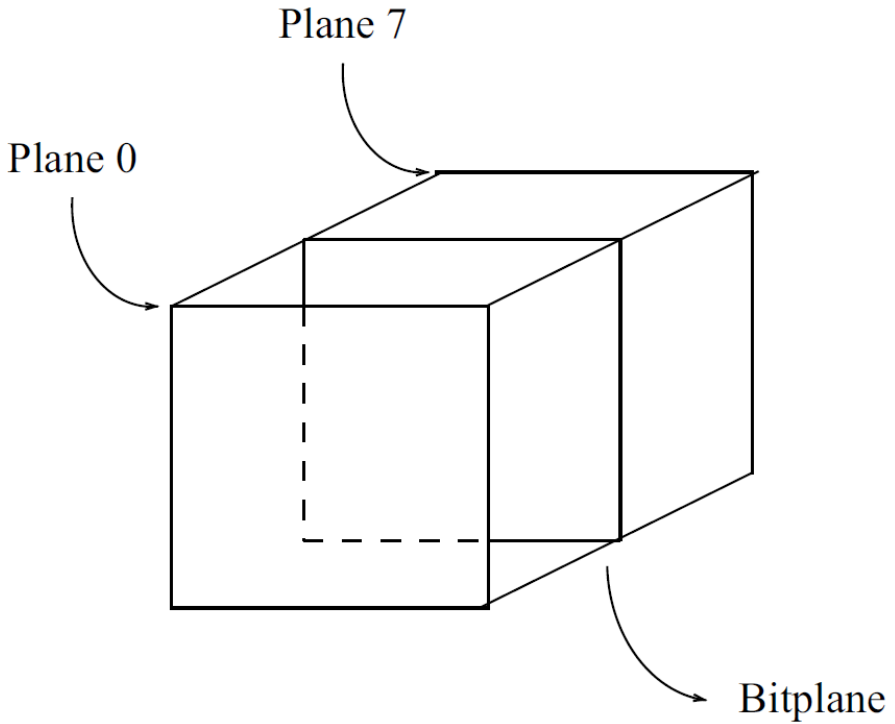
8-Bit Gray-Level Images

- The resolution of the video card does not have to match the desired resolution of the image
- Notice that an aspect ratio of 4:3. has been found to look natural. For this reason 4:3 was adopted for early TV and most early laptop screens. **today become 16:9**

2

8-Bit Gray-Level Images





Lena Image
Grayscale image

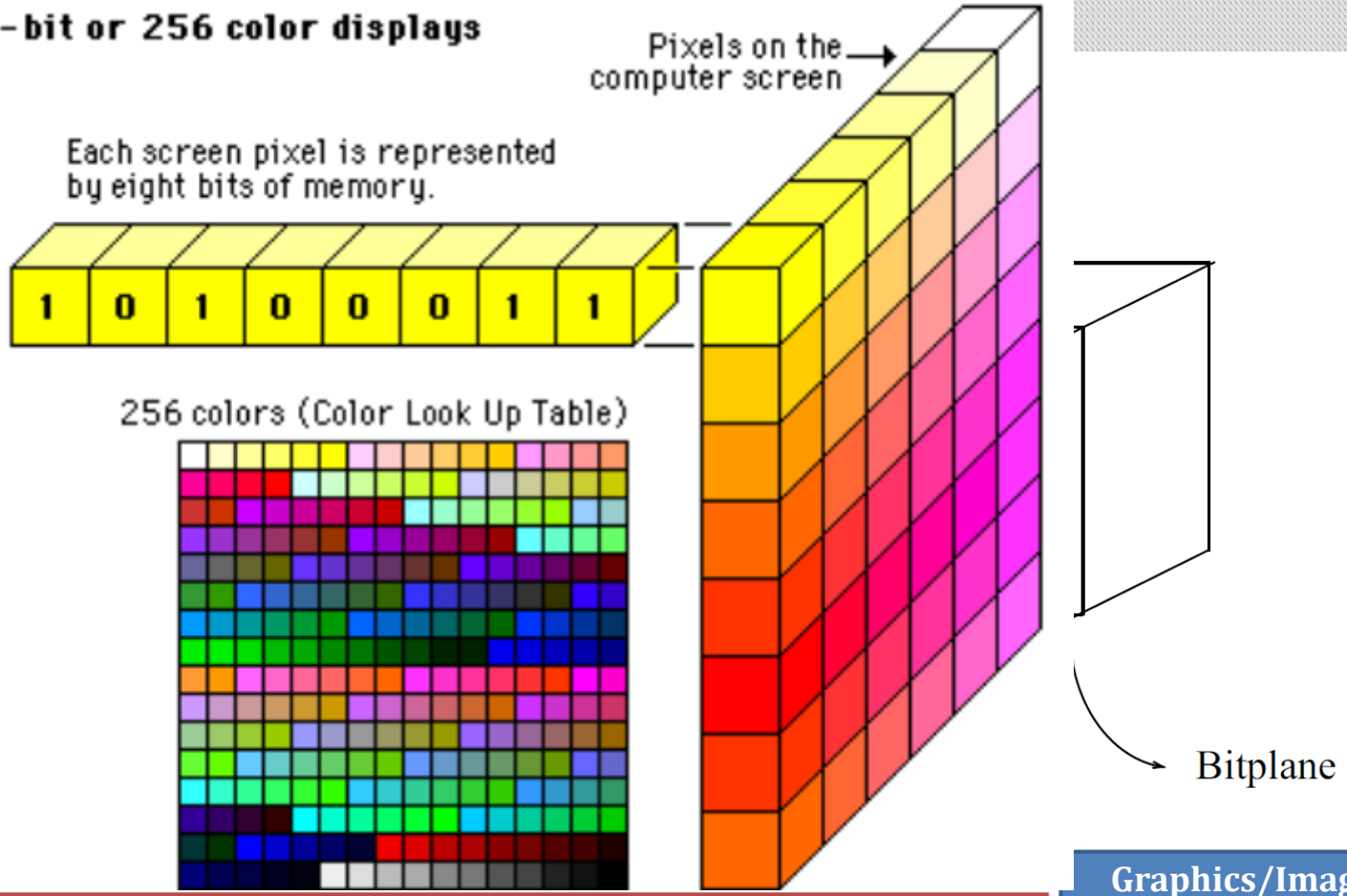
Size: 640 ×480 pixel

Storage: 300 kB

Why:

- 640 ×480 = 307,200 byte
- 307,200/1024 = 300 kb

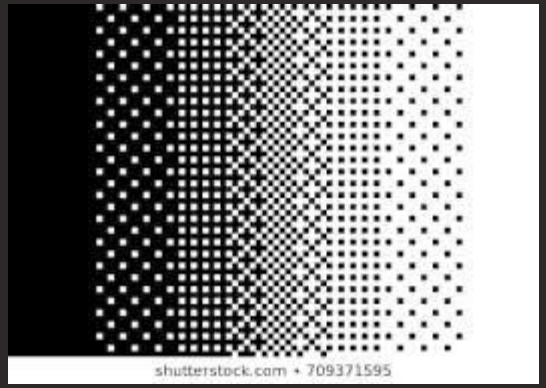
8-bit or 256 color displays

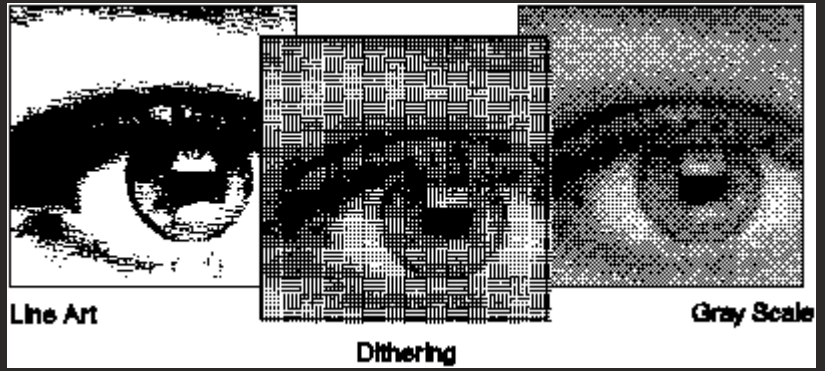


“

Suppose we have available a 600 (dpi) laser printer and you want to print Lena image, is the is a problem

Dithering technique is the solution





3

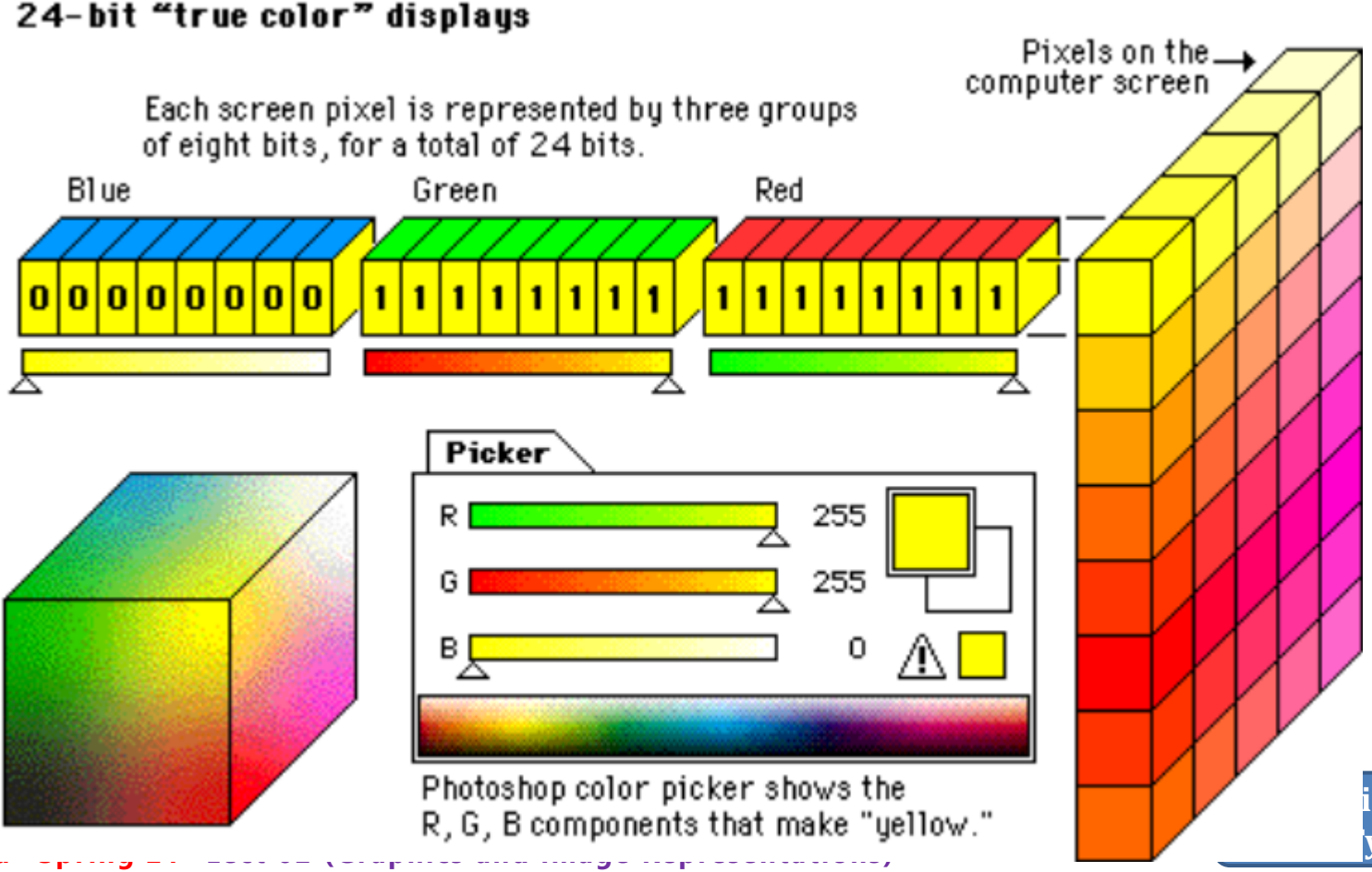
24-Bit Color Images

- Each pixel is represented by three bytes, usually representing RGB in the range 0 –255.
- possible combined colors 16,777,216.??
- storage penalty

- An important point to note is that many 24-bit color images are actually stored as 32-bit images, with the extra byte of data for each pixel storing an α (alpha)

3

24-Bit Color Images



Lena Image
a 24-bit color image

Size: 640 ×480

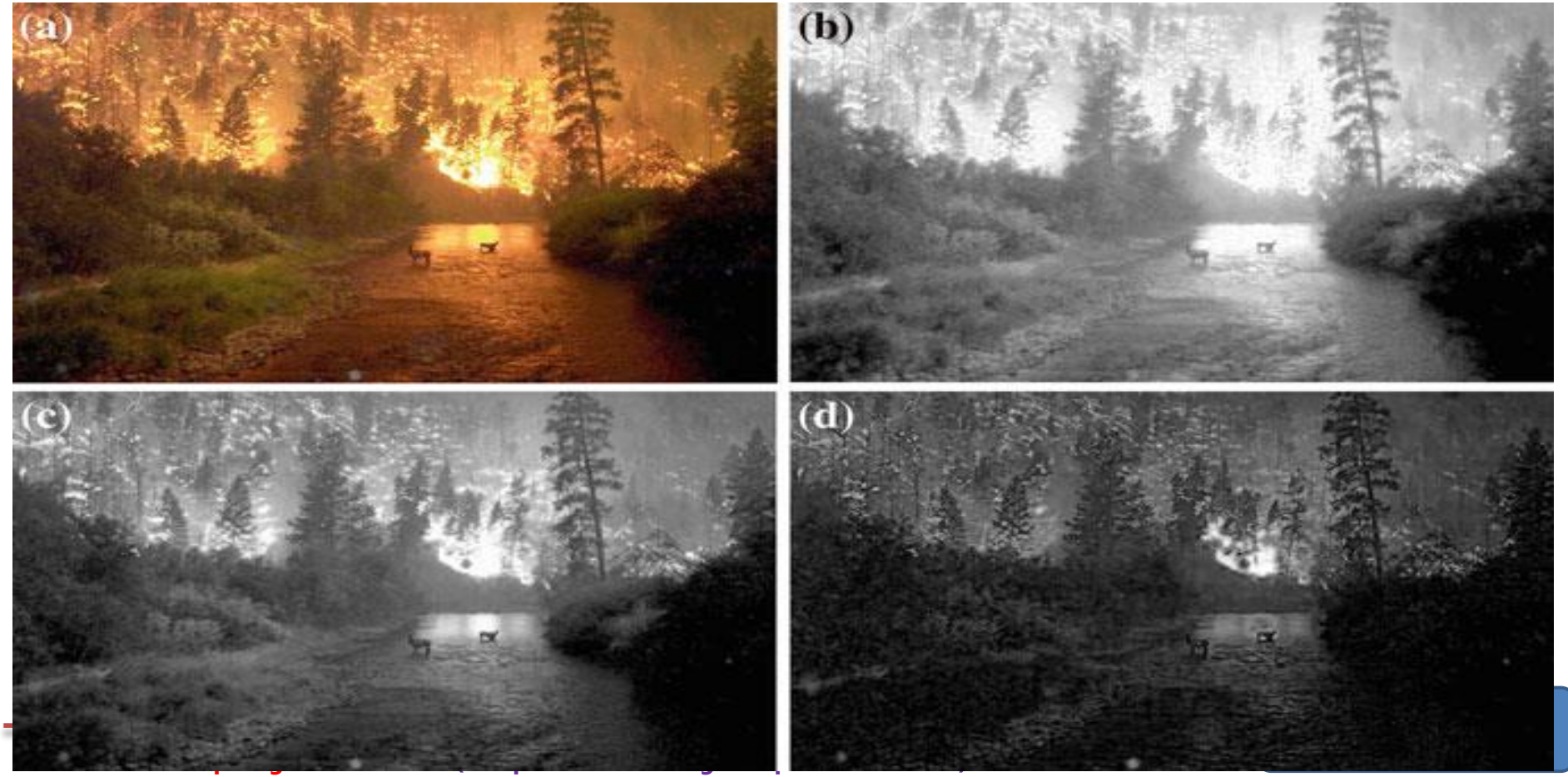
Storage: ≅921.6 (kB)

Why:

- 640 × 480 × 24 = 7,372,800 bit
- 7,372,800 /8= 921,600 byte
- 921,600 / 1000 = 921.6 kb

3

24-Bit Color Images



4

Higher Bit-Depth Images

- Such images are called multispectral (more than three colors) or hyperspectral
- Used when:
  - a maximum faithfulness to the viewed scene is require , (e.g. an image of a patient's liver).
  - Satellite imaging, where extra information can give
- More information using special cameras
  - use invisible light (e.g., infrared, ultraviolet)

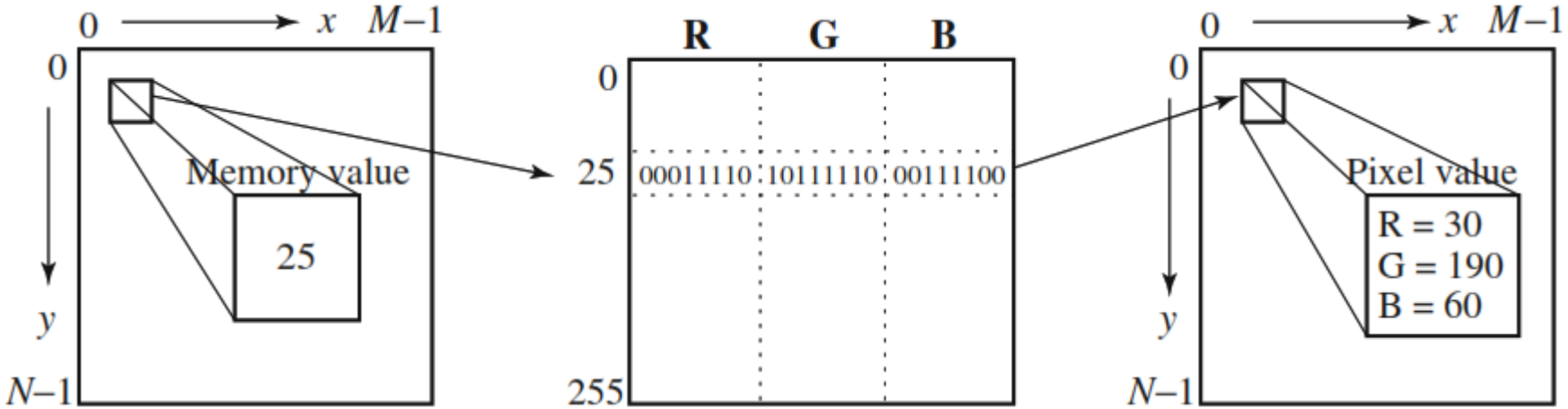
5

8-Bit Color Images ("256 colors")

- Many systems can utilize color information stored with only 8 bits of information (If space is a concern).
- 8-bit color image files use the concept of a lookup table to store color information.
- The idea used in 8-bit color images is to store only the index, or code value, for each pixel.

5

8-Bit Color Images

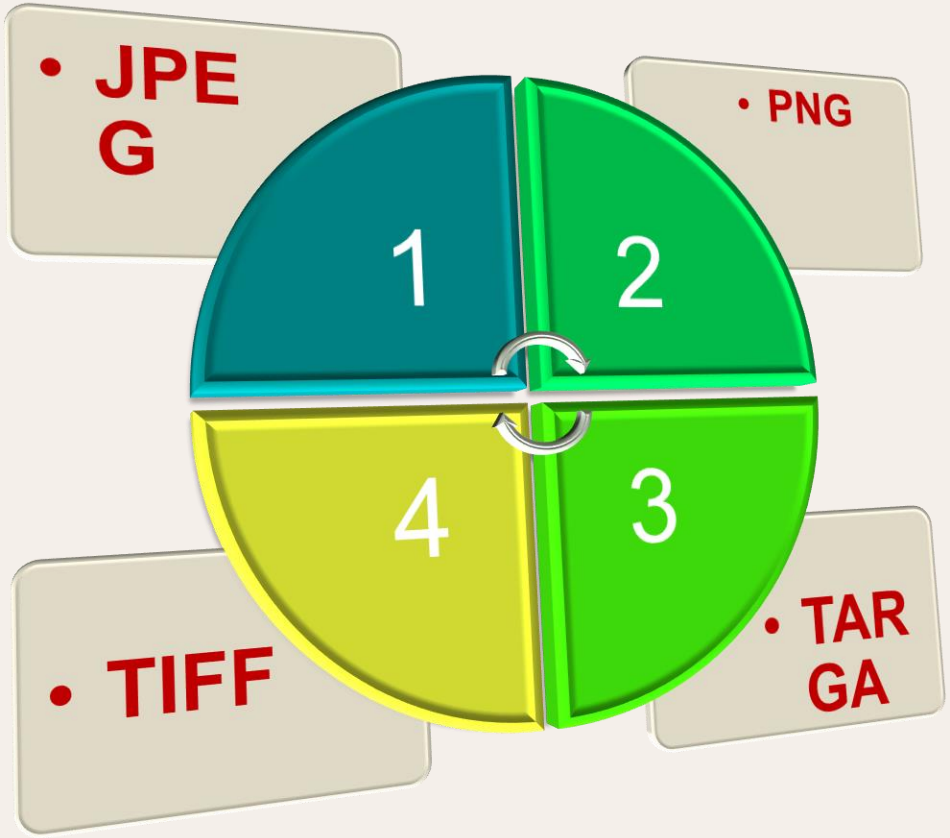


5

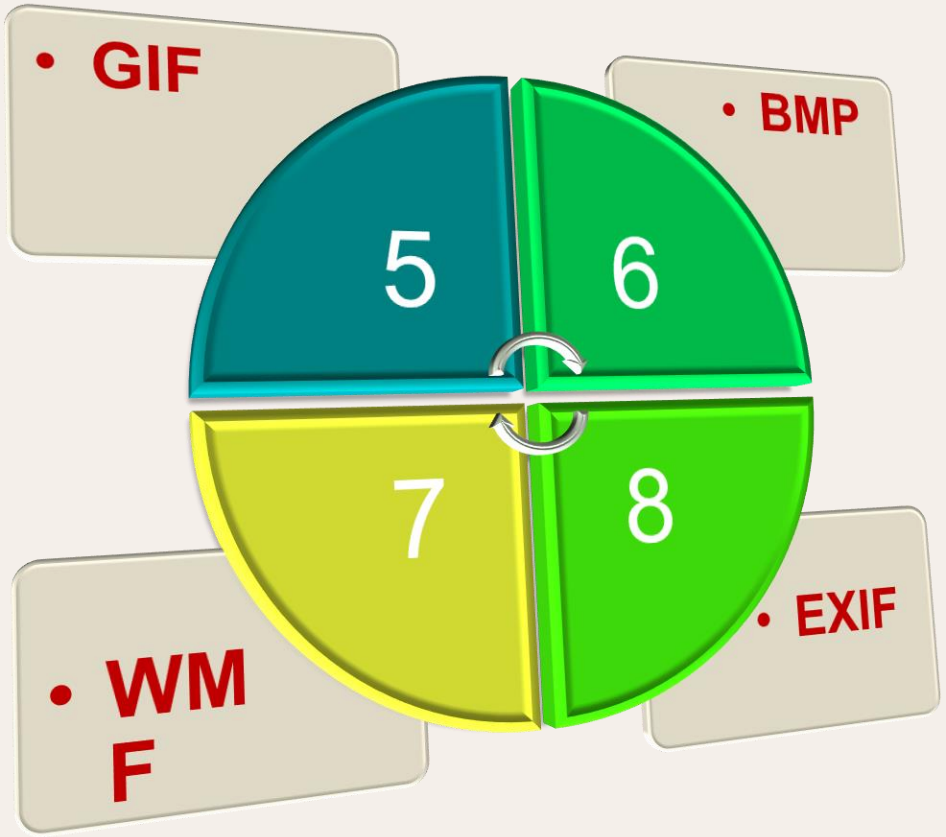
8-Bit Color Images

- For an 8-bit image, the image file can store in the file header information just what 8-bit values for R, G, and B correspond to each index.
- A simple animation process is possible via simply changing the color table: this is called color cycling or palette animation.

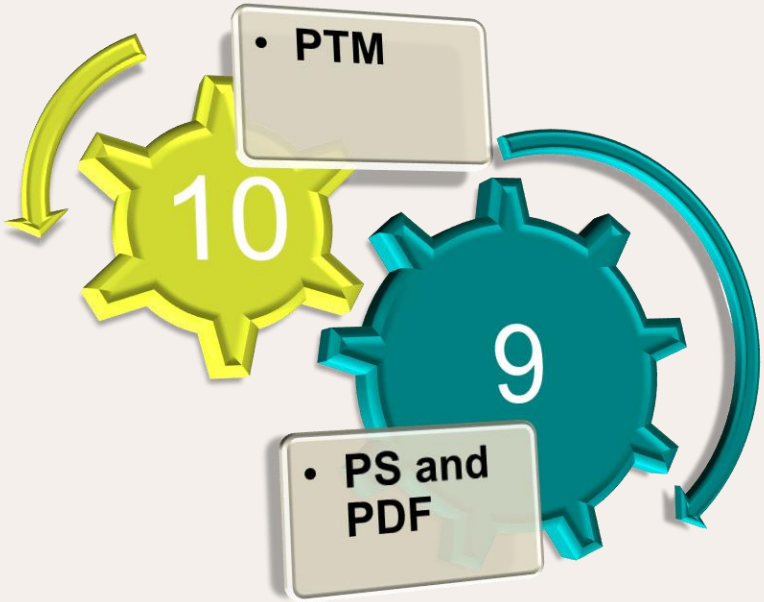
Popular File Formats



Popular File Formats



Popular File Formats



1 GIF: Graphics Interchange Format

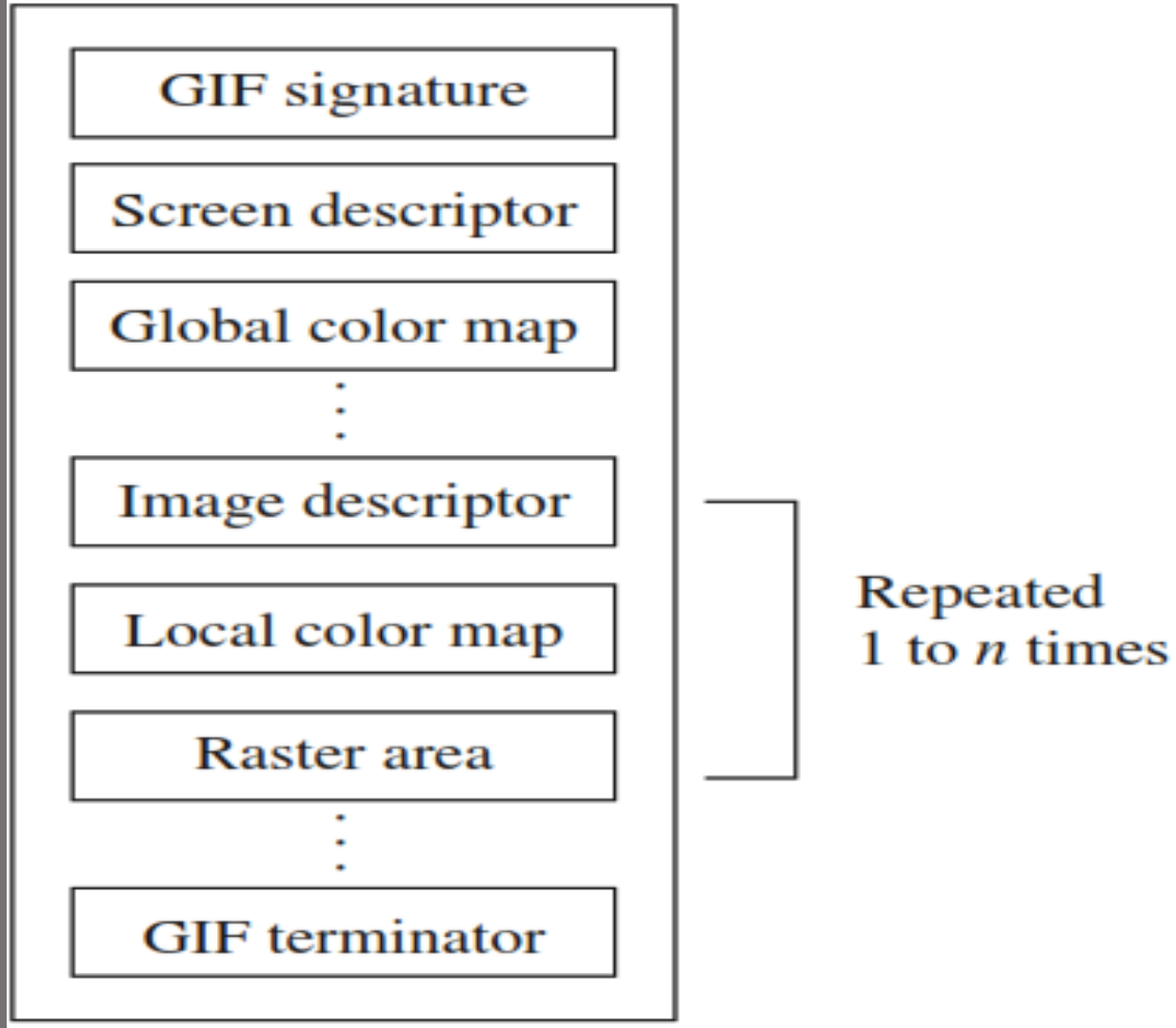
- Initially for transmitting graphical images over phone lines via modems.
- uses the Lempel-Ziv (compression algorithm)
- is limited to 8-bit (256) color images only.
- it is best suited for images with few distinctive colors (e.g., graphics or drawing).

1 GIF: Graphics Interchange Format

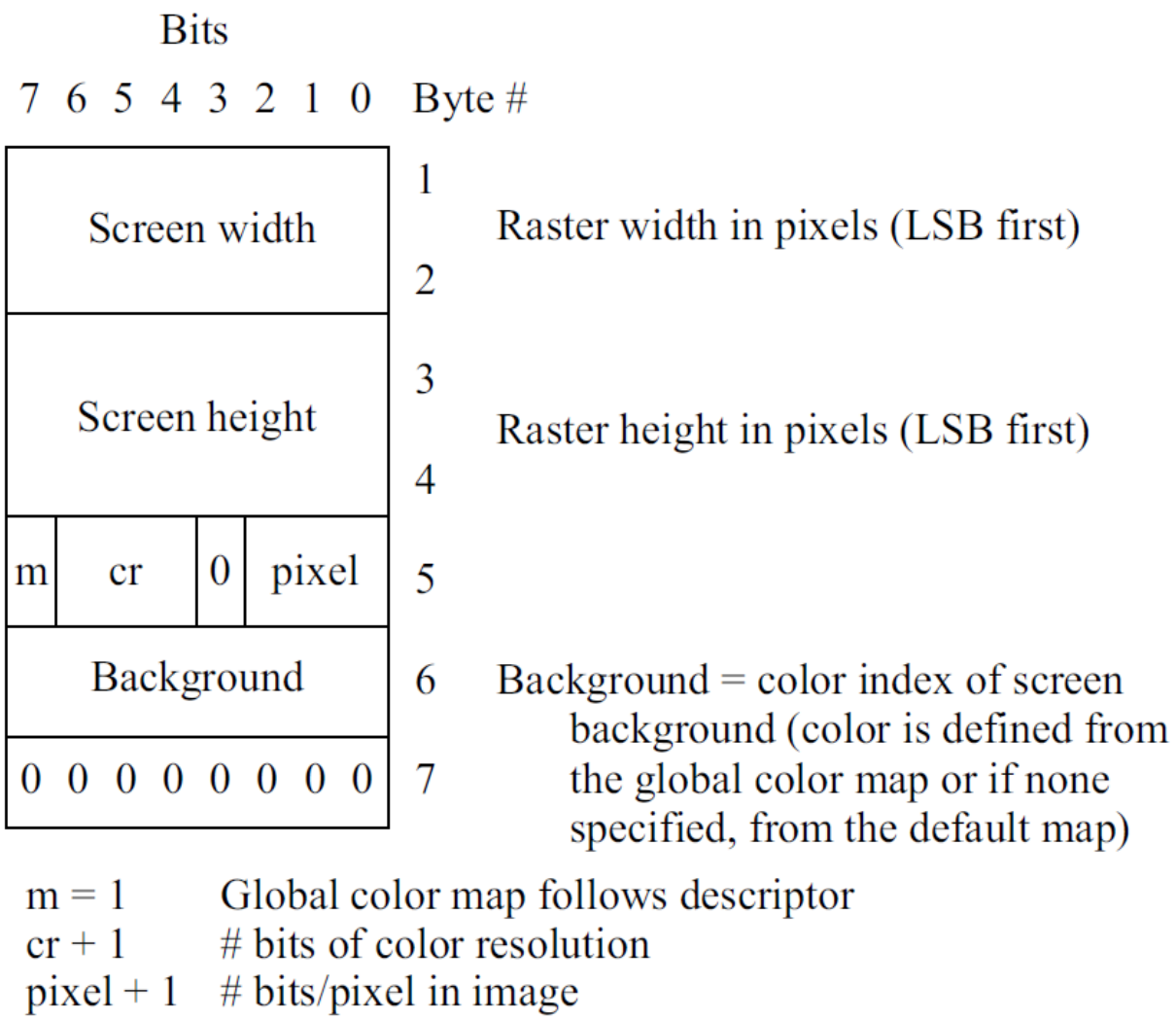
- comes in two flavors The original specification is GIF87a.

  The later version, GIF89a, supports simple animation

GIF file format



GIF screen descriptor



JPEG: Joint Photographic Experts Group

- Is the most important current **lossy** compression standard for image compression.
- This standard was created by a working group of the International Organization for Standardization (ISO).
- We shall study JPEG in a good deal more detail in Chap. 9

JPEG: Joint Photographic Experts Group

3 PNG: Portable Network Graphics

- It is extended to GIF standard
- PNG files include support for up to 16 bits per pixel in each
- color channel, i.e., 48-bit color.
- Files may also contain gamma correction information **(α-channel information).**
- It supports both **lossless** and **lossy** compression with performance *better than GIF*

4 TIFF: Tagged Image File Format

- Its support for attachment of additional information (referred to as “tags”)
  - *The most important tag is a format signifier: what type of compression, etc., is in use in the stored image*
- TIFF can store many different types of images: 1-bit, grayscale, 8-bit, 24-bit RGB, and so on.
- It provide the option to compress the image or let it without compression
- It is a **lossless** compression

5 BMP: BitMap

- BitMap (BMP) is one major system standard image file format for Microsoft Windows.
- It uses raster graphics. BMP supports many pixel formats, including indexed color, 16, 24, and 32-bit color images.
- It makes use of Run-Length Encoding (RLE) compression

6 WMF : Windows MetaFile

- WMF: is the native vector file format for the Microsoft Windows.
- WMF files actually consist of a collection of Graphics Device Interface (GDI) function calls.

7 EXIF : Exchangeable Image File

- is an image format for digital cameras
- It enables the recording of image metadata (exposure, light source/flash, white balance, type of scene, etc.)
- A variety of tags (many more than in TIFF) is available to facilitate higher-quality printing.

8 PS and PDF

- **PostScript** is an important language for typesetting, and many high-end printers have a **PS** interpreter built into them.
- It is a vector-based, rather than pixelbased, picture language.
- It includes vector/structured graphics, text; bit-mapped images.
- PostScript files are just stored as ASCII; in **academic** settings and does not provide compression.

8 PS and PDF

- Therefore, another (text + figures) language has largely superseded PostScript in nonacademic settings: Adobe Systems Inc. includes LZW compression in its **Portable Document Format (PDF)** file format.
- PDF files that do not include images have a compression ratio, 2:1 or 3:1, using LZW-based compression tools (`gzip` for Unix, `WinZip or WinRAR`).

8 PS and PDF

- For files containing images, PDF may achieve higher compression ratios by using separate JPEG compression for the image content.

9

PTM: Polynomial Texture Mapping

- is a technique for storing a representation of a camera scene that contains information about a set of images taken under a set of lights with each placed at a different direction from the scene
- The objective of PTM is in part to find out the surface properties of the object being imaged

9

PTM: Polynomial Texture Mapping

(a)

(b)


Thank you