

## **Tutorial 1:**

### **Discussion Topic: Image Formats and Bit-Depth**

#### **File Formats**

There are many file formats, but we will only describe a few of the more common ones :

##### **1. BMP - BITMAP**

- i. Windows based PC bitmap format.
- ii. 1 to 24 bit color formats
- iii. 4 and 8 bit images compressed using lossless compression
- iv. 24 bit images not compressed

##### **2. GIF - Graphics Interchange Format**

- i. 1 or 8 bit bitmap, grayscale or indexed color images developed for use with Macs and PCs use on web pages - compressed, so small, allow for fast downloads
- ii. support animations, interlacing, and transparent colors
- iii. also used frequently with presentation software
- iv. best used for clip art/cartoon style graphics

##### **3. Jpg or Jpeg - Joint Photographic Experts Group**

- i. 24 bit color images
- ii. used for web and presentation graphics
- iii. compressed
- iv. good image quality at small file sizes
- v. good for photographic type image
- vi. lossy compression can result in poor image quality if compressed too much

##### **4. TIF or Tiff - Tagged Image File Format**

- i. good for exchange of images between programs and platforms
- ii. generally uncompressed, or uses lossless compression
- iii. 1 bit color to 24 bit color
- iv. multiple types of tiffs, some incompatible with others

**Bit-Depth**

As the image is just black and white - no colors, no grays - it could be represented by 0's and 1's as shown in figure 2.1:

0	0	0	0	0	0	0
0	0	0	0	0	0	0
0	0	0	0	0	1	1
0	0	0	1	1	0	0
0	0	1	0	0	0	0
1	1	0	0	0	0	0
0	0	0	0	0	0	0

Fig 2.1 Representation of image in binary form

A bit is a binary digit, which can only have a value of 0 or 1. This is a 1 bit digital representation of the image. That is, the color of each pixel can be stored in just 1 bit of space in the computer. 256 color values can be fitted into 8 bits, 16 million colors need 24 bits.

Bit depth defines the number of colors available to each pixel within an image.

Bit Depth	Colors Available
1-bit	black and white
2-bit	4 colors
4-bit	16 colors
8-bit	256 colors
8-bit grayscale	256 shades of gray

16-bit	32768 colors
24-bit	16.7 million colors
32-bit	16.7 million + 256 Levels of transparency

Table 2.1 Associated number of colors with bit-depth variation

8-bit image - 256 colors

With an 8-bit image, each pixel can be one of 256 colors.

This is a color table, not the image itself. It shows the choice of 256 colors available to each pixel. If the colors are numbered from 0 starting at the top left hand corner of the square, then one pixel in the image might be color 5, which is yellow. Numbers less than 256 fit in 8 bits

24-bit image - 16 million colors

With a 24 bit image, you have 16 million colors, made up from 256 shades of red, 256 shades of green and 256 shades of blue. All the colors are made up from varying amounts of these primary colors.

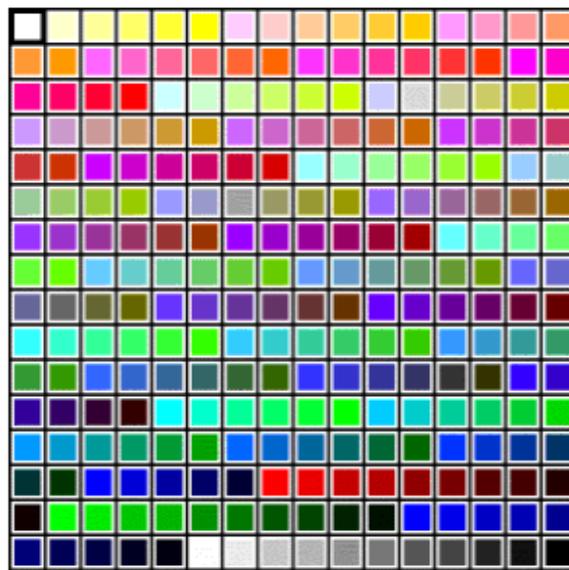


Fig 2.2 Distribution of color pixels

So for example, 0, 0, 0 would be black and 255, 255, 255 would be white.

255, 0, 0 is red. 0, 255, 0 is green and 0, 0, 255 is blue.

255, 255, 0 makes yellow, 255, 0, 255 makes magenta and 0, 255, 255 makes cyan. Each value of 0 - 255 takes up 8 bits, so the total amount of space to define the color of each pixel is 24 bits.