Lecture No: 4 Digital Image File Format

Why do we need so many different types of image file format?

- The short answer is that there are many different types of images and application with varying requirements.
- A more complete answer, also considers market share proprietary information, and a lack of coordination within the imaging industry. Many image types can be converted to one of other type by easily available image conversion software. Field related to computer imaging is that computer graphics.

Image format

Image file formats are standardized (under the auspices of the International Organization for Standardization (ISO)) **formats used for storing** digital images. An Image file is a matrix of pixels. Each pixel consists of numbers representing magnitudes of brightness for each of the 3 basic (primary) colors (RGB). We briefly mention here only the most usable formats. Due to the large size of most images, image formats may use **compression**. Data compression is the reduction of data size (to be suitable for storage or transmission) without damaging the information. Compression can be lossy [e.g., by using Discrete Cosine Transform (DCT) as we will see later] or lossless (e.g., by using Huffman coding).Lossy compression is much more efficient than lossless compression, but some information will be lost after we recover the image through inverse transform.

GIF (Graphics Interchange Format) is limited to 256 colors. Hence, the GIF format is suitable for storing images with few colors such as diagrams, logos, and cartoons. The GIF format uses a lossless compression that is more effective when large areas in the image have the same color. GIF uses **indexed color**, i.e., the pixel does not contain a color directly, but it contains the index of that color (= its location in a

separate sheet called **palette**). This method of indirect coloring saves memory (or transmission time), but if the palette is lost or has an error, it will be imposible to restore colors. Another disadvantage is that **we cannot display** two indexed images with different palettes simultaneously.

PNG (Portable Network Graphics) file format is developed as a successor to the GIF, but PNG format supports 16 million colors. PNG uses 8 or 16 bits for each primary color (red, green, blue), hence 24 or 48 bits in total for each pixel of a color image (it uses 8 or 16 bits for gray images). Also, PNG support indexed color. This format used ZIP lossless compression.

TIF (Tagged Image File Format) uses 8 or 16 bits for each primary color (red, green, blue), hence 24 or 48 bits in total for each pixel of a color image (8 or 16 bits for gray images). In addition, TIF support indexed color. This format usually does not use compression (sometimes uses LZW lossless compression) .

BMP file format (or: Windows bitmap) handles images within Microsoft Windows OS. This format **does not use compression**; hence, bmp images are normally large. It uses 1, 2, 4, 8, 16, 24, 32, 48, or 64 bits for each pixel. and the data of image are located in the field of data while there are two fields one for header (54 byte) that contains the image information such as (height ,width , no. of bits per pixel, no of bands , the file type). The second field is the color map or color palette for gray level image, where its length is 0-255).

JPEG (Joint Photographic Experts Group) file format uses 8 bits for each primary color (red, green, blue), hence 24-bit in total for color images (it uses 8 bits only for gray images). **JPEG uses compression**, usually lossy compression with DCT. MS-DOS uses JPG as filename extension for JPEG. Most digital cameras save images using JPEG format. **JPEG 2000** is a new format, started in 2000, using lossy compression through wavelet transform.