IMAGES

An image, digital image, or still image is a binary representation of visual information, such as drawings, pictures, graphs, logos, or individual video frames. A digital image is nothing but a matrix of pixels.

A pixel is a smallest picture element that contains useful information about a digital image such as light intensity, color etc. Pixels are combined to form a complete image.

Bitmaps

A bit is the simplest element in the digital world, an electronic digit that is either on or off, black or white, or true (1) or false (0). This is referred to as binary, since only two states (on or off) are available. A map is a two dimensional matrix of these bits. A bitmap, then, is a simple matrix of the tiny dots that form an image and are displayed on a computer screen or printed.
A one-dimensional matrix (1-bit depth) is used to display monochrome images—a bitmap where each bit is most commonly set to black or white.

Color

Color is a vital component of multimedia. Light comes from an atom when an electron passes from a higher to a lower energy level; thus each atom produces uniquely specific colors. This explanation of light, known as the quantum theory. Color is the frequency of a light wave within the narrow band of the electromagnetic spectrum to which the human eye responds.
The letters of the mnemonic VIBGYOR, learned by many of us to remember the colors of the rainbow, are the descending frequencies of the visible light spectrum: Violet, Indigo, Blue, Green, Yellow, Orange and Red. Light that is infrared, or below the frequency of red light and not perceivable by the human eye, can be created and viewed by electronic diodes and sensors, and it is used for TV and VCR remote controls, for wireless communications among computers, and for night goggles used in the military. Infrared light is radiated heat. Ultraviolet light, on the other hand, is beyond the higher end of the visible spectrum and can be damaging to humans. The color white is a noisy mixture of all the color frequencies in the visible spectrum. Sunlight and fluorescent tubes produce white light.
The cornea of the eye acts as a lens to focus light rays onto the retina. The light rays stimulate many thousands of specialized nerves, called rods, which cover the surface of the retina. Receptors in the cones are sensitive to red, green, and blue light, and all the nerves together transmit the pattern of color information to the brain. The eye can differentiate among about 80,000 colors, or hues, consisting of combinations of red, green, and blue. As color information is sent to the brain, other parts of the mind massage the data en route to its point of cognitive recognition. Human response to color is complicated by cultural and experiential filters that cause otherwise straightforward color frequencies to carry pleasant, unpleasant, soothing, depressing, and many other special meanings.

Computerized Color:
Because the eye's receptors are sensitive to red, green, and blue light, by adjusting combinations of these three colors, the eye and brain will interpolate the combinations of colors in between. Although the eye perceives colors based upon red, green, and blue, there are actually two basic methods of making color: additive and subtractive.

Additive Color:
In the additive color method, a color is created by combining colored light sources in three primary colors: red, green, and blue (RGB). This is the process used for cathode ray tube (CRT), liquid crystal (LCD), and plasma displays. On the back of the glass face of a CRT are thousands of phosphorescing chemical dots. These dots are each about 0.30mm or less in diameter (the dot pitch), and are positioned very carefully and very close together, arranged in triads of red, green, and blue. These dots are bombarded by electrons that "paint" the screen at high speeds (about 60 times a second). The red, green, and blue dots light up when hit by the electron beam. Your eye sees the combination of red, green, and blue light and interpolates it to create all other colors.

Subtractive Color:
In the subtractive color method, color is created by combining colored media such as paints or ink that absorb (or subtract) some parts of the color spectrum of light and reflect the others back to the eye. Subtractive color is the process used to create color in printing. The printed page is made up of tiny halftone dots of three primary colors: cyan, magenta, and yellow (designated as CMY).

Computer Color models:

RGB color model- The RGB color model is one of the most widely used color representation method in computer graphics. It use a color coordinate system with three primary colors red, green and blue. Each primary color can take an intensity value ranging from 0(lowest) to 1(highest). Mixing these three primary colors at different intensity levels produces a variety of colors. The collection of all the colors obtained by such a linear combination of red, green and blue forms the cube shaped RGB color space. In the RGB color model, an arbitrary color within the cubic color space can be specified by its color coordinates: (r, g.b). (0, 0, 0) for black, (1, 1, 1) for white, (1, 1, 0) for yellow, (0.7, 0.7, 0.7) for gray. RGB colors of a pixel is of 24 bits. Now suppose a color image with width and height are 100x200px then the total memory space required to store the image is 100x200x24 =480000 bits=58.59375 KB
Uses of RGB color model:
Used when project involves digital screens like computers, mobile, TV etc.
Used in web and application design.
Used in online branding.
Used in social media.
CMY color model- Cyan, magenta and yellow are the secondary colors of light and the primary colors of pigments. This means, if white light is shined on a surface coated with cyan pigment, no red light is reflected from it. Cyan subtracts red light from white light. Unlike the RGB color

model, CMY is subtractive, meaning higher values are associated with darker colors rather than lighter ones.

Difference between RGB and CMYK color model:

RGB	CMYK
Used for digital works.	Used for print works.
Primary colors: Red, Green, Blue	Primary Colors: Cyan, Magenta, Yellow, Black
Additive Type Mixing	SubtractiveType Mixing
Colors of images are more vibrant	Colors of lass vibrant.
RGB Scheme has wider range of colors than CMYK	CMYK has lesser range of colors than RGB.
file formats:- JPEG, PNG, GIF etc.	file formats:- PDF, EPS etc
Basically it is used for online logos, online ads, digital graphics, photographs for website, social media, or apps etc.	Basically it is used for business cards, stationary, stickers, posters, brochures etc.

Web Safe Colors: In the past, computer monitors were only capable of displaying up to 256 of the 16 million available colors. Therefore, a list of 216 web safe colors was created so developers could know what colors would be compatible with all types of displays. These sets of 216 colors were compatible with all the types of monitors of different brands and of different operating systems. These set of colors are called web safe colors.

Different image formats:
Image Format describes how data related to the image will be stored. Data can be stored in compressed, Uncompressed or vector format. Each format of the image have a different advantage and disadvantage.

1. **TIFF(.tif, .tiff) -** Tagged Image File Format this format store image data without losing any data. It do not perform any compression on images have a high-quality image is obtained but size of image is also large, which is good for printing, professional printing.

2. **JPEG (.jpg, .jpeg) -** Joint Photographic Experts Group is a loss-prone (lossy) format in which data is lost to reduce size of image. Due to compression, some data is lost but that loss is very less. It is a very common format and are good for digital cameras, nonprofessional prints, E-Mail, Powerpoint etc., making it ideal for web use.

3. **GIF (.gif) -** GIF or Graphics Interchange Format files are used for web graphics.They can be animated and are limited to only 256 colors, can allow for transparency. GIF files are typically small is size and are portable.

4. **PNG (.png) -** PNG or Portable Network Graphics files are a lossless image format. It was designed to replace gif format as gif supported 256 colors unlike PNG which support 16 million colors.

5. **Bitmap (.bmp) -** Bit Map Image file is developed by Microsoft for windows. It is same as TIFF due lossless, no compression property. Due to BMP being a proprietary format, it is generally recommended to use TIFF files.

6. **EPS (.eps) -** Encapsulated PostScript file is a common vector file type. EPS files can be opened in applications such as Adobe Illustrator or CorelDRAW.

7. **RAW Image Files (.raw, .cr2, .nef, .orf, .sr2) -** These Files are unprocessed created by a camera or scanner. Many digital SLR cameras can shoot in RAW, whether it be a .raw, .cr2, or .nef. These images are the equivalent of a digital negative, meaning that they hold a lot of image information. These images need to be processed in an editor such as Adobe Photoshop or Lightroom. It saves metadata and is used for photography.