Principle of color in multimedia media essay

Q1. Explain the principle of color in multimedia. How many dimensions are used in the color? Explain with suitable example.

Color is a sensation produced by the human eye and nervous system. It is related to light, but an understanding of the properties of light is not sufficient to understand color, and is especially not sufficient to understand the art of color reproduction. Overwhelming experimental evidence tells us that the perception of a color is related to the strength of three signals which are transmitted along the optic nerve to the brain. Color is a phenomenon of light caused by how our eyes detect differing qualities of projected or reflected light. Because science and technology has allowed us to understand the physiology of the human eye, to measure wavelengths of light and chart energy patterns, we have come a long way in grasping the complexities of color. The importance of this is that:

It is useful to represent a color by a set of exactly three numbers. In practice, the set of three numbers must be related to some actual color reproduction process. The numbers commonly specify portions of some set of primary colors such as:

Color is the principal way the mind separates elements in space and chooses something to focus on. Thus you should use rich or bright colors like red and yellow sparingly, and generally only for items you really wish to emphasize. Use different colors rather than different shapes to distinguish features on a page. Beware of the negative effects of certain highly contrasting colors placed next to each other (such as green and red), as well as the off-putting optical illusions created, for instance, by a series of parallel lines. If navigational elements have color at all, make sure their hues don’t distract viewers from focusing on the main content of the page.

Web design publications often talk about using only “ web-safe” or “ browser-safe” colors, meaning a limited palette that will show up roughly the same in all browsers and operating systems. But, as the web designer Lynda Weinman has noted, very few computers still display only 256 colors, their capability when the web was young. Indeed, most people view the web in millions of colors now, and so historians just starting on the web may ignore the browser-safe palette and its often garish, overly bright colors chosen for their mathematical simplicity rather than aesthetic value. Those experienced with this palette can continue to use it with no harm, but others shouldn’t bother. The possible exception to this rule is if many of your anticipated users will be using very old computers, in which case you should choose something from the web-safe palette for any major swath of color on your page, as well as any colored fonts.

Dimensions of Color

There are three dimensions to color-hue, value and intensity. This makes color multidimensional-any color appearance can be described in terms of these three dimensions.

1. Hue:

Hue refers to the names of the colors. It is the contrast between redness, blueness and greenness. We most typically think of hues as coming from white light divided into the visible spectrum-red, orange, yellow, green, blue and violet or as a “ circle of hues” or “ color wheel”.

Of the three dimensions of color, hue is the simplest to identify. It is that element most often referred to as ‘ color’. Looking at a rainbow, we can recognize the different dominant hues: red, orange, yellow, green, blue, violet. We also realize that any hue can appear in many variations other than their spectral form. Red, for example, exhibits a broad range of appearance, running from light to dark and weak to strong. Regardless of their appearance in terms of light or dark, weak or strong, they would all belong to the hue family: red. Hues are generally arranged in a circular fashion (hue circuit) or color wheel. Red is the name of a broad color family. The popular term, pink, is a variation of that hue, as is the familiar name, maroon.

2. Value:

Value refers to the lightness or darkness of a color. It is often related to a gray scale where white is the lightest value followed by a series of grays to black, the darkest value. The hues are located somewhere in between the extremes of white and black in value. A color value scale is a hue mixed with white to form tints and with black to form shades of that hue. Red plus white makes pink. Pink is a tint or light value of the hue red. Red plus black makes brown. Brown is a shade or dark value of the hue red.

As an example, ‘ fire-engine red’ would carry a notation of R 5/16 on this variation of a Munsell chart.

When a hue is lighter or darker that its original spectral state, the amount of light it reflects has changed: value is the dimension which refers to the lightness or darkness of a hue. Adding white to red produces a tint; adding black produces a shade. Some examples of red shades: maroon, brown, cordovan, chocolate. A ‘ pink shade’ is an oxymoron. Values are usually displayed in a series of about ten steps, but actually are unlimited. Value steps are displayed vertically, darkest at the bottom.

3. Intensity

Intensity refers to the purity or impurity of a hue. The more pure hue a given color contains, the more intense it is. Opposing terms used to describe this contrast are intense vs. gray, saturated vs. desaturated or bright vs. dull. When a color is too bright and its intensity needs to be reduced, we will often say,” Gray that color.” The most typical ways to gray a color are to add gray (black and white) or by adding some of the complementary color. The complement of a hue is the hue opposite it on the color circle. Red and green, orange and blue, and yellow and violet are examples of complementary colors.

4. Chroma

Pure red, as well as light and dark variations all belong to one hue family. When we encounter a weak red, i . e., a red that is neither lighter or darker of a sample hue, we are not dealing with value (light reflectance) but with the dimension of chroma. Synonyms for chroma: strength, purity, saturation, intensity. It is the degree to which a hue departs from full intensity and moves towards a neutral gray. A red rose and a red brick may be of the same hue and value, but the rose exhibits greater purity of saturation. Chroma steps are arranged horizontally, left to right- weakest to strongest.

Each complementary hue at the same value displaying various intensities (chroma)

Q2. How an appearance of an image on a monitor is depend on monitor resolution and monitor size?

Ans.

Imagine lying down in the grass with your nose pressed deep into the thatch. Your field of vision would not be very large, and all you would see are a few big blades of grass, some grains of dirt, and maybe an ant or two. This is a 14-inch 640 x 480 monitor. Now, get up on your hands and knees, and your field of vision will improve considerably: you'll see a lot more grass. This is a 15-inch 800 x 640 monitor. For a 1280 x 1024 perspective (on a 19-inch monitor), stand up and look at the ground. Some monitors can handle higher resolutions such as 1600 x 1200 or even 1920 x 1440-somewhat akin to a view from up in a tree.

Monitors are measured in inches, diagonally from side to side (on the screen). However, there can be a big difference between that measurement and the actual viewable area. A 14-inch monitor only has a 13. 2-inch viewable area, a 15-inch sees only 13. 8 inches, and a 20-inch will give you 18. 8 inches (viewing 85. 7% more than a 15-inch screen).

A computer monitor is made of pixels (short for " picture element"). Monitor resolution is measured in pixels, width by height. 640 x 480 resolution means that the screen is 640 pixels wide by 480 tall, an aspect ratio of 4: 3. With the exception of one resolution combination (1280 x 1024 uses a ratio of 5: 4), all aspect ratios are the same.

Here are some recommended resolutions for the different screen sizes:

14″

15″

17″

19″

21″

640×480

BEST

GOOD

TOO BIG

HUGE

TERRIBLE

800×600

GOOD

BEST

GOOD

TOO BIG

HUGE

1024×768

TOO SMALL

GOOD

BEST

GOOD

STILL GOOD

1280×1024

TINY

TOO SMALL

GOOD

BEST

GOOD

1600×1200

TERRIBLE

TINY

TOO SMALL

GOOD

BEST

SCREEN RESOLUTIONS, MONITOR SIZES AND VARIATIONS IN IMAGES SIZE

The dimensions of image on screen will often be very different to the size of the original we are scanning in. The size of the image on screen depends on monitor resolution and monitor size.

Video cards are able to display a particular set number of pixels horizontally and vertically on the screen. For example, the card may display (width and height) 640 x 480 pixels or 800 x 600 pixels.

Physical dimension of the monitor. A large monitor set to 640 x 480 pixels uses larger pixels than a small monitor with the same setting.

1. Two monitors with the same physical dimension, fixed-size image, but different screen resolutions.

Suppose you have a monitor that displays 800 x 600 pixels and you want your image to take up 1/4 of that screen across and 1/3 down, then: 800/4 x 600/3 = 200 x 200 pixels (Figure 1). However, the same image (200 x 200 pixels) displayed on a monitor of the same size but with different resolution (e. g. 640 x 480), will look much larger as it will take up a larger proportion of the screen (Figure 2).

Figure1:

Screen Resolution 800x 600

Image Size 200 x 200

Figure 2:

Screen Resolution 640 x 480

Image Size 200 x 200

2. Two monitors with the same screen resolution, fixed-size image, but different physical dimensions.

Suppose your image size is 200 x 200 and the screen resolution of both monitors is the same (e. g. they both have a 640 x 480 screen resolution). The monitors are of different physical proportion, (e. g. one is a 21 inch monitor, the other a 15 inch monitor). In this case the image will take up the same proportion of space in both monitors, although the absolute size of the image is different (larger in the larger monitor).

Figure 3:

Monitor Size 21 inch

Screen Resolution 640 x 480

Image size 200 x 200

Figure 4:

Monitor Size 15 inch

Screen Resolution 640 x 480

Image Size 200 x 200

Q3. Discuss the physical and psychological principles as to why animation works, as well as how it is usually presented?

Ans. The 12 basic principles of animation is a set of principles of animation introduced by the Disney animators Ollie Johnston and Frank Thomas in their 1981 book The Illusion of Life: Disney Animation. Johnston and Thomas in turn based their book on the work of the leading Disney animators from the 1930s onwards, and their effort to produce more realistic animations. The main purpose of the principles was to produce an illusion of characters adhering to the basic laws of physics, but they also dealt with more abstract issues, such as emotional timing and character appeal.

The 12 principles are as follows:

Squash and stretch

Anticipation

Staging

Straight Ahead Action and Pose to Pose

Follow Through and Overlapping Action

Slow In and Slow Out

Arcs

Secondary Action

Timing

Exaggeration

Solid Drawing (same or different as Weight)

Appeal

1 SQUASH AND STRETCH

The most important principle is “ squash and stretch”. the purpose of which is to give a sense of weight and flexibility to drawn objects. It can be applied to simple objects, like a bouncing ball, or more complex constructions, like the musculature of a human face. Taken to an extreme point, a figure stretched or squashed to an exaggerated degree can have a comical effect. In realistic animation, however, the most important aspect of this principle is the fact that an object’s volume does not change when squashed or stretched. If the length of a ball is stretched vertically, its width (in three dimensions, also its depth) needs to contract correspondingly horizontally.

Illustration of the “ squash and stretch”-principle:

Example A shows a ball bouncing with a rigid, non-dynamic movement. In example B the ball is “ squashed” at impact, and “ stretched” during fall and rebound. The movement also accelerates during the fall, and slows down towards the apex (see “ slow in and slow out”).

2 ANTICIPATION

This movement prepares the audience for a major action the character is about to perform, such as, starting to run, jump or change expression. A dancer does not just leap off the floor. A backwards motion occurs before the forward action is executed. The backward motion is the anticipation. A comic effect can be done by not using anticipation after a series of gags that used anticipation. Almost all real action has major or minor anticipation such as a pitcher’s wind-up or a golfers’ back swing. Feature animation is often less broad than short animation unless a scene requires it to develop a characters personality.

Anticipation: A baseball player making a pitch prepares for the action by moving his arm back.

For special effect, anticipation can also be omitted in cases where it is expected. The resulting sense of anticlimax will produce a feeling of surprise in the viewer, and can often add comedy to a scene. This is often referred to as a ‘ surprise gag’.

3 STAGING

A pose or action should clearly communicate to the audience the attitude, mood, reaction or idea of the character as it relates to the story and continuity of the story line. The effective use of long, medium, or close up shots, as well as camera angles also helps in telling the story. There is a limited amount of time in a film, so each sequence, scene and frame of film must relate to the overall story. Do not confuse the audience with too many actions at once. Use one action clearly stated to get the idea across, unless you are animating a scene that is to depict clutter and confusion. Staging directs the audience’s attention to the story or idea being told. Care must be taken in background design so it isn’t obscuring the animation or competing with it due to excess detail behind the animation. Background and animation should work together as a pictorial unit in a scene.

4 STRAIGHT AHEAD AND POSE TO POSE ANIMATION

Straight ahead animation starts at the first drawing and works drawing to drawing to the end of a scene. You can lose size, volume, and proportions with this method, but it does have spontaneity and freshness. Fast, wild action scenes are done this way. Pose to Pose is more planned out and charted with key drawings done at intervals throughout the scene. Size, volumes, and proportions are controlled better this way, as is the action. The lead animator will turn charting and keys over to his assistant. An assistant can be better used with this method so that the animator doesn't have to draw every drawing in a scene. An animator can do more scenes this way and concentrate on the planning of the animation. Many scenes use a bit of both methods of animation.

Computer animation removes the problems of proportion related to " straight ahead action" drawing; however, " pose to pose" is still used for computer animation, because of the advantages it brings in composition. The use of computers facilitates this method, as computers can fill in the missing sequences in between poses automatically. It is, however, still important to oversee this process, and apply the other principles discussed.

5 FOLLOW THROUGH AND OVERLAPPING ACTION

When the main body of the character stops all other parts continue to catch up to the main mass of the character, such as arms, long hair, clothing, coat tails or a dress, floppy ears or a long tail (these follow the path of action). Nothing stops all at once. This is follow through. Overlapping action is when the character changes direction while his clothes or hair continues forward.

The character is going in a new direction, to be followed, a number of frames later, by his clothes in the new direction. “ DRAG,” in animation, for example, would be when Goofy starts to run, but his head, ears, upper body, and clothes do not keep up with his legs. In features, this type of action is done more subtly. Example: When Snow White starts to dance, her dress does not begin to move with her immediately but catches up a few frames later. Long hair and animal tail will also be handled in the same manner. Timing becomes critical to the effectiveness of drag and the overlapping action.

6 SLOW-OUT AND SLOW-IN

As action starts, we have more drawings near the starting pose, one or two in the middle, and more drawings near the next pose. Fewer drawings make the action faster and more drawings make the action slower. Slow-ins and slow-outs soften the action, making it more life-like. For a gag action, we may omit some slow-out or slow-ins for shock appeal or the surprise element. This will give more snap to the scene.

The movement of the human body, and most other objects, needs time to accelerate and slow down. For this reason, an animation looks more realistic if it has more frames near the beginning and end of a movement, and fewer in the middle. This principle goes for characters moving between two extreme poses, such as sitting down and standing up, but also for inanimate, moving objects, like the bouncing ball in the above illustration.

7 ARCS

All actions, with few exceptions (such as the animation of a mechanical device), follow an arc or slightly circular path. This is especially true of the human figure and the action of animals. Arcs give animation a more natural action and better flow. Think of natural movements in the terms of a pendulum swinging. All arm movement, head turns and even eye movements are executed on an arcs.

8 SECONDARY ACTION

This action adds to and enriches the main action and adds more dimension to the character animation, supplementing and/or re-enforcing the main action. Example: A character is angrily walking toward another character. The walk is forceful, aggressive, and forward leaning. The leg action is just short of a stomping walk. The secondary action is a few strong gestures of the arms working with the walk. Also, the possibility of dialogue being delivered at the same time with tilts and turns of the head to accentuate the walk and dialogue, but not so much as to distract from the walk action. All of these actions should work together in support of one another. Think of the walk as the primary action and arm swings, head bounce and all other actions of the body as secondary or supporting action.

Secondary action: as the horse runs, its mane and tail follow the movement of the body.

9 TIMING

Expertise in timing comes best with experience and personal experimentation, using the trial and error method in refining technique. The basics are: more drawings between poses slow and smooth the action. Fewer drawings make the action faster and crisper. A variety of slow and fast timing within a scene adds texture and interest to the movement. Most animation is done on twos (one drawing photographed on two frames of film) or on ones (one drawing photographed on each frame of film). Twos are used most of the time, and ones are used during camera moves such as trucks, pans and occasionally for subtle and quick dialogue animation. Also, there is timing in the acting of a character to establish mood, emotion, and reaction to another character or to a situation. Studying movement of actors and performers on stage and in films is useful when animating human or animal characters. This frame by frame examination of film footage will aid you in understanding timing for animation. This is a great way to learn from the others.

10 EXAGGERATION

Exaggeration is not extreme distortion of a drawing or extremely broad, violent action all the time. It[1]s like a caricature of facial features, expressions, poses, attitudes and actions. Action traced from live action film can be accurate, but stiff and mechanical. In feature animation, a character must move more broadly to look natural. The same is true of facial expressions, but the action should not be as broad as in a short cartoon style. Exaggeration in a walk or an eye movement or even a head turn will give your film more appeal. Use good taste and common sense to keep from becoming too theatrical and excessively animated

11 SOLID DRAWING

The basic principles of drawing form, weight, volume solidity and the illusion of three dimension apply to animation as it does to academic drawing. The way you draw cartoons, you draw in the classical sense, using pencil sketches and drawings for reproduction of life. You transform these into color and movement giving the characters the illusion of three-and four-dimensional life. Three dimensional is movement in space. The fourth dimension is movement in time.

12 APPEAL

A live performer has charisma. An animated character has appeal. Appealing animation does not mean just being cute and cuddly. All characters have to have appeal whether they are heroic, villainous, comic or cute. Appeal, as you will use it, includes an easy to read design, clear drawing, and personality development that will capture and involve the audience¹s interest. Early cartoons were basically a series of gags strung together on a main theme. Over the years, the artists have learned that to produce a feature there was a need for story continuity, character development and a higher quality of artwork throughout the entire production. Like all forms of storytelling, the feature has to appeal to the mind as well as to the eye. Appeal in a cartoon character corresponds to what would be called charisma in an actor. A character who is appealing is not necessarily sympathetic – villains or monsters can also be appealing – the important thing is that the viewer feels the character is real and interesting. There are several tricks for making a character connect better with the audience; for likable characters a symmetrical or particularly baby-like face tends to be effective.

Q4. What are the different color models? What is the need to use different color models?

Ans. A color model is an abstract mathematical model describing the way colors can be represented as tuples of numbers, typically as three or four values or color components. When this model is associated with a precise description of how the components are to be interpreted (viewing conditions, etc.), the resulting set of colors is called color space. This section describes ways in which human color vision can be modeled.

A color model is a 3D unique representation of a color. There are different color models and the use of one over the other is problem oriented. For instance, the color model RGB is used in hardware applications like PC monitors, cameras and scanners, the CMY color model is used in color printers, and the YIQ model in television broadcast. In color image manipulation the two models widely used are HSI and HSV.

DIFFERENT MODELS ARE AS FOLLOWS:

RGB Model

CMY Model

CMYK Model

HSV Model

HSL Model

1. RGB Color Model

In the RGB color model, we use red, green, and blue as the 3 primary colors. We don’t actually specify what wavelengths these primary colors correspond to, so this will be different for different types of output media, e. g., different monitors, film, videotape, slides, etc.

This is an additive model since the phosphors are emitting light. A subtractive model would be one in which the color is the reflected light. We can represent the RGB model by using a unit cube. Each point in the cube (or vector where the other point is the origin) represents a specific color. This model is the best for setting the electron guns for a CRT.

Note that for the " complementary" colors the sum of the values equals white light (1, 1, 1). e. g.

red (1, 0, 0) + cyan (0, 1, 1) = white (1, 1, 1)

green (0, 1, 0) + magenta (1, 0, 1) = white (1, 1, 1)

blue (0, 0, 1) + yellow (1, 1, 0) = white (1, 1, 1)

Media that transmit light (such as television) use additive color mixing with primary colors of red, green, and blue, each of which stimulates one of the three types of the eye's color receptors with as little stimulation as possible of the other two. This is called " RGB" color space. Mixtures of light of these primary colors cover a large part of the human color space and thus produce a large part of human color experiences. This is why color television sets or color computer monitors need only produce mixtures of red, green and blue light.

Each color can be a point in the RGB color model cube. Red, green and blue are known as the primary colors. These colors can be added to produce secondary colors which are:

magenta = red + blue

cyan = green +blue

yellow = red + green

Other possible combinations:

white = blue (primary) + yellow (secondary)

white = green (primary) + magenta (secondary)

white = red (primary) + cyan (secondary)

RGB Color Cube Color Model

2. CMY Color Model

CRTs produce color by emission and uses the RGB model. Printers produce color by reflective light so it is a subtractive process and uses a model based on the colors: Cyan, Magenta, Yellow.

Remember that cyan = green + blue, so light reflected from a cyan pigment has no red component, i. e., the red is absorbed by cyan. Similarly magenta subtracts green and yellow subtracts blue. Printers usually use four colors: cyan, yellow, magenta and black. This is because cyan, yellow, and magenta together produce a dark gray rather than a true black.

It is possible to achieve a large range of colors seen by humans by combining cyan, magenta, and yellow transparent dyes/inks on a white substrate. These are the subtractive primary colors. Often a fourth black is added to improve reproduction of some dark colors. This is called “ CMY” or “ CMYK” color space.

The cyan ink will reflect all but the red light, the yellow ink will reflect all but the blue light and the magenta ink will reflect all but the green light. This is because cyan light is an equal mixture of green and blue, yellow is an equal mixture of red and green, and magenta light is an equal mixture of red and blue.

3. CMYK color model

Unlike RGB, which is an additive color model, CMYK is a subtractive color model. Typically used in printing, CMYK assumes that the background is white, and thus subtracts the assumed brightness of the white background from four colors: cyan, magenta, yellow, and black (called “ key”). Black is used because the combination of the three primary colors (CMY) doesn’t produce a fully saturated black.

CMYK can produce the whole spectrum of visible colors thanks to the process of half-toning, whereby each color is assigned a saturation level and miniscule dots of each of the three colors are printed in tiny patterns so that the human eye perceives a certain color.

Like RGB, CMYK is device-dependent. There’s no straightforward formula to convert CMYK color to RGB colors or vice versa, so conversion is typically dependent upon color management systems. ColoRotate easily converts one system to the other.

“ Still Life with Crystal Bowl,”

4. Hue, Saturation, and Value Color Model

First described by Alvy Ray Smith in 1978, HSV seeks to depict relationships between colors, and improve upon the RGB color model. Standing for hue, saturation, and value, HSV depicts three-dimensional color. If you think about HSV as a wheel of cheese, the center axis goes from white at the top to black at the bottom, with other neutral colors in between. The angle from the axis depicts the hue, the distance from the axis depicts saturation, and the distance along the axis depicts value.

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The HSV (Hue, Saturation, and Value) color model is more intuitive than the RGB color model. The user specifies a color (hue) and then adds white or black. There are 3 color parameters: Hue, Saturation, and Value. Changing the saturation parameter corresponds to adding or subtracting white and changing the value parameter corresponds to adding or subtracting black.

5. HSL

Like HSV, HSL was described by Alvy Ray Smith and is a 3D representation of color. HSL stands for hue, saturation, and lightness. The HSL color model has distinct advantages over the HSV model, in that the saturation and lightness components span the entire range of values.

Based on the HSL color model, ColoRotate contains all the hues at different levels of saturation along its horizontal plane and with variant intensity along its vertical plane.

In the bicone or diamond of the HSL structure, all the visible colors can be seen. These are the three dimensions in which our brain analyzes the colors we see. The first dimension is brightness (a vertical slice). The hue is comprised of the second and third dimensions (corresponding to round slices through the diamond).

HSV and HSL representations:

Need to use different color models:

We also use “ color model” to indicate a model or mechanism of color vision for explaining how color signals are processed from visual cones to ganglion cells. For simplicity, we call these models color mechanism models. There are any numbers of approaches to describing colors using a mathematical model; each one qualifies as a color model. You can, for example, assign a specific hue, saturation, and brightness level to define a color (HSB color models); or a value of red, green, and blue (RGB color models); or a value of cyan, magenta, and yellow (CMY color models); or a value of cyan, magenta, yellow, and black (CMYK color models).

Within these general descriptions–HSB, RGB, CMY, CMYK, and more–any model can use any arbitrary number of steps for each parameter. Some schemes, for example, use 100 steps each. Others use 256 steps, a convenient number for the digital world because you can define 256 steps for each color by assigning 8 bits to each color.

All of these color models–and more–are widely used to describe colors, both by software and by various types of hardware like digital cameras, scanners, monitors, and printers. Unfortunately, most of these have historically been device-dependent models — meaning that the designation for a given color applies only to the particular device. And that makes it hard to move color information between devices without introducing errors.

Two device-dependent models can share the same name, but they won't share the same descriptions for each color except by pure co-incidence. For example, some printers use CMYK color models. (Not all do. A printer can use an RGB color model, and translate the colors to the right amounts of cyan, magenta, yellow, and black ink.)

Suppose you define a color in a drawing program as cyan 120, magenta 75, and yellow 130, and then print on three printers, each of which uses a device-dependent version of a CMY or CMYK colo