Animation Concepts

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A simulation of movement created by displaying a series of pictures or frames. Cartoon on televisions is one example of animation. Animation on computers is one of the chief ingredients of multimedia presentations. There are many software applications that enable you to create animations that you can display on a computer monitor.

What is Animation:-

Animation is an illusion of motion. It is the process of creating the illusion of moving images & model by displaying sequential images in rapid succession.

The animation fall under two basic categories, namely 2D Animation & 3D Animation.

2D Animation :-

2D or two dimensional animations are a series of drawing based on width & height. (X & Y Axis).

Concept of 2D Animation:-

The word 'Animation' is derived from the Latin word 'Anima', which means soul. It breathes life into imaginary characters. It is gaining popularity in the world of entertainment & multimedia. Apart from being a source of entertainment animation is also an educational tool. It is a form of art that is celebrated in the world wide film festivals.

Animation Concepts:-

Animation is an optical illusion created by presenting a sequence of 2D images. Information can be presented in a much more interesting way through animations. You can show animated texts, charts & even a movement of electrons which can be recorded by vedio.

Frame Based Animation:

The concept of key frame animation is similar to that of the age old flip book animation in which a series of images in different sequences create the illusion of a moving image. For Example, if you want to show a person riding a bike & moving from one end of the road to the other end. Draw a series of images starting with the first page that will show the person on the starting point of the road. In the corresponding pages show the gradual movements of the person until the end of the road. When you flip through the pages of the book, it creates the illusion of a person on a bike travelling from on end of the other.

Traditional Animation:

The word 'cel' came from the concept of celluloid layers wherein the active elements of the background are created by the animators once & the subjects are moved in the foreground instead of redrawing all the elements for each frame. Celluloid is highly flammable & also easily decomposes, & is no longer widely used. Instead, paper is used to draw images. Traditional animation using computers, makes it easier as incremental changes can be done on the elements by copying & pasting them into the subsequent frames. The in-between changes can be done by use of a technique called tweening.

Flip Book Animation:

Animation is a process in which a series of static images are presented in such a sequence that they appear to be moving. In this process both hand drawn images known as cells as well as photographs known as frames are used. The smoothness of an animation movie depends on that number of images used smoother is the movement in an animation film. Flip book animation is the most popular & the easiest. Even your friends can create it by drawing different sequences of the same image across the subsequent pages so that when you thumb through the pages it creates an animation based on the principle of persistence of vision.

Tweening:

Tweening (short form of in-betweening) refers to the in-between sketches that create the illusion of movement. In sophisticated animation software you can see each sequence of the in between sketches & can edit any one of those sequences at will & as per requirement.

Static Animation:

The term static animation may sound like an oxymoron but by static it means a unmoveable hand drawn image & by animation it means that the image is drawn in such a manner so as to create an illusion that it is coming out of the page & jumping at you. Static images drawn on still papers with pen & pencil can also create an illusion of movement.

Anime:

Anime (short form of animation) has its origin in Japan & is considered as a subset of animation by the western world. It generally consists of hand-drawn images but presently mostly computer generated images are used. Anime is broadcasted on television, distributed as DVDs, included into video games, & also produced as full length motion pictures.

Making An Animation Film:-

Animation is a visual illusion of motion caused by a progressive display of static 2D images in a particular sequence. This could be anything from a flip book to a motion picture film.

Traditional Animation:

Traditional animation is a form of animation which involves tracing of hand drawn images on transparent acetate sheets (cels) & then placing them over a painted background & then taking photographs using a rostrum camera. Though digital scanning has replaced traditional cel animation but the 'look' of the cel animation is still preserved & the job of the character also remains the same. Thus the digital influence over cel animation has led to what is called as 'tradigital' animation.

Example: The Lion King, Spirited Away Les Triplettes de Belleville.

1. ***Full Animation:***   It is the most popular style involving realistic & detailed form of animation.

   Example: All Disney feature length animations, The Secret of NIMH,& the Iron Giant.

2. ***Limited Animation:***   Limited animation is a cheaper method of cartoon creation not involving the 'realistic' approach.

   Example: The Flintstones & yellow Submarine.

3. ***Rubber Hose Animation***:   The rampant use of imagination to create 'cartoony' characters with no restrictions imposed on the artists for following the rules of physics & animation. Typically, the cartoon characters' neck, arm or leg would elongate or stretch during running, falling or other actions.

   Example: Early Mickey Mouse Cartoon, Popeye etc.

4. ***Rotoscoping***:   Rotoscoping is a technique, patented by Max Fleischer in 1917. It involves tracing of live movements of characters in the form of outlines or using rotoscoped material as a basis for a smooth & expressive animation.

   Example: Snow White & The Seven Dwarfs & Gulliver's Travels.

5. ***Stop Motion:***   Stop-Motion animation is the one in which the animator has to physically shoot one frame at a time & alter it time & again till the animation movie is completed. There are many different movements. It is also known as claymation.

   Example: morph, Wallace & Gromit, The Trap Door, The Chicken Run etc.

                                        Here have also Cutout Animation, Model Animation, Puppet Animation.

Computer Animation:

The animation is created digitally using computer & techniques.

2D Animation (The animation is created using 2D vector & bitmap graphics.)

1. **Power Point Animation:** Power Point Animation is created using the Power Point software. The available tools in the software are used to create animation & games.

2. **Flash Software:** A Flash Animation movie is created usinf flash software. It produces the end product in .swf file format. Though Flash animation are considered too simple due to a certain kind of visual style, they are fast gaining ground in TV animation series, commercial & also in award winning short animated movie.

3D Animation:

Figure are digitally created using polygons & are moved using the digital armature involving a process called rigging. Various effects & techniques such as fire, hair etc are used to give a realistic look to the characters. Maya & 3D Studio are the popular 3D animation software tools.

Example : The incredible, shrek etc.

Less Common Techniques:

Drawn on film animation ,, Paint-on-glass animation,, Sand animation.

The steps for creating an animation film, it has to go through phases like-

6. Pre – Production
7. Production
8. Post-Production

These stages are the sub-divided into parts & the animators excute their work as decided.

Pre-Production:

Pre   Production is the period of time during which work is done on a show prior to the first rehearsal. During pre production, you make decisions that dictate how the rest of the production comes together. During pre-production there are the following things are finalized so that all obstacles are removed to get a smooth production.

3. Story
4. Character Development
5. Story Board
6. Creating Premises
7. Scene Planning
8. Sound Track
9. X-Sheet

Production:

This is the most challenging stage of creating an animation film. At the stage, you get to see the actual result of the treatment given to the story & the visual achievement of the director's imagination.

1. Layout Drawing
2. Background

Post Production:

Post Production is the process of compositing & editing both of the picture into an organized whole.

1. Compositing
2. Digital Compositing
3. Background Plate
4. Blue Screen
5. Matte

Character Design & Development

A character's personality & its role in the film largely contribute to the design of the character. To develop such character one has to know the distinction between realistic & stylized designs & also the importance of facial expressions & lip synchronization.

Character Design

You need to know what a character looks like before storyboarding starts. Upon simultaneously working on the storyboards & designs, the look & feel of the character gradually evolves. Later using the approved character designs finalize the storyboards. Character design usually starts with a large number or series of sketches. To come up with a generic form for the character, you will have to start work using contour forms. You should remember that characters need to work with other characters, & they rarely appear alone.

Artistic Approach

When the drawing of a character is standardized, you can start work on the expressions. Expressions can be defined as character sketches displaying various emotional characteristics such as laughing, crying, shouting, & even being deceitful. It is essential to capture would not generally display. The shape of the mouth differs depending on the style of animation used. A definite set of mouth positions are given for a character in order to maintain uniformity. On average there are eight mouth shapes in animation, but anime, characters have just three or four mouth positions. The most crucial part of character design is the turn-around. There should a consistency look of the character from all angles when it moves, & the finer details of the character are finalized in this part of character design. Colour is the concluding step in character design. It has to be added to the main character, the other characters & to the different backgrounds. The fundamental to effective character design & making the characters appear credible to the audience is by drawing & studying human & animal anatomy or movements. Character design & animation are decisively associated to life drawing by these issues.

Do's

9. You should simplify the anatomy & visual details.

10. The character design should be in accordance with the part it plays in the story.

11. Create plausible physical & moral character.

12. You should engage in a lot of brainstorming about the character.

13. You should work on your drawing abilities.

Don'ts

10. Don't create visually uninspiring characters.

11. Don't copy character designs of other artists as it will give rise to copyright issues.

12. Don't give the character an inconvenient amount of appendages or limits, clothing, or equipment.

Types of Design:

Design is classified into two sections – realistic & stylized, with a lot of undefined area between them. Stylized designs are caricatures of reality, where as realistic designs are caricatures of reality, where as realistic designs imitate nature as much as possible. Every part of the filmmaking process will be affected based on how realistic you want the characters to appear.

Realistic Design:

You should choose digital animation as the medium when creating characters that <u>closely</u> imitate nature. Real looking creatures & characters are created by feature-film animators & the special effects teams & later integrate into live-action environments. The thumb rule of realism is the more natural something looks, the more challenging it is to animate. Audiences will be able to pick up even the slightly deviations in a realistic human character. A lot more of effort has to be put in to make the realistic character appealing to the audience, when the character gets more on-screen time.

Stylize Design:

You can avoid some of the problems that affect realism by stylizing your character. The audience will accept unnatural expressions &

movements from a character that doesn't look completely photo realistic. The classic cartoon "Daffy Duck" is a good example of stylize designs. It is a real character even though; It doesn't look like a real duck. But a simple character will appear alive when animated well. You can decide the behaviour of a creature from a science fiction movie, as the audience has never seen the creature before but the behaviour of a character should be realistic to the audience if the character looks realistic.

Designing a Character:

You may be an amazing detail artist, but how good are you at creating effective animation ready art? Cartoon art is dissimilar from illustrations as it concentrates on efficiency, as well as style. Unnecessary additional details will add extra hours of work & increase the effort taken when drawing a character repeatedly. It is extremely difficult for individual studios & animators to produce numerous episodes in a short duration.

Building a Character:

Let us see how an animation ready character can be created starting with the basic shapes & at the elementary level. You should start with stick figures to acquire a posture. It is essential to take care of the central body line & the position of the shoulder & the hips. The planes of the body should be balanced to maintain equilibrium. Therefore if one plane slants to one side & the other one will slant to the opposite side.

SEE.................

(1. Layout)

Using the stick figure sketch, basic shapes are added to create volume. You can break the body down into basic shapes such as circle, rectangles & triangles. You will have to visualize in three dimensions. The neck is represented by a cylinder which is set on a cone that slopes down to the shoulders, which is represented in the in the form of circles which is in turn placed above a narrowing quadrilateral, representing the chest.

Refers..................... (2. Layout)

Now that you nave the basic form of the figure, you can start adding a few details like the general form of the fingers, hair & the other body characteristics that are essential for your character.

Refers…………………

(3. Layout)

To start the detailing on the figure, sketch the form of your character on top of the basic form. Details like fingers & sections of hair should be added but, make sure that you don't add too many details to the hair, as it is will complicate the animation process.

Refers……………

(4. Layout)

Before you start drawing the precise shape of the figure, it is better to correct any inconsistencies in position & proportion. Digital colorists & cel painters have standards for colours used in animation.

Head & Body Proportions:

Let us develop a character study for a character. On a single sheet of paper sketch the multiple positions & different dimensions of a character in the animated film. This is called a model sheet. The expressions & personality of the character develops & it is consistently maintained with this process. When you begin to draw a character in action first consider the entire figure & then the action which it is going to perform. The best means of expressing emotions in a cartoon is through the head. Consider the head as an elastic elliptical balloon & practice drawing freehanded ellipses through the head. Characters can be created by expanding, compressing, & inverting the basic head of the cartoon. You will only have to adjust the setting of these guidelines to change the position of the head. Always choose the position that best brings out the character's expressions.

Reference some Layouts…………

Hands:

There is no defined way to draw hands on a cartoon. You might have noticed that cartoon characters have fingers ranging from three to sometimes as many as ten. The number of fingers a character has depends on the drawing style of the animator. Hands are as expressive as the face. They can also be used as effective tools to express emotions & thus strengthen the character of the cartoon. Using the four elementary shapes sketch the basic form of the hand. The generic form is a linked two-piece with an added thumb attachment. You can develop the hand according to your character's requirements once the basic form has been finalized.

Feet:

Don't forget to pay attention to the feet, as it also expressing emotions & strengthening the character of the cartoon. The basic form of each foot is a wedge attached to small cylinders or blocks that represent the toes. You can add elaborate details to the feet once the basic form has been corrected & finalized. A cartoon will look extremely funny when its feet are made to appear big.

Clothing & Other Accessories:

You should remember that clothing plays a vital role in the creation of the character. The clothing should match the personality of the character, especially the accessories. Clothing should fit the profile of the character's body. That while using patterns, you should draw only enough for the patterns to be recognizable & that it follows the body's contour.

Facial Expressions:

Facial expressions involve expressing emotions using hair, eyebrows, eyes, ear, nose, mouth, & chin. It also involves lip synchronization. Though the ears, nose & hair add minimal to facial expressions, they also help in the development of character. Lip synchronization is a technique used in animation when the cartoon characters speaks & is also used for dubbing into other language. Most animated movies have scenes where the dialogue is recorded after the completion of the animation. The dialogue recording session falls into the post production phase of movie making.

Production & Post Production for Animation Films

The last stage in creating a film, video, or 3D animation is generally known as post-production. In this stage transitions are created, individual shots or scenes are together edited, & transitions are added. Lot of movie scripts never make it to the production stage. They remain as a fading memory in the minds of those who conceived them & those movie scripts which are given a go-ahead by the management for production are considered lucky. It is not simply going outdoors, shooting the picture, & returning back home. Animation is more than that & takes a much longer time. For instance, Jurassic Park was in production for some 80 days but much of the real work was done in the pre- and post-production phase. Before filming any scene, storyboards are created. On a Bristol board, you can sketch & illustrate the stories. The storyboard roughly shows as to how every scene in the movie will look on a movie screen. It looks like a strip where the dialogues instead of being included in the drawing, are separately written below. The combination of story sketches & soundtrack is called a story reel. As soon as the dialogues are recorded & the story sketches are drawn, they are combined on the story reels. In reality, all the story sketches are scanned & loaded into the computer, while dialogues are recorded & assorted accordingly. The output will look like any other movie but instead of animation series for children ends here as they change after every few seconds. It would just be the beginning for a full length animation movie.

Production Process:

Production process involves drawing the layouts, keyframe animation, creating backgrounds, drawing in-betweens, cleaning, digitally painting the characters, & finally checking the artwork.

14. Layout Drawing

15. Keyframe Animation

16. Backgrounds

17. In-betweening

18. Cleaning

19. Ink & Paint

20. Checking

Post-Production:

This production stage goes on for a much longer time than the actual shooting of the film, & can take up to several months to finish. The most crucial work of dubbing, editing,& addition of special takes place at this stage.

13. Compositing

14. Editing

Mixing Audio-Video:

This is the stage where full-motion, & beat matched videos are mixed along with the audio to provide an integrated audio/video show.

Final Mixing:

The final mix, also referred to as a final dub, is where the dialogue, foley, sound effects 7 music are combined. During this session, audio stems, which are the final mixed tracks of the above mentioned elements, are created. Typically separate dialogue, music & sound effects (including foley) stems are created. These stems are used to create the final audio deliverables for a project. As per the buyer's delivery requirements, the producer determines the mix format for the show.

<u>What is 3D:</u>

The dimension of an object is its physical attribute related to the 3D space. There is no such thing as existence of an object in physical space without reference to some material object. The space in which the object is placed determines whether the object is 2D or 3D.

You can understand a concept of three dimensions with a simple exercise. Draw a line. An object that is a line has got a single dimension, the length. Now, you can draw a square. Paint it with your desired colour & pattern. It will look flat but contain two dimensions, width & height. Now draw a cube & paint it like a square. You will notice that it has width, & depth.

Three dimensional objects are expressed in 3D environment by their width, height, & depth. They can also be represented in terms of axes such as X, Y, Z respectively. Since you need to have a third axis to indicate accurate position of these objects. They are referred to as 3D objects.

<u>3D Animation Techniques:</u>

Animation techniques are wide in variety, hence it becomes difficult to categorize them. Techniques are often combined due to their variety. Following are the techniques used in animations.

21. Morphing

22. Rotoscoping

23. Stop-Motion

24. Anime

<u>Animation Production Terminology:</u>

The mere knowledge of animation isn't sufficient. The terminologies with animation are equally important. They are universally used terms in the field of animation. These terms will prove extremely useful when you are working on a project or giving interviews. Let's take look at the most important terminologies.

15. **Animation fps**   A motion picture is projected at 24 frames per second (fps). This would also be the minimum number of cels that need to be created.

16. **Background drawing**   It is the area where action takes place. There are usually very few backgrounds in a film compared to cels. _

17. **Cel & cel setup**   An image is drawn on a clear place of plastic. This plastic is known as cel. One or more cels overlaid on a background are known as cel setup.

18. **Character Models**   At first animator create a model sheet of their character. The model sheet contains the character in a variety of facial expression & poses, which will serve as the model for each time they are drawn.

19. **Cinematography**   Various devices, procedures & techniques are used to achieve this.

20. **Clean up**   They are tracings that are made of rough drawings on which color & shading specifications are marked.

21. **Depth of Field**   Depth of field deals with the range of depths over which objects in a frame are in focus. It forces the eye to focus on the next focal place. Depth of field is very important in computer animation.

22. **Key Setup**   It completes the picture as seen in the film, generally the rarest & most valuable of any studio's are.

23. **Layout**   The black & white rendering done by a layout person that determines the basic composition of the scene.

24. **Lead Animator**   This animator is responsible for creating & animating one particular character in film.

25. **Maquette**   It is a statue based on the model sheet.

26. **Model Sheet**   It is the drawing of a single character, in a variety of attitudes & expressions, created as a reference guide for animators.

27. **Motion Blur**   Motion blur helps in bring the frames together & eliminating the jittery images that can come from animation.

28. **Rough Animation Drawings**   They are the original first sketches of a character in action. In computer animation it's done with wire-frames.

29. **Sequence**   The created cels are put together to form a sequence.

30. **Time out**   This is an animation key. It involves setting all the on screen action to the proper beats including music, sound effect.

31. **Rendering**   This is the final step in computer animation. During rendering, the computer takes each pixel that appears on screen & processes the components.

32. **Rough Sketch**   It is the animator's drawings used in the process of creating the finished image to be transferred to cel.

33. **Xerography**   It was tested in sleeping Beauty, & then used for the first time in a feature with 101 Dalmatians.

3D Animation Environment

Views

While creating any type of scene, you need to consider different ways by which it can be projects. At the same time, it also important to consider how the audience is going to view it. If the scene requires the movement of an object from all sides, a good study of views becomes mandatory. The chances of a good scene getting ruined are high if the views & projections are incorrect. Correct views are also important for good animation.

25. **Top View:** A principle view in a object created by rotating the line of sight by 90 degrees around the horizontal axis above the front view.

26. **Front View:** A principal view of an object, positing the object in such a manner that the majority of its features will be located in the front, right side & the top views.

27. **Bottom View:** It is created by rotating the object by 90 degrees around the horizontal axis below the front view. This view isn't typically included in a standard multiview drawing.

28. **Bird's eye View:** A detailed view of a scene seen by looking straight down from attitude is known as bird's eye view. From this viewpoint, the ground line is below the horizon of the object.

29. **Direct View:** It is a descriptive geometry technique that places the observe at an infinite distance from the object with the observer's line of the sight perpendicular to the geometry in question. This method is also referred to as the natural method.

30. **Ground's Eye View:** It is a perspective graphics, a viewport looking up at the object.

31. **Auxiliary View:** The view derived from any image plane other than the fontal, horizontal, or profile planes is the auxiliary view.

32. **Central View:** The view from which related views are aligned in an orthographic drawing is known as the central view.

Projections:

19

The word projection is used to represent objects & structures graphically on 2d media. The projection surface is a plane, such as picture plane & projection plane. A good knowledge of views & projection is an absolute necessity for any 3d animator, because it is the prime concern while building a 3D scene. A wrong projection of a layout or scene can ruin the entire layout & make the output look non-realistic. Some of the primary projection methods include orthographic , oblique, & perspective projection.

Orthographic Projection:

A 3D object can be represented in two dimensions by a method known as orthographic projection. It utilizes multiple views of the object, from points of view rotated around the object centre through increments of 90 degree. In other words, it is a multiview drawing, as that shows every feature of an object in its true size & shape. In orthographic projection, there are two types of projection used. Here, the views are positioned relative to each other. But they do differ in position for plan, front, & side views.

Perspective Projection:

The type of projection that helps project 3D images on a planar surface is called perspective projection. A paper or painting canvas would be an appropriate example of a planner surface. It is a projection technique in which some or all of the projectors converge at predefined points. It is also known as perspective view. The perspectives on a planar surface contain distortion, similar to the distortion created when portraying the earth's surface on a planar map.

Concepts of Materials & Lights

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Lighting systems play an important role in an animation film project, especially when the characters are 3D. The animation movies would be incomplete without lights. Therefore lights should be treated like a character & productively used.

Mapping Objects:

The map is originally referred to as a bitmap image that must be mapped onto the surface of the object. Later, due to the common usage, the idea was expanded to something as broad as texture.

Mapping:

Mapping is the process by which texture is applied on the surface of an object.

Map Projection:

Map projection can be referred to as a mathematical formula for converting points on a sphere. The projection of Earth on a flat map can be cited as a prime example. Image maps can be projected in different ways onto three dimensional surfaces. The selection of mapping projection method should be based on creative considerations. Some of the most useful projection methods are flat & cubical projection, cylindrical projection, & spherical projection.

33. **Flat Projection**

34. **Cubical Projection**

35. **Cylindrical Projection**

36. **Spherical Projection**

Mapping Types:

There are various types of maps & they are categorized according to the effect they generate on the texture.

34. **Environmental Mapping**

35. **Procedural Maps**

36. **Texture Maps**

37. **Reflection Map**

38. **Color Map**

39. **Bump Map**

40. **Displacement Map**

41. **Transparency Map**

Mapping Coordinates:

Coordinates in the three dimensional world act as directional guidelines. There are sis directions available in three pairs.

3. Left & Right – The horizontal directions

4. Up & Down – The vertical directions

5. Forward & Backwards – It does not have any general name

In the abstract 3D space found in a 3D computer graphics application, there is no particular meaning to up & down, left or right, forward & backward. It's a simply a pure imaginary space of 3D called X, Y, & Z axis. Mapping coordinates specify how the map is projected onto the material & whether it is projected as tiled or mirrored. Mapping coordinates are also known as UV or UVW coordinates.

Shaders:

Shading means simulating light falling on a scene & the effect it has on the brightness & colour of different areas of objects in the rendering process. The shading value is calculated based on the relationship between the surface

normals & the light sources that reach the surface. There are a number of ways to make objects more realistic. There are different ways to shade a scene.

6. **Flat Shading**

7. **Interpolative Shading**

8. **Gouraud Shading**

9. **Phong Shading**

10. **Metal Shading**

Lighting in 3D Environment:

Lighting in computer graphics refers to the placement of lights in a scene to achieve the desired effect. Image synthesis & animation packages contain different locations & modified by changing the parameters. Lighting is a very important part of image synthesis. 3D applications usually use four different light sources.

1. **Ambient Light**

2. **Directional or Global Lights**

3. **Point Lights**

4. **Spotlights**

Lighting in Film & Video:

Film stock has a greater dynamic range for light than videotape. Videotape has improved. But the film still has a greater range. This means that early video, & to a lesser extent current video, requires more light for exposure. So, even though the techniques used were similar, early video had a flat, low contrast look. The basic lighting for film & video was a three point system. But there have some more system too.

1. **Key Light**

2. **Fill Light**

3. **Back Light**

4. **Eye Light**

5. **Background Light**

6. **Kicker Light**

Camera Concepts & Rendering Techniques

In the previous session, you learnt about the concepts of lights, maps, shaders, cameras, & the terminologies related to them, after putting them into a scene. You need to output the scene for using it in desired Medias. In this session, concepts of cameras & process of rendering will be covered.

Camera Concepts:

The camera helps audience see events unfolding on the screen. The camera should be used in such a way that it adds to whatever is happening in a given scene. Real-world scenes are captured directly if the movie has been shot with an actual camera. However when you are working with computer graphics, the camera should be treated like a real-life movie camera.

Types of Camera

Generally for user convenience, all three-dimensional rendering programs provide a default or standard camera. The lens rep[resents the scene in front of it using perspective projection. Other views of the default camera are commonly shown in front, top, & side orthographic projections.

37. **Target Camera**

38. **Free Camera**

Pyramid of Vision:

The pyramid of vision is defined as the portion of the 3D environment seen through the camera. It is also known as the cone of vision. The objects that are located inside the pyramid can be viewed by the camera.

Point of View (POV) & Point of Interest (POI):

The point of view is a subjective camera angle that becomes the perspective of a character. & the point of interest or the centre of interest is the location in space where the camera is focused.

Clipping Planes:

It is a plane that defines the portion of a 3D design displayed in a view. The clipping planes are perpendicular to the line of sight. It throws away polygons on the other side of it. This can dramatically speed up the rendering of a polygonal scene, since unneeded polygons take up valuable processing power.

Field of View:

Field of view is a traditional photography term, which can be defined as the area that the viewer can see in the Real time 3D scene. The FOV is usually determined by its width in degrees & the camera's focal length.

Focal Length:

The focal length of a lens is the distance between the optical centre of the lens & the place where it focuses its image. The focal length of a camera controls the way in which three-dimensional objects are seen by the camera. It is measured in millimetres. The lens on a digital camera is marked with its focal length & this is typically a very small number such as 6-15mm. In traditional photography, everyone is used to the common focal lengths of 28mm, 50mm, 200mm, etc. Some of the focal lengths lens sizes :

<20mm = Super wide angle

24mm – 35mm = Wide angle

50mm = Normal, the same picture angle as your eye (46 degrees)

80mm – 300 mm = Telephoto

>300mm = Super telephoto

Depth of Field:

The depth of field is the portion of the scene in front of the camera that appears focused. It is defined by the area between the near & the far focal planes.. These are the zones on either side of the principle focus point that will remain in focus at a given setting.

Panning & Tilting:

You can make almost any move using a virtual camera. However, it is still a good idea to use the real world moves. Panning & tiling are the two ways by which a camera can move. Panning & titling are sometimes used to create suspensions by delaying the revelation of off-screen happenings. On the other hand, fast panning/tilting suggests child-like exuberance or wonderment.

Rendering:

Rendering is the art & the process of giving the final touch to a 3D scene. In this process, the vector data gets converted to raster images or animation as per the instructed output settings. 3D rendering is a creative procedure similar to photography or cinematography, which includes lighting, staging scenes & producing images. The 3D data depicted could be a complete scene including geometric models of different 3D objects, buildings, landscapes & animated characters. In the rendering process, the camera takes a picture of the objects as seen from the camera's viewpoint, direction, & field of view. The rendering is achieved mathematically by tracing lined from the vertices of the polygons in all objects in the scene back to the viewpoint of the camera. The rendering process consists of six major steps regardless of the computer systems used. These steps need not be followed in a fixed order. They can be changed as per project requirements.

5. Getting models stored on the hard disk or creating models in the programme

6. Placing the camera

7. Defining light sources

8. Specifying characteristics of the surfaces of objects, including colour, texture, shininess, reflectivity & transparency

9. Shading techniques

10. Animation

Rendering Engines:

There are different engines available to render 3D objects & scenes.

7. Game Engine

8. RenderMan

9. RenderMax-Lite

10. Aqsis

11. Spider

12. 3Delight

13. Smedge

Z-Buffer:

The Z-buffer technique, used in computer graphics programming, determines which objects are behind & in front of each other in a 3D view. It is taken into consideration from the eye's perspective. Z-buffer rendering gets its name from the fact that all objects in the scene are sorted by their Z position or depth in scene. This depth information is kept in a buffer & made available to the rendering process as the hidden surface removal calculations are performed. The rendering method makes the hidden surface remove one object & one pixel at a time. One of the main advantage of Z-buffering is that you do not need to short the polygons in the scene, which is very useful when scene complexity is high, a degree of sorting is sometimes used at the object-level when parts of the scene have transparent properties.

Raytracing:

It is a popular rendering technique. The raytracing does not start from the scene's light source but from the observer's eye. Raytracing a complex 3D model may take hours for a computer to render. It is important to understand the technology of this technique to achieve the required results. It is especially useful for rendering images that contain reflective surfaces & transparent objects.

Rediosity:

Radiosity & raytracing algorithms are different & yet they are complementary in many ways. Radiosity is an advanced form of raytracing. This rendering works by treating every surface as light source. It calculates the amount of light hitting each surface while taking the surface texture into consideration & the amount of light reflected from it. The main advantages of rediosity are as follows:

1. Calculates light intensity on each surface

2. Supports indirect lighting & panumbra shadows

3. Inter-object diffuse illumination possible

4. Extremely realistic looking output

5. The point from which a scene is viewed can be moved without having to do all the calculations again, provided that the lighting has not been changed.

6. Ideal for rendering product visualizations & architectural walkthroughs.

Network Rendering:

You can render a single file using computer networks, which offer many ways to increase the speed of rendering. This process is called network rendering. You can increase the speed or rendering with this method. But, the final performance depends on the network detail, the network rendering features offered by the software, & the computer hardware.

Distributed Rendering:

In this method, a rendering job is assigned to different computers on the network. This strategy requires software that is able to split a rendering job into several sections & then put the end result together.

Remote Rendering:

The remote rendering feature allows an application to run on a remote server machine. It can also perform 3D rendering on the remote machine. The power of remote rendering allows users to view & interact with extremely large data sets from any client machine located almost anywhere.

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