ARCHITECTURE DESIGN 1

BCADES-203

BLOCK 1:

INTRODUCTION & BASIC TOOLS

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Education is something which ought to be brought within the reach of every one.

- Dr. B. R. Ambedkar

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INTRODUCTION & BASIC TOOLS

UNIT 1 Introduction to 3ds Max

UNIT 2 3d Modifiers

UNIT 3 Mesh and Poly Modelling

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ROLE OF SELF INSTRUCTIONAL MATERIAL IN DISTANCE LEARNING

The need to plan effective instruction is imperative for a successful distance teaching repertoire. This is due to the fact that the instructional designer, the tutor, the author (s) and the student are often separated by distance and may never meet in person. This is an increasingly common scenario in distance education instruction. As much as possible, teaching by distance should stimulate the student's intellectual involvement and contain all the necessary learning instructional activities that are capable of guiding the student through the course objectives. Therefore, the course / self-instructional material are completely equipped with everything that the syllabus prescribes.

To ensure effective instruction, a number of instructional design ideas are used and these help students to acquire knowledge, intellectual skills, motor skills and necessary attitudinal changes. In this respect, students' assessment and course evaluation are incorporated in the text.

The nature of instructional activities used in distance education self- instructional materials depends on the domain of learning that they reinforce in the text, that is, the cognitive, psychomotor and affective. These are further interpreted in the acquisition of knowledge, intellectual skills and motor skills. Students may be encouraged to gain, apply and communicate (orally or in writing) the knowledge acquired. Intellectual- skills objectives may be met by designing instructions that make use of students' prior knowledge and experiences in the discourse as the foundation on which newly acquired knowledge is built.

The provision of exercises in the form of assignments, projects and tutorial feedback is necessary. Instructional activities that teach motor skills need to be graphically demonstrated and the correct practices provided during tutorials. Instructional activities for inculcating change in attitude and behavior should create interest and demonstrate need and benefits gained by adopting the required change. Information on the adoption and procedures for practice of new attitudes may then be introduced.

Teaching and learning at a distance eliminates interactive communication cues, such as pauses, intonation and gestures, associated with the face-to-face method of teaching. This is particularly so with the exclusive use of print media. Instructional activities built into the instructional repertoire provide this missing interaction between the student and the teacher. Therefore, the use of instructional activities to affect better distance teaching is not optional, but mandatory.

Our team of successful writers and authors has tried to reduce this.

Divide and to bring this Self Instructional Material as the best teaching and communication tool. Instructional activities are varied in order to assess the different facets of the domains of learning.

Distance education teaching repertoire involves extensive use of self- instructional materials, be they print or otherwise. These materials are designed to achieve certain pre-determined learning outcomes, namely goals and objectives that are contained in an instructional plan. Since the teaching process is affected over a distance, there is need to ensure that students actively participate in their learning by performing specific tasks that help them to understand the relevant concepts. Therefore, a set of exercises is built into the teaching repertoire in order to link what students and tutors do in the framework of the course outline. These could be in the form of students' assignments, a research project or a science practical exercise. Examples of instructional activities in distance education are too numerous to list. Instructional activities, when used in this context, help to motivate students, guide and measure students' performance (continuous assessment)

Unit 1 Introduction to 3ds Max

Learning Outcome

After reading this unit, you will be able to:

- Discuss the 2d and 3d animation
- Clarify more about the interface
- Point out and interpret the different views
- Define the Timeline Controls
- Discuss the Standard Primitives and Extended Primitives
- Explain Layer Manager and its uses
- Describe Different Transformation Tools

Time Required to Complete the unit

The time required to study this Unit is broken as follows:

1. 1st Reading: It will need 3 Hrs for reading
2. 2nd Reading with understanding: It will need 4 Hrs for reading and understanding
3. Self-Assessment: It will need 3 Hrs for reading and understanding
4. Assignment: It will need 2 Hrs for completing an assignment
5. Revision and Further Reading: It is a continuous process

Content Map

1.1 Introduction to Autodesk 3ds Max

Autodesk 3ds max, originally called 3D Studio MAX, is the leading animation program in the video game industry. It is very good at handling low as well as high polygon animation, but perhaps its greatest asset is its entrenched support network and many plug-in. It is also a more expensive high-end package. As it is also majorly used in the video game industry, it is also a popular hobbyist package. 3ds Max is also widely used in architectural visualisations because it goes hand-in-hand very well with AutoCAD--also developed by Autodesk. This software is also found in film production.

1.2 Difference between 2d and 3d Animation

2D stands for Two Dimensions. A dimension can be defined as number of parameters or coordinates required to define points for a shape or an object. 2D objects or shapes are represented along two axis x-axis and y-axis. Two points (in x and y) are required to define a point for an object or shape in 2D. X and Y-axis are perpendicular to each other. 3D objects or shapes are represented along three axis x-axis, y-axis and z-axis. Three points (in x, y and z) are required to define a point for an object or shape in 3D. X, Y and Z-axis are also perpendicular to each other. Room corner where two walls meet each other can be a good example of how X, Y and Z-axis are placed; the two edges along the floor can be considered as X and Y-axis and the intersection or edge between the two walls can be considered as the Z-axis.

The process of animation is totally based on the phenomenon of persistence of vision that allows the visual illusion of the objects. Persistence of vision is a phenomenon of eye in which an image continues to appear in one's vision after the exposure to the original image has ceased. Previously animation was restricted to only hand drawings (only 2D Animation). However, with the advent of technology, animation has a new face that is known as 2D and 3D animations. 3D animation is known to be far better than 2D. It adds more dynamism and liveliness to animation.

2D is flat which means that if a 2D shape is turned to the side then it becomes a line. Whereas 3D comprises an extra dimension known as z coordinate which stands for rotation and depth. The basic distinction between 2D and 3D can be shown by drawing a circle and a ball/sphere. Circle is a 2D figure whereas sphere is a 3D figure. 3D presents the object from every possible direction.

2D animation is generally done using frame-by-frame animation. Other techniques used in 2D animation are tweening, rotoscoping etc. In 3D animation, the objects are built or modelled and then they are animated by deforming those models using bones, joint and skinning.

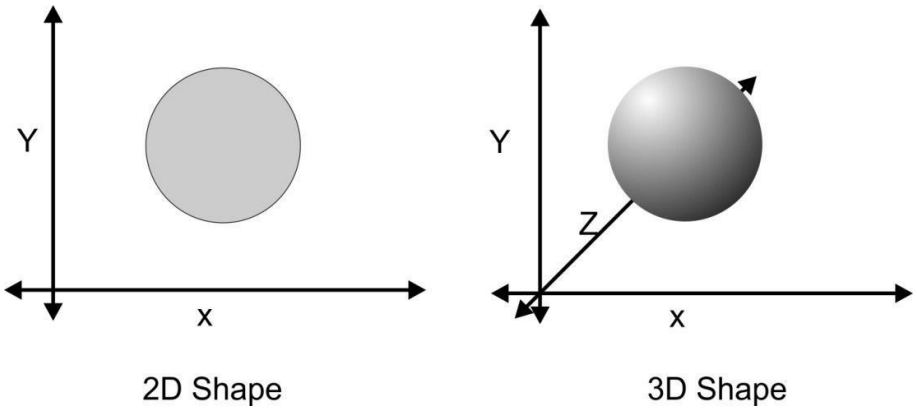


Fig. 1.1: 2D and 3D Difference

Study Notes

Assessment

1. Define 2 Dimensions.
2. Explain the difference between 2 and 3 Dimension.

	Discussion
Explore the 2 Dimension and 3 Dimension Software available in market.	

1.3 Showing of Interface

3DS MAX has the interfa ce, which includes all necessary functions in gr ouped stakes, and that makes it easier to w ork around the product. 3DS MAX has won an award for providing the best Graphical User Interface (GUI).

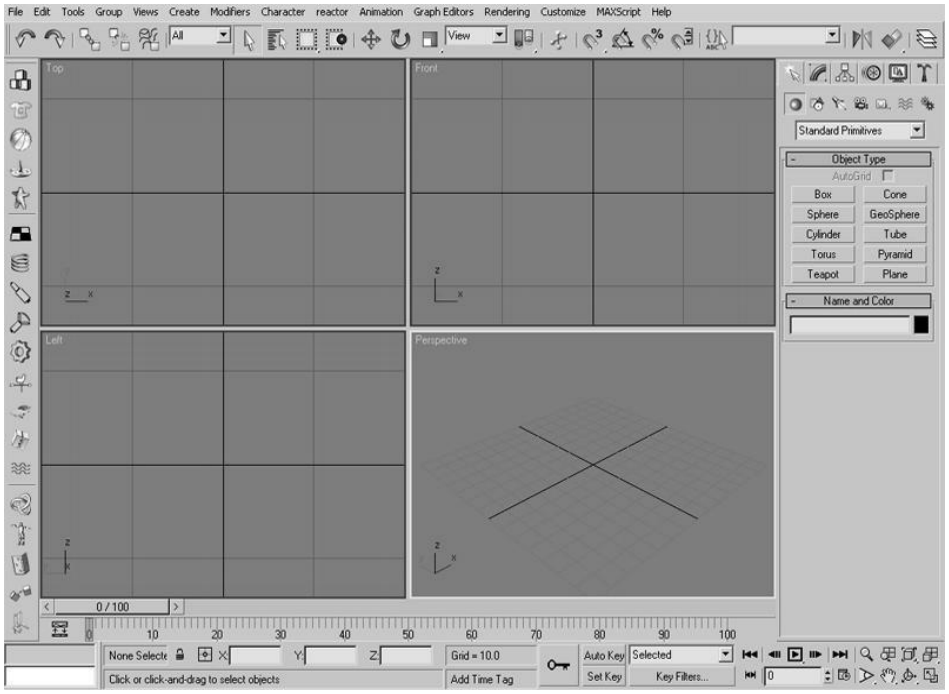


Fig. 1.2: Showing the interface of the 3DS MAX

The interface of 3DS MA X contains many panels and helps to work with the software. The panels here are as follows:

1. View ports
2. Menu Bar
3. Command Panel
4. Main toolbar

5. View port Navigation tools
6. Time controls
7. Status bar and prompt line

1.3.1 DIFFERENT VIEWS AND VIEW PORTS

There is huge difference between views and viewports. So let us have a look at both the terms:

VIEWS:

The view can be defined as, we observe/look at objects.

There are two types of the views, which we normally see in the view ports.

Axonometric view and the Perspective view

1. Axonometric view

In this view, all the lines are parallel to one another. The Top, front, left and user view ports are the axonometric views. This displays one of the three sides of the objects. The lines in here do not congregate.

2. Perspective view

This view shows the objects with the vanishing point which belong to the horizon. Here in this view the lines congregate at the horizon. The examples are the perspective view and the camera view. This views show the depth in the scene.

The perspective view resembles the human vision. It gives the depth and space of the environment and objects placed in it.

The axonometric view gives us the clear view of the object. This view is perfect for the scaling and the placement.

The other views are:

3. Orthographic view

This view represents the objects in 2D. This view is perfect for the positioning of the objects. The objects here look at the right angle.

4. Isometric view

In this view, all the sides of the objects are equally inclined to the plane. The objects in here produce equal forth shortening along the edges. The example is User view.

5. The Schematic View

The Schematic View is a node based scene graph that gives us access to object properties, materials, controller s, modifiers, hierarchy and non-visible scene relationships such as wire parameters and instancing. This view is used to check and change the animations of the objects and relations between objects.

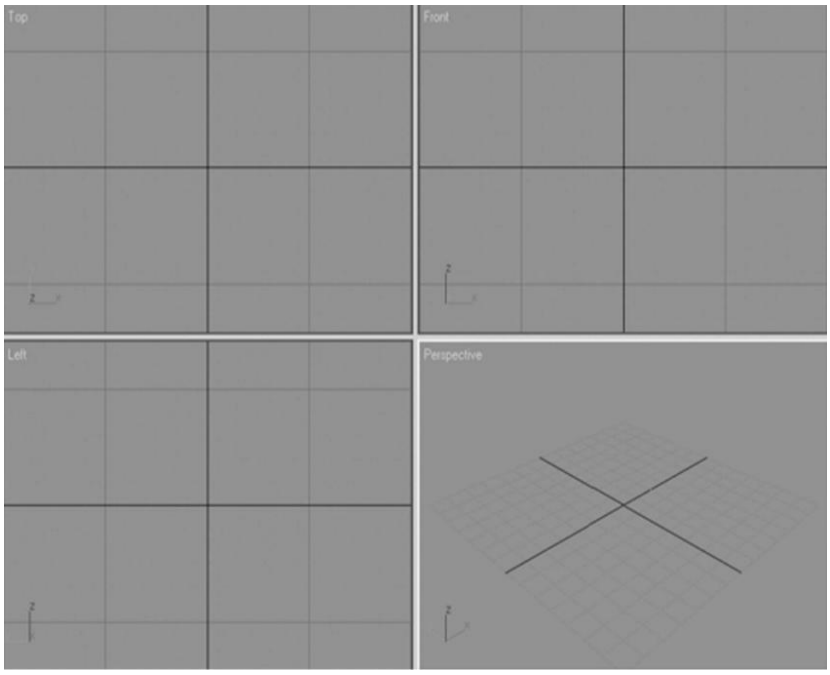


Fig. 1.3: Sh owing the Interface of the View Ports

When we start up with 3ds max, we see the main screen is divided into 4 different viewports. These are the areas where we can create any objects and can h ave different views of the objects from diff erent angles with which we can get an exact idea of the position, orientation and the size of the object. The one in the bottom left is called the perspective viewport and the o ther three as are called top, front and left views. Following are the list of viewports availabl e:

Perspective, User, Front, Back, Top, Bottom, Left, Right, Grid, A ctive Shade, Schematic, Asset Browser, MAXS cript Listener, Shape

	Study Notes

	Assessment

1. What is a Perspective view?Give an example.
2. Write a short note on Isometric view.

	Discussion

Study the various viewports available in 3D Max Software.

1.4 ViewportLabels

The viewport labels display name of the respective viewport on the upper left corner. We can access the different options of the viewport by right clicking on the label. This is called the viewport menu. Here you get the following options:

1. Smooth/Highlights

This displays the object with smoothness and highlights it. In addition, we can see the maps that are applied on the surface of the object.

This option supports self-illuminated objects and 32 lights. (It completely depends on the graphic card.)

2. Wireframe

It displays the object as if it is made of wires. The colour of the wire depends upon the colour of the object.

3. Edged faces

This highlights the edges of the object. This is best used when we sculpt a model.

4. Smooth

It displays the objects in a smooth shade.

5. Facets + highlights

It displays the smooth shading with the edges of the object.

6. Facets

It displays face but does not give the smoothness and highlights of the object.

7. Flat

It displays each polygon without shading and diffuse colour of the object. The ambient or any kind of the lights do not effect here.

8. Lit wire frame

It displays the object in the wire frame mode with the shading done by lighting.

9. Bounding box

Bounding box displays the object as the wireframe box with no segments.

10. Transparency

It displays the transparency of the objects if it has transparency map or has a less opacity. There are three different options to see the object here. They are:

Best: It shows the highest quality of transparency

Simple: It shows the less accurate transparency

None: It gives no transparency.

11. Show grid

It switches on or Off the home grid in the view port. The shortcut is G.

12. Show background

It turns On or Off any viewport background. Viewport background can be set from the view menu.

13. Show safe frames

This shows the proportion of the width and height of the output size of the rendering output.

14. Texture correction

Here pixel interpolation is done and the distorted texture is displayed correctly in the viewport, especially in the perspective view port.

15. Disable view

Disable view disables the active viewport. You cannot make any changes to a Disabled viewport

16. Views

It helps us to switch the current viewport to any other viewport.

17. Undo

It undoes the last viewport change.

18. Redo

It cancels the last viewport undo.

19. Viewport configuration

It displays the View port Configuration dialog that contains many options for further control of the view ports.

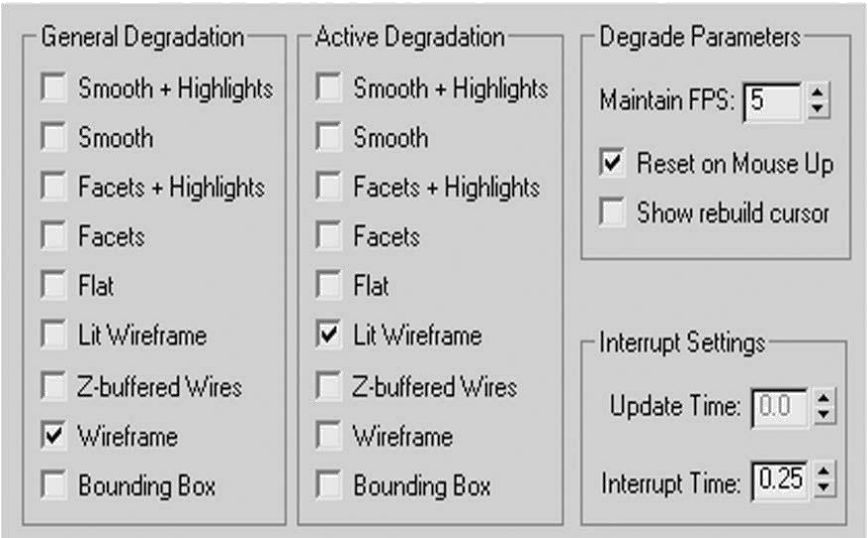


Fig. 1.4: S howing the View Port Configuration

	Study Notes

	Assessment

1. What is the use of Smooth/Highlights video label in 3D Max?
2. Write a note on Transparency.

	Discussion
Open 3D Max and use all the video label mentioned.	

1.5 Panel Menus

The following Panel Menus are available in 3D Max:

1. Menu Bar
2. Command Panel
3. Main tool bar
4. view port navigation panel
5. Timeline Control
6. Status Bar and Prompt Line

1. Menu Bar

All the options related to the usage of the software are present in the menus placed in the menu bar. File menu contains all the commands related to the file operation, Edit menu contains commands related to the editing of objects in the scene, Create menu contains commands related to the creation of various objects, the same commands are also available in the command panel's create tab. Similarly, Modifiers menu contains the modifiers, which are also available in the modifier tab of the command panel. Customise menu contains commands related to the customisation of the 3ds max UI. In the different versions of the 3ds max, there can be some changes in the menus.

Fig. 1.5: Showing the Menu Panel

2. Command Panel

Command Panel: The Command panel is situated on the right side of the max UI. It is used to for many actions in max. For example, it can be used to create and manipulate 3D objects. You can change their options related to the display, you can change the hierarchy related options as well as you can create and edit animation of an object using command panel.

Fig. 1.6: Showing the Command Panel

3. Main tool bar

Main toolbar: This toolba r contains the frequently used tools like undo, redo, select, select and move, select and ro tate, link unlink, snapping, mirror, align obj ects, material editor etc.

Fig. 1.7: Showing the Main Toolbar

4. View port Navigation tools

This helps us in controlli ng the objects in the viewport. It has tools like zoom, zoom region, pan, arc rotate, toggle full screen etc.

Fig. 1.8: Sh owing the View Port Navigation Tools

5. Time controls

The complete animation in the file can be controlled with these tools. Time controls contain set of playback buttons like play, stop, step backward, step forward etc. It also has

an indicator for the current position of the playback head. You can put a fra me number to shift the playback head to that frame. You can also change the timeline prefer ence from the time controls bar.

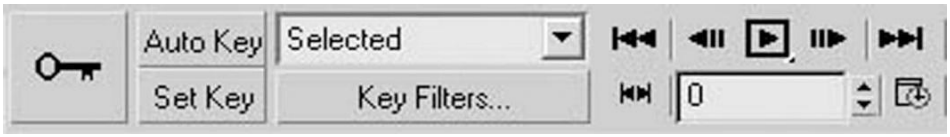


Fig. 1.9: Showing the Time controls

6. Status bar and Prompt line

Status bar and prompt line: It displays the status of the selected object and displays error. This has certain feature buttons also like lock selection. A small lock like icon is a toggle button to lock the selection to the current object. The shortcut for the same is spacebar. There are three text fields with the labels X, Y and Z. These box es display the current value of the selected tra nsformation tolls. You can also input these values to change the transformations.

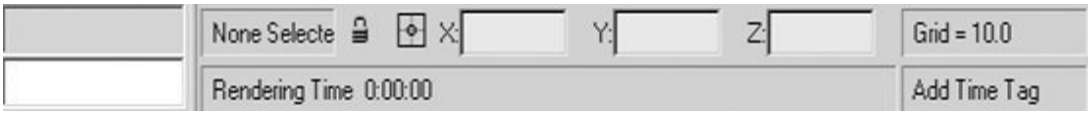


Fig. 1.10: Showing the Status Bar and Prompt Line

	Study Notes

	Assessment
1. Write a note on Command P anel. 2. Write a note on Time Control.	

	Discussion
Explore the tools available in Menu Panel.	

1.6 Transformation tools

There are three transformation tools:

1. Select and move: It is used t o move the selected objects in the viewport.
2. Select and rotate: It is used to rotate the selected objects in the viewport.
3. Select and scale: It is used to scale the selected objects in the viewport.

Fig. 1.11: Transformation Tools

There are three types of scaling tools:

1. Select uniform scale: It scales the object uniformly, i.e. it keeps the proporti ons.
2. Select non–uniform scale: It scales the object non-uniformly i.e. while scali ng it does not keep the proportions.
3. Select and squash: It squash es the object allover

1.6.1 REFERENCE CO-ORDI NATE SYSTEMS

This is used to set the type of the coordinate system, which is norm ally used for transformation.

There are seven types of refere nce coordinate systems as follows:

Fig. 1. 12: Reference Co-ordinate Systems

1. VIEW: This is the default coordinate system present in all orthogonal view p orts.
2. SCREEN: The active view port is taken under consideration.
3. WORLD: It uses the world coordinate system. X-axis to the right, Z-axis to u pwards and Y-axis away from us.
4. PARENT: It uses the coordin ate system of the parent object.
5. LOCAL: It uses the coordinate system of the currently selected object.
6. GIMBALS: It picks up the coo rdinate system arbitrary.
7. GRID: It uses the active grid.

1.6 .2 SELECTION

Selection Tool, Selection Regions, Selection by List.

Fig. 1.13: Selection Tools

1. Selection Tool

This tool is used to sele ct the object. You can select by clicking on th e object or by creating a selection region arou nd objects.

2. Selection Regions

This provides us the facility of selecting the area or regions of an object. It is mostly used in modelling. This tool has different selection type. You can select a selection type by pressing and holding the left mouse button on this tool, which will pop up a new tool list from which you can select the selection region type.

3. Selection by List

This helps in selecting the objects by choosing it from the list. It is better to use it when we want to select only lights, cameras, bones, helpers, groups etc. because it provides you certain features to filter objects. You can also type in the name of an object to filter it from the rest of the objects.

1.6.3 WINDOWS / CROSSING OPTION

This is used to toggle between the two selections modes.

1. Window allows us to select the objects within the selection.
2. Crossing allows us to select the objects, which are in the same region.

Study Notes

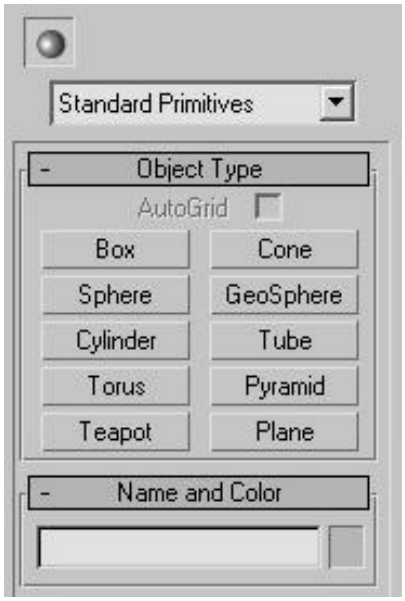
Assessment

1. Make a list of the types of Scaling and Transformation tool available.
2. Explain about Reference co-ordinate system.

	Discussion
Using the 3D max software try t he given Selection techniques.	

1.7 Standard Primitive s

With the help of the abo ve, we can easily create the standard primitives. As seen in fig 1.13 there are 10 different objects present in the roll out. In this slot, all the objects except PLANE are 3D but the pla ne is 2D. The plane just consists of X and Y-axis and it is one side object means we cannot se e it from the backside.



F ig. 1.14: Standard Primitives

1. BOX: This primitive is used to create the box for the base or as the prime object for any modelling anything like mac hines, character, furniture etc.

2. CONE: This primitive create s a cone, which can be used in creating joker's cap, a tomb, pencil, etc.

3. SPHERE: This primitive is of a marble shape. This can be used to create ball, tomb, eyes etc.

4. GEOSPHERE: This is exactly like sphere. T-e only difference between the s phere and the exosphere is the distribution of the segments.

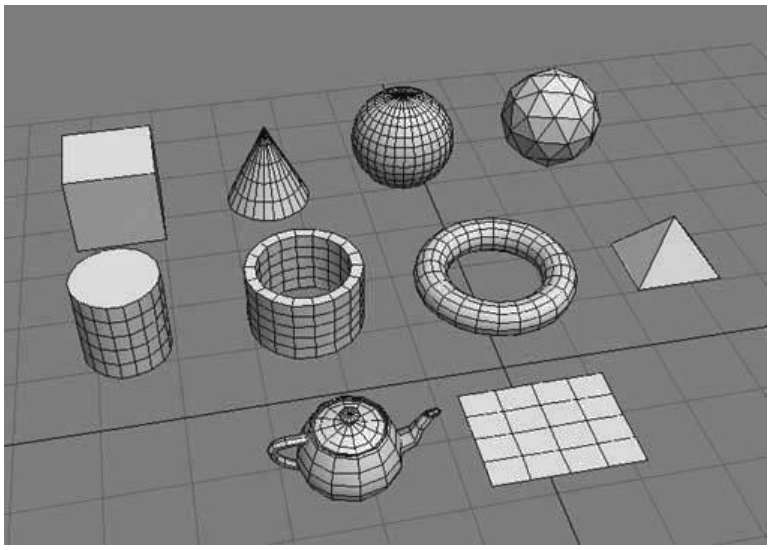


Fig. 1.15: 10 Standard Primitive Objects

5. CYLINDER: This is used to create the cylinder. This can be used to create the cylindrical objects. Characters are also made out of cylinder.
6. TUBE: This is used to create t he tubular objects like pipe etc.
7. TORUS: This is used to create the objects like tire, pipes, part of machine s, doughnuts etc.
8. PYRAMID: As the name states it is used to create the objects in the shape of pyramid. Can be used to make pyrami ds, caps etc.
9. TEAPOT: This is used to cr eate the teapot. We can easily separate eac h part of the teapot
10. PLANE: This is a 2D projected object. It can be used to create the base of th e object, mat, etc. Plane is one-sided objectt.

	Study Notes

	Assessment

1. What is a Standard Primitive?
2. Explain five Standard Primitives.

	Discussion

Utilise the 10 standard primitive to create a basic Robot.

1.8 Extended Primitiv es

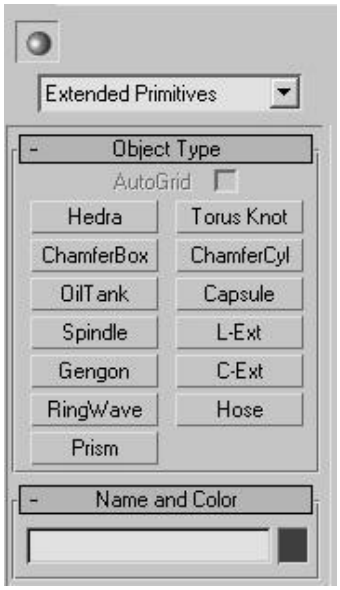


Fig. 1.16: Extended Primitives

1. HEDRA: This primitive is used to create the objects like gems etc.
2. TORUS KNOT: This is exactly like the standard primitive “tours” but the onl y difference is that this primitive creates a k not.
3. CHAMFER BOX: This is exactly like box but this contains fillet at the edge.

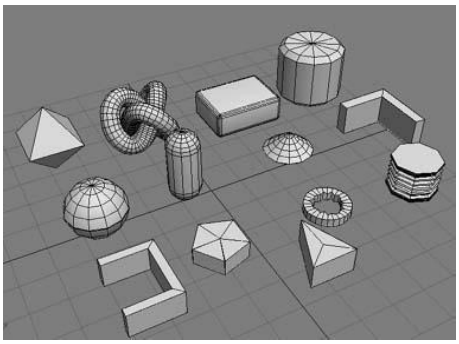


Fig. 1. 17: 13 Extended Primitive Objects

4. CHAMFER CYLINDER: This is similar to the cylinder but this contains fillet at the edge. Can be used to make pipes, stand of the table etc.
5. OIL TANK: This is exactly lik e an oil tank seen at any gas station or a wate r purification station. Can be also used to make space shuttle
6. CAPSULE: This is used to mak e the objects in the shape of the capsules

7. SPINDLE: Normally used to create the Top or a spindle. There is no defined use.
8. L-EXT: Used to created walls in the L shape
9. C-EXT: Used to created walls in the C shape
10. GENGON: Can be used to create the gems, especially used to create diamonds
11. RINGWAVE: Can be used as a ring with irregular inner edge. It can be given height. Can be used to create any designer object, nebula blast etc.
12. HOSE: This can be used to connect two different objects together as it creates a link between them creating friction and elasticity depending upon the animation
13. PRISM: This is a three-sided object exactly like prism as the name states.

1.8.1 AEC EXTENDED

AEC Extended objects are designed for use in the architectural, engineering and construction fields. Use Foliage to create plants, Railing to create railings and fences and Wall to create walls.

Fig. 1.18: AEC Extended Panel

Study Notes

	Assessment
1. Write a note on Extended Primitives. 2. What is ACE Extended and it s use?	

	Discussion
Explore the ACE Extended Primitives.	

1.9 Clone and Groupin g

The options given here are normally used to create the duplicate of the selected object. There are three options in this palette.

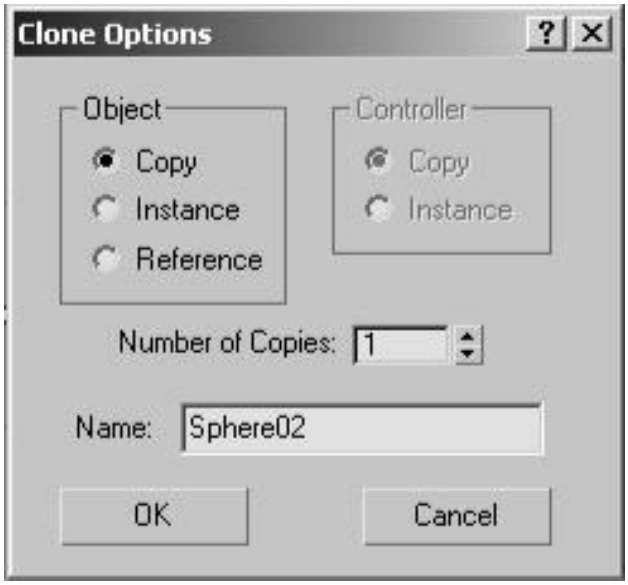


Fig. 1.19: Clone Options

Copy: This creates a copy of the selected object.

Instance: This creates an instance of the selected object.

Reference: This creates a reference of the selected object.

Number of copies: This allows us to set the number of copies we want.

Name: It allows naming t he copied objects individually.

1.9.1 GROUPING

1. Grouping

Grouping means combining two or more objects into one bunch or folder known as group. This group is given a na me to identify it and it can be used to translate or scale the collection of object included it. For example, a table is made up of standard primitives such as cylinder and boxes. To move this table we need to group the cylinder and boxes, name the group as Table fro identifica tion and translate if using move tool.

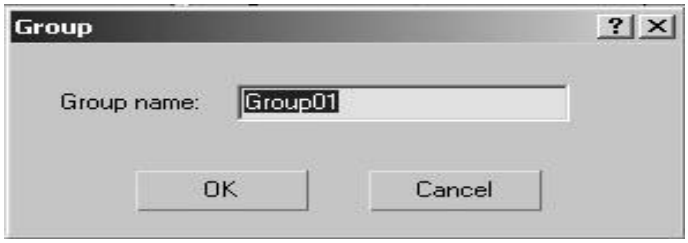


Fig. 1.20: Grouping Window

This option is used to create a group of the selected objects.

2. Selection sets

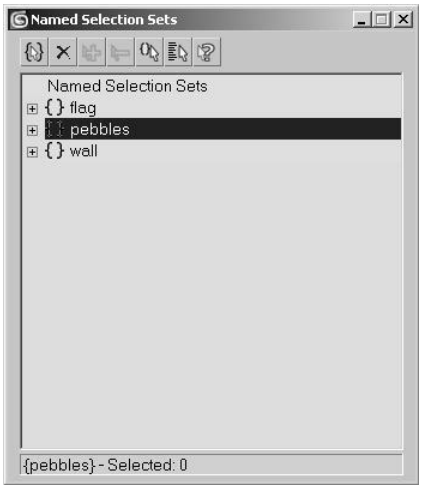


Fig. 1.21: Named Selection Sets

This option is used to create a set of selection of the objects.

3. Boolean Compound Object

A Boolean, Boolean object combines two other objects by performing a Boolean operation on them. This tool actually sticks the two objects together by b ecoming one

object. For example, to make a pencil with a rubber cap on it, both objects can be combined into one by using Boolean compound option, which will be much easy to handle.

Study Notes

Assessment

1. Define Cloning and give an example.
2. Describe Boolean Compound with example.

Discussion

Discuss the difference between grouping and Boolean Compound.

1.10 Layer Manager

Layer manager is used to set the objects in layers and distribute them into different layers. Here we can hide the objects, apply effects or prevent rendering of particular objects by separating them in different layers. This is exactly like working with layers in Photoshop. The layers manager plays an important part when we import or link files with Autodesk AutoCAD. The objects in the AutoCAD are placed in the layers. Earlier layers were only available in 3ds max design but later it was added to 3ds max too.

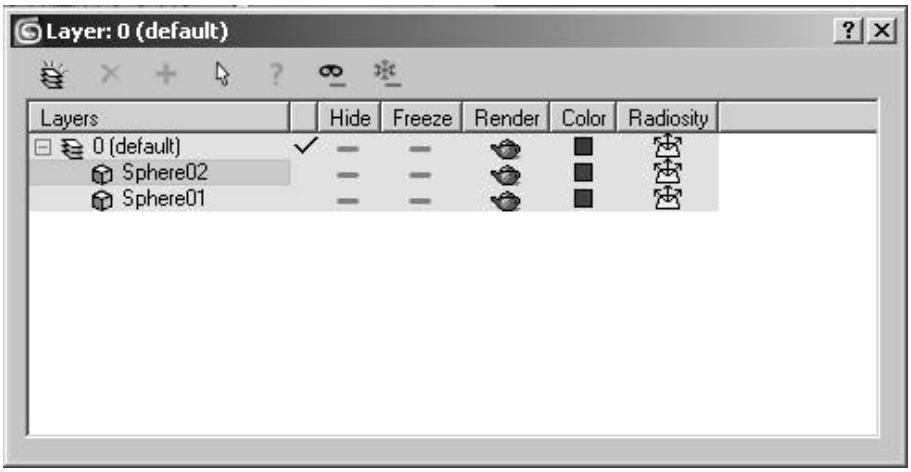


Fig. 1.22: Layer Manager

	Study Notes

	Assessment

1. Define layer management.
2. What is the use of Layer man ager option?

	Discussion
Study the process of Layer Manager Option.	

1.11 Snap Tool

This tool is used to snap the objects according to the selected options. T his tool gives you control over the movement of the cursor by snapping it to the grid at specific measured unit.

There are three types of snap to ggles.

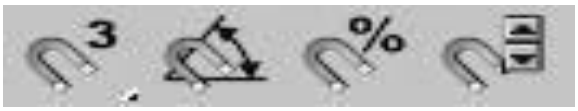


Fig. 1.23:Snaps tools

Snap toggle: It is used t o snap the cursor directly to the objects (depends upon the type of snap used).

2D Snap: It is used to sna p to the grids or to the geometry in 2d space but the depth is ignored i.e. Z-axis.

2.5 Snap: It snaps the c ursor directly to the edge or the vertex of t he projected object.

3D Snap: It snaps the cu rsor to the geometry present in the 3d space.

Snap tool setting is found in the following menu:

Tools menu > Grids and Snaps > Grid and Snap Settings > Grid and Snap Settings dialog > Options panel

	Study Notes

	Assessment

1. Define Snap Tool and its use.
2. List the different types of Snap Tool available.

	Discussion

Open 3D Max, create an object and use the different snapping tool available.

1.12 Hierarchy >Pivot Point Rollout

Hierarchy:

Hierarchy is the option, which allows us to differentiate between parent and child in the PARENT-CHILD relationship. This is very important when we work with the Kinematics (inverse or forward).

Fig. 1. 24: Hierarchy &Pivot Point Rollout

Pivot point:

Pivot point is the centre point or a local point of the local coordinate.

The pivot point is define d for transformation, location for any applied m odifier and it defines the transformation of the linked child object and in IK (inverse kinematics)

1.12.1 SELEC TION FLOATER

Displays the list of objects in different categories from which we can choose the object to select it either to trans form it or to modify it.

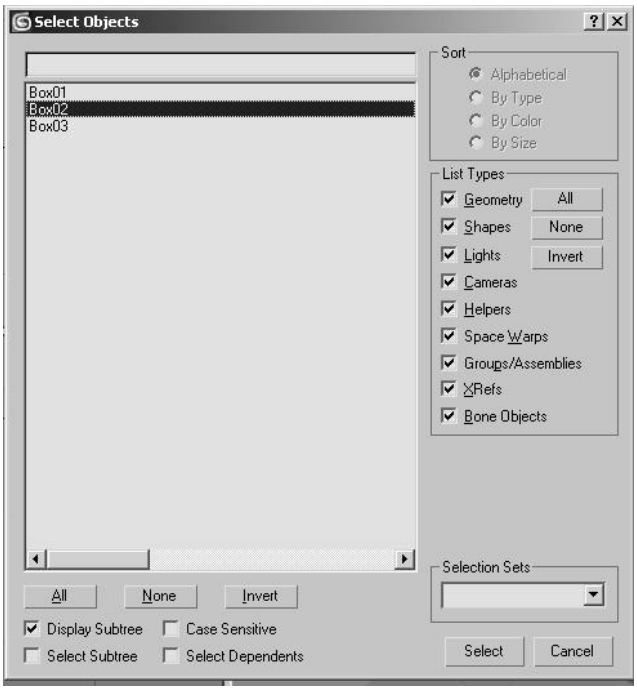


Fig. 1.25: Selection Floater

1.12.2 DISPLAY FLOATER

Displays the options with which either we can freeze or hide the o bjects in the viewport according to our need . We can control this by selecting any one of the following options.

Fig. 1.26:Display Floater

1. By Name : We can hide or fre eze the objects by selecting the objects by nam e
2. Selected: the selected objects can be hidden or freezed.
3. Unselected: the unselected o bjects can be hidden or freezed.
4. By hit: We can hide or freeze the objects by clicking on the objects.

1.12.3 ARRAY

Array is a very useful and specified tool for cloning the object s along with transformations. The objects can be given either incremental values or totals to position, rotation as well as scale.

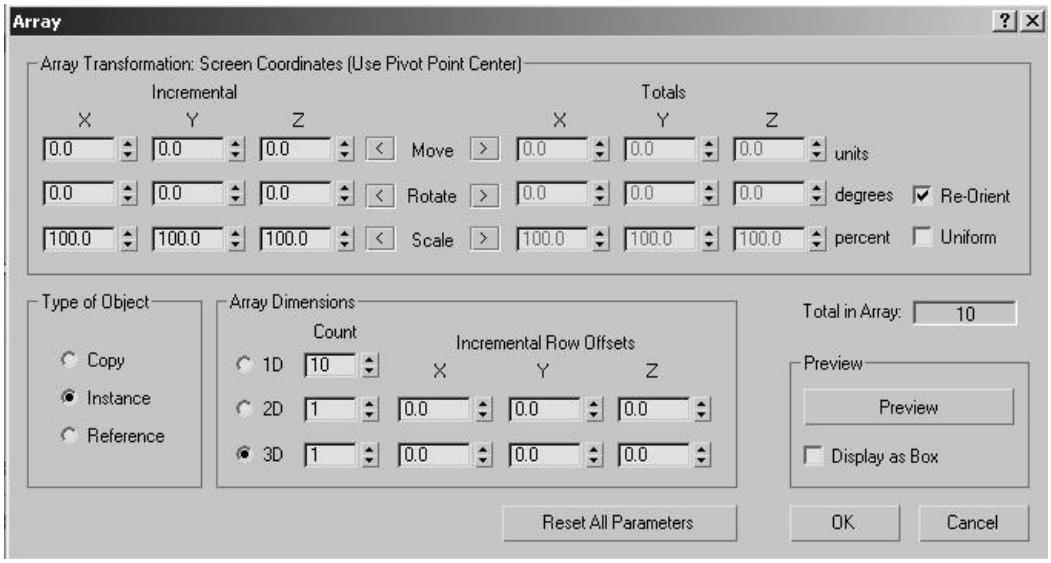


Fig.1.27: Array

1D: creates the array in one dimension though it occupies 3d space

2D: creates the array wit h both rows and columns. For ex. 3 rows and 5 columns

3D: creates the array wit h rows, columns by two levels

Parameters of array palette:

1. Incremental
   - Move : Specifies the dist ance between 2 objects either in X, Y or Z-axis
   - Rotate: Specifies the degree of rotation between two objects either in X, Y or Z-axis.
   - Scale: Specifies the percentage of scale between two objects either in X, Y or Z-axis.

2. Totals

   - Move: sets the space bet ween the pivot points of each object.
   - Rotate: Specifies the tot al degree of rotation of the object.
   - Scale: Specifies the total scale of the object along the threeaxes.

3. Object Group

   - Copy : Arrays the copies of the object
   - Instance : Arrays the instances of the object
   - Reference : Arrays the references of the object

4. Total in array: Displays the n umber of objects arrayed in the scene.
5. Preview: Gives the preview of the object.
6. Bounding Box: displays the o bjects as the bounding box during the preview.

1.12.4 Align

This tool is used to set the incremental for the scaling of the object s o that we can scale the object in the proportion we want.

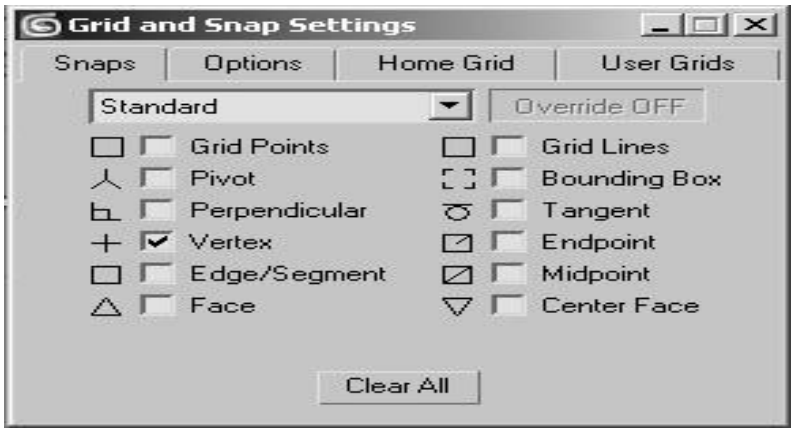


Fig. 1.28: Align Snap

1.12.5 Spinner Snap Toggle

This sets the increment o r the decrement value of a spinner on just single click. These values are effective only when this option is toggled on. Values for various types of spinners can be set over here. For examp le you can give value for angle spinners, percentage spinner etc.

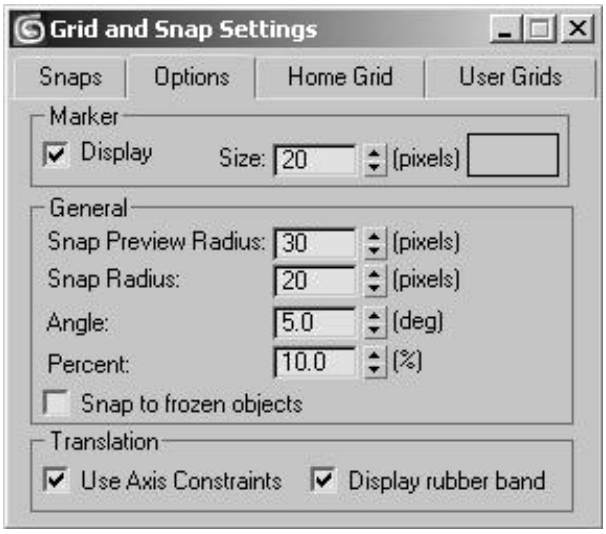


Fig. 1.29: Spinner Snap Toggle

	Study Notes

	Assessment

1. Define Hierarchy.
2. Explain Array with example.

	Discussion
Explore the importance of Hierarchy in 3D.	

1.13 Summary

INTRODUCTION TO AUTODESK 3DS MAX

Autodesk 3ds Max, is a modelling, texturing, animation and rendering package developed by Autodesk Media and Entertainment. It has poly modelling capabilities, an accommodating plug-in design and is able to be used on the Microsoft Windows platform. It is used for creation of TV commercials, architectural visualisations and video game development. It is also used for movie effects and movie pre-visualisation also.

DIFFERENCE BETWEEN 2D AND 3D ANIMATION

2D animation is generally done using frame-by-frame animation. Other techniques used in 2D animation are tweening, rotoscoping etc. In 3D animation, the objects are built or modelled and then they are animated by deforming those models using bones, joint and skinning.

SHOWING OF INTERFACE

3DS MAX has the interface, which includes all necessary functions in grouped stakes, and that makes it easier to work around the product. 3DS MAX has won an award for providing the best Graphical User Interface (GUI).

VIEWPORT LABELS

When we start up with 3ds max, we see the main screen is divided into 4 different viewports. These are the areas where we can create any objects and can have different views of the objects from different angles.

PANEL MENU

The following Panel Menus are available in 3D Max:

Menu Bar, Command Panel, Main tool bar, view port navigation panel, Timeline Control, Status Bar and Prompt Line.

TRANSFORMATION TOOL

There are 3 transformation tools-Select and move, Select and rotate, Select and scale

STANDARD PRIMITIVES

We can easily create the standard primitives. There are 10 different objects present in the roll out. In this slot, all the objects except PLANE are 3D but the plane is 2D. The plane just consists of X and Y-axis and it is one side object, meaning we cannot see it from the backside.

EXTENDED PRIMITIVES

We can create the extended primitives like Hedra, torus knot, Chamfer box etc. AEC Extended objects are designed for use in the architectural, engineering purpose.

CLONE AND GROUP

The options given here are normally used to create the duplicate of the selected object.Grouping means combining two or more objects into one bunch or folder known as group. This group is given a name to identify it and it can be used to translate or scale the collection of object included it.

LAYER MANAGER

Layer manager is used to set the objects in layers and distribute them into different layers. Here we can hide the objects, apply effects or prevent rendering of particular objects by separating them in different layers.

SNAP TOOL

This tool is used to snap the objects according to the selected options. This tool gives you control over the movement of the cursor by snapping it to the grid at specific measured unit.

HIERARCHY > PIVOT POINT ROLLOUT

Hierarchy is the option, which allows us to differentiate between parent and child in the PARENT-CHILD relationship. This is very important when we work with the Kinematics (inverse or forward).

1.14 Self-Assessment Test

Broad Questions

1. How many types of the views are there? Explain them.
2. Write a brief note on command panel. Explain various standard and extended primitives.

    a. 2d and 3d

    b. Perspective view

    c. Command Panel

    d. Snap Tool

    e. Clone options

1.15 Further Reading

1. 3ds Max Essentials: Autodesk Media and Entertainment Courseware, Autodesk
2. Introducing 3ds Max 9: 3D for Beginners, Dariush Derakhshani, Randi L. Derakhshani and Jon McFarland
3. Introducing 3ds Max, Dariush Derakhshani and Randi L. Derakhshani
4. Mastering Autodesk 3ds Max Design 2011, Mark Gerhard,Jeffery M. Harper

Assignment

Create a room using C-extension or AEC.Then using various primitives and extended primitives, create furniture in the room.

Unit 2 3d Modifiers

Learning Outcome

After reading this unit, you will be able to:

- Explain the different modifiers in 3Dsmax and learning the Uses
- Interpret the difference in World Space Modifiers and Object Space Modifiers
- Point out the Shapes
- Demonstrate how to use them in various forms
- Discuss the different modifiers for the shapes

Time Required to Complete the unit

The time required to study this Unit is broken as follows:

1. 1st Reading: It will need 3 Hrs for reading
2. 2nd Reading with understanding: It will need 4 Hrs for reading and understanding
3. Self-Assessment: It will need 3 Hrs for reading and understanding
4. Assignment: It will need 2 Hrs for completing an assignment
5. Revision and Further Reading: It is a continuous process

Content Map

2.1 Introductionto Modifiers

With the modifiers contained in the Modify Panel, you can alter objects in a vast number of ways. Modifiers can work with every aspect of an object, including geometric deformations, materials and general object maintenance. In this chapter, we looked at the Modifier Stack and how modifiers are applied and examined several useful modifier sets. The modifiers are divided into various categories according to their use. Some modifiers work on 3D objects, some work on 2D shapes. Some are used for modelling and some are used for deformation. Some modifiers help in animation and some help in dynamics. In this chapter, we will be looking at some of the modifiers, which work with 2D as well as 3D object. These modifiers are majorly used to deform the objects.

2.2 Explain the World Space and Object Space

Object-space modifiers straight transform an object's geometry in local object space. When we apply an object-space modifier, it shows directly above the object with other object-space modifiers in the modifier stack. The arrangement in which the modifiers appear in the stack can affect the resulting geometry.

World-space modifiers act as object-specific space warps. They are carried with the object, but like space warps, use world space rather than object space for their effects. World-space modifiers eliminate the need for binding to a separate space-warp gizmo, making them convenient for modifying a single object or selection set.

2.2.1 Modifiers

The modifiers are used for modifying for altering the shape or size of the object. Unlimited number of modifiers can be applied. These modifiers can be easily copied or mover to other object. Always remember the order of the modifiers applied is important.

1. Taper

This modifier is used to scale the objects at both the ends. It modifies the objects by scaling it at the top end as well as the bottom end.

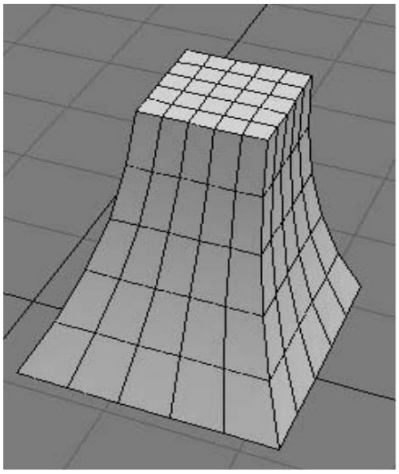


Fig. 2.1: Taper Modifier

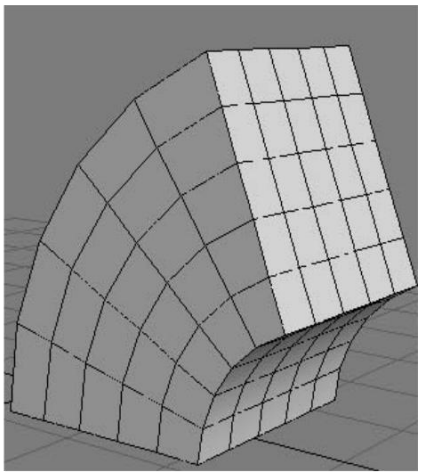


Fig. 2.2: Bend Modifier

2. Bend

This modifier is used to bend the object from the defined gizmo. If the gizmo is placed up then it will start bending the object from that particular portion.

3. Twist

This modifier twists the objects to create twisted objects. For example Screws, rope etc.

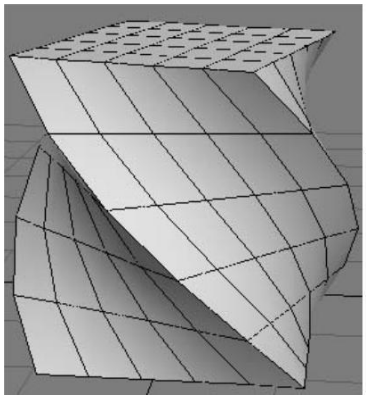


Fig. 2.3: Twist Modifier

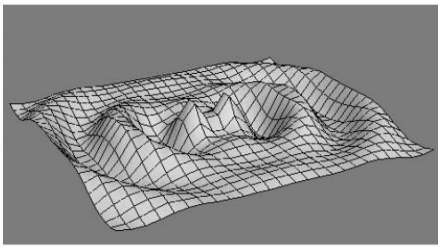


Fig. 2.4: Ripple Modifier

4. Ripple

This modifier is used to create a ripple effect on the objects.

5. Wave

This modifier is used to c reate a wavy effect on the objects. It is exactly like the wave filter in Photoshop.

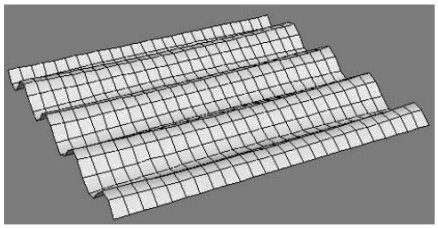


Fig. 2.5: Wave Modifier

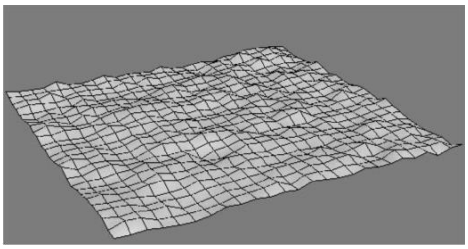


Fig. 2.6: Noise Modifier

6. Noise

This modifier adjusts the position of any vertices with the combination of any three coordinates.

7. Stretch

This modifier is used to stretch the objects in any of the threeaxes.

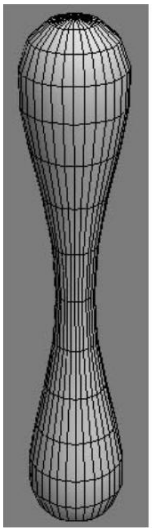


Fig. 2.7: Stretch Modifier

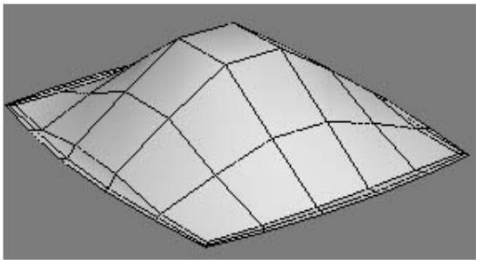


Fig. 2.8: Melt Modifier

8. Melt

This is used to melt the objects in a specific manner. It melts the object with the specific calculation of the temperature.

9. Skew

It is used to skew the object on any of the one axis, may be on X, Y or Z-axis.

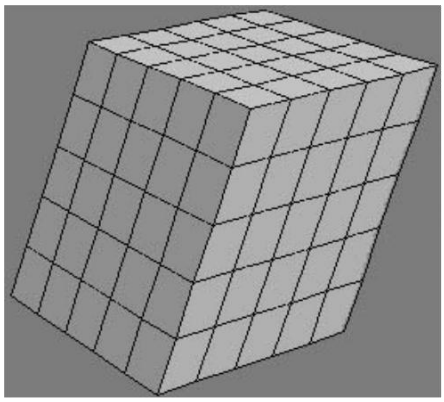


Fig. 2.9: Skew Modifier

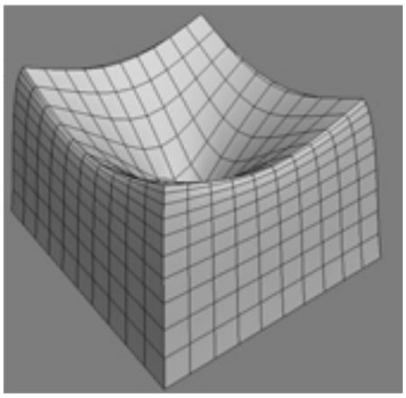


Fig. 2.10: Squeeze Modifier

10. Squeeze

This option is used to squeeze the object in any of the desired axis, may be X, Y or Z-axis.

11. Displace

This option is used to displace the particular surface or polygons related to the selected bitmap displacement map.

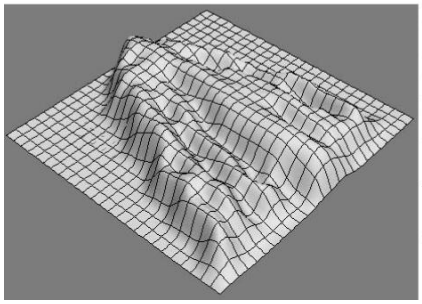


Fig. 2.11: Displace Modifier

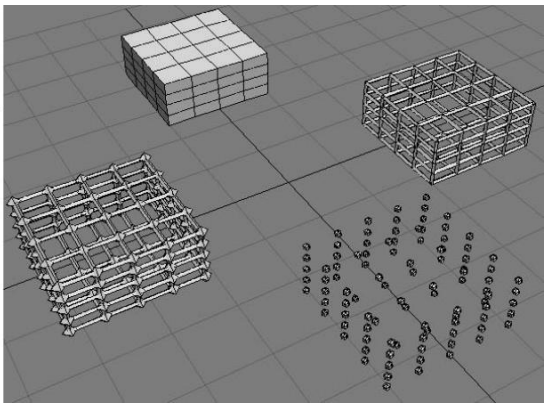


Fig.2.12: Lattice Modifier

12. Lattice

This converts the objects or displays the segments of the objects as struts with joints (optional) and vertices.

13. Mirror

This modifier is used to mirror the objects on either of any of the threeaxes.

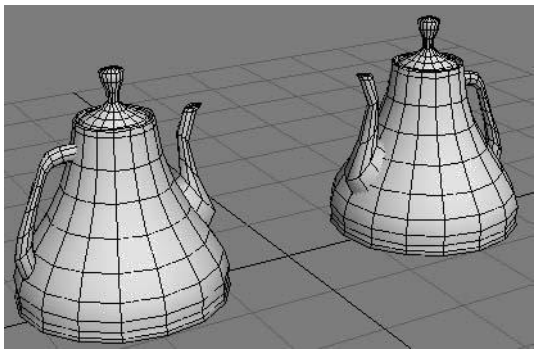


Fig. 2.13: Mirror Modifier

14. Slice

This modifier is used to refine the mesh, to slice the object or a group of objects. We can transform the gizmo and can even give desired animation.

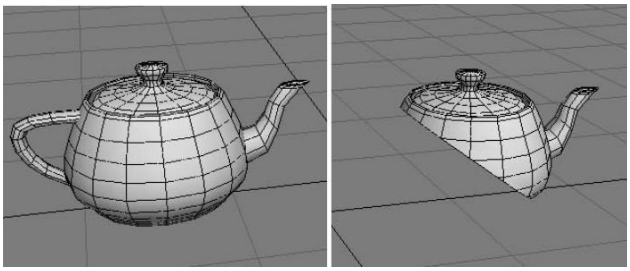


Fig. 2.14: Slice Modifier

15. Affect Region

This is basically a surface modelling tool used to create a bubble, a rat under a mat, etc. it does not depend upon the topology of the object.

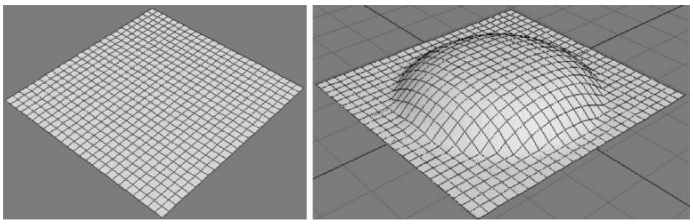


Fig. 2.15: Affect Region Modifier

16. Symmetry

This modifier helps us doing three different tasks together.

1. Slice the mesh
2. Mirror the mesh

3. Automatically weld

4. Whatever changes we do to the either side it automatically sets on the opposite side.

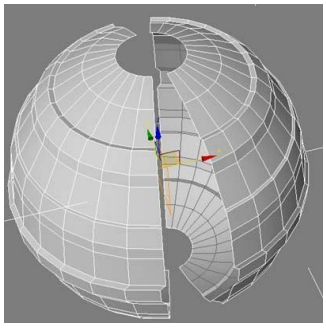


Fig. 2.16 Symmetry Modifier

17. Shell

This modifier adds thickness to the surface from either of one side, may be from outside or inside. It adds a set of extra faces, which always faces the opposite direction of the present surface.

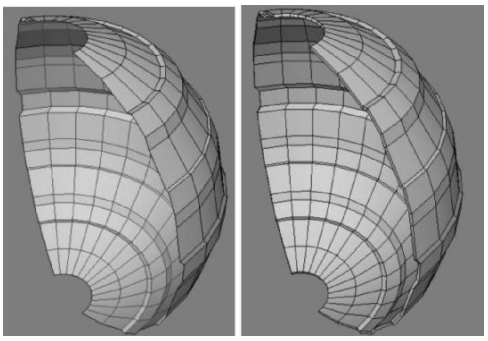


Fig. 2.17: Shell Modifier

	Study Notes

	Assessment

1. Define Taper with an example.
2. Explain Symmetry modifier with example.

	Discussion

Using the modifiers, create a tube that is bulging only around the ball placed inside it.

2.3 Shapes

Shapes are the objects that are made up of 2 or more than 2 splines. Spline is a collection of segments or vertices. Shapes are all 2d objects, which look exactly like the lines drawn in graphic suite like Illustrator or Corel Draw. Hence, we can say that a shape is a collection of 2 or more lines or curves. Here are different types of shapes available in 3ds MAX.

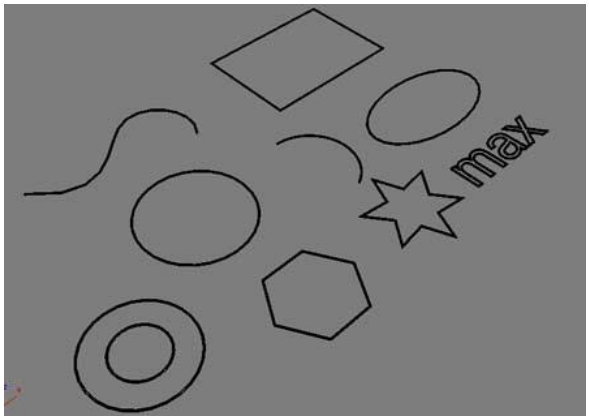


Fig. 2.18: 2d Shapes

1. Lines

Line is the only readymade “Editable Spline” present in the shapes. It has got different options with which we can control the curves of the spline.

There are some options, which help us to control the display and the interpolation of the spline.

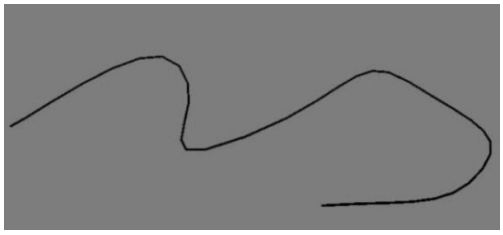


Fig. 2.19: Line Shapes

2. Circle

This is a closed shape which forms a circle, depending how we draw i.e. may be from the centre or from the edge.

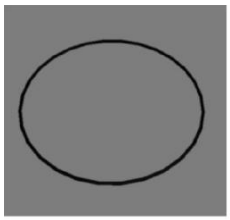


Fig. 2.20: Circle Shapes

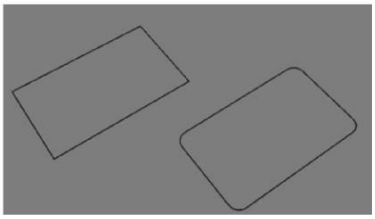


Fig. 2.21: Rectangle Shapes

3. Rectangle

This is a closed shape, which lets us draw a rectangle or a square. There are two kinds of rectangle, (a) with the sharp corners and (b) with the rounded corners. This totally depends upon the options, which we set.

4. Ellipse

This is again a closed shape, which lets us draw an oval. We will not get a radius here but we get the options with which we can set the width and height of the object. This is the main difference between a circle and an ellipse.

Fig. 2.22: Ellipse Shapes

Fig. 2.23: Arc Shapes

5. Arc

Arc is the name suggests it draws an arc. The length of an arc depends upon the length that we specify in the beginning.

6. Doughnut

Doughnut is a closed shape used to draw a shape like a doughnut. Which when modified can be converted into a tube.

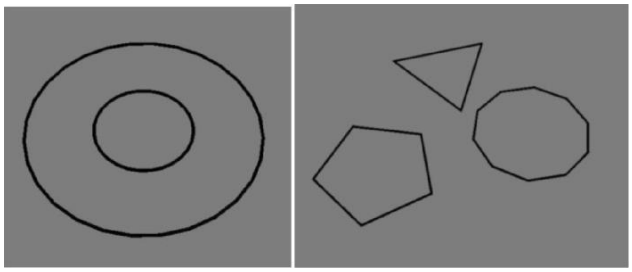


Fig. 2.24: Doughnut Shapes

Fig. 2.25: N Gon Shapes

7. Ngon

N Gon is a closed shape used to draw a polygon or a circle. The number of sides can be set as required. There are two options for drawing it, (a) Inscribed: which means it will draw a polygon in which the radius is set from the centre to the corners. (b) Circumscribed: it means it will draw a polygon in which the radius is set from the centre to the sides.

8. Text

Text is the name that suggests this tool is used to write the text. This contains the options exactly like the text tool in graphic suite. We can change the font, font size, font style, leading and kerning.

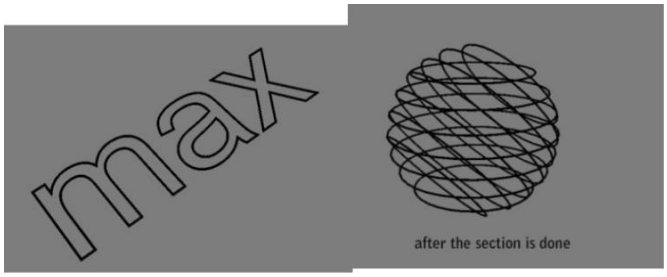


Fig. 2.26: Text Shapes

Fig. 2.27: Section Shapes

9. Section

Section is used to bisect the object. It slices the mesh object. The best option is that we can slice the object into one or more mesh objects.

10. Star

Star: this is used to draw a star. The number of sides can be adjusted as required. The corners can be smoothened as per the need. This option of smoothing the corners is called as “fillet”. This is normally seen on the edge of the furniture like table, cupboards, etc.

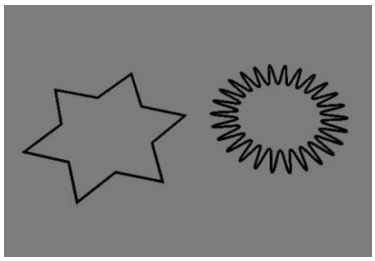


Fig. 2.28: Star Shapes

Study Notes

Assessment

1. Define Spline with few examples.
2. What is an Ngon?

	Discussion
Using the Splines, create a Flowe r shape.	

2.4 How to Modify Sh apes

This helps in creating the splines or the shapes in a defined manner. T his can be set during the creation time. This is divided into 2 groups' initial type and drag type.

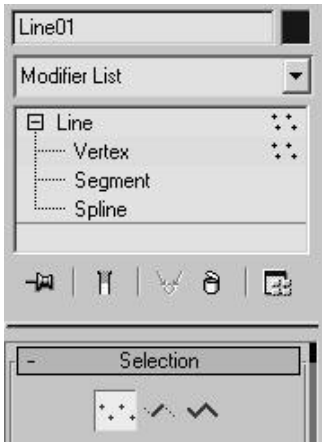


Fig. 2.29: Modifier List

1. Initial type:

- Corner: for the creation of a sharp point
- Smooth: for the creation of smooth and nonadjustable curves

2. Drag type:

- Corner: for the creation of a sharp point
- Smooth: for the creation of smooth and nonadjustable curves
- Bezier: for the creation of sm ooth and adjustable curves

Rendering Options for Shapes:

1. Viewport: this is used to set the thickness, sides and angle of the spline in the viewport. This is present only when th e display renders mesh and use viewport settin g options are ON.

2. Rendered: used to set the render thickness, sides and angles
3. Thickness: used to set the thickness of the spline in the form of diameter; ranges from 1.0 to 100,000,000
4. Sides : used to set the sides of the spline
5. Angle: used to set the rotati onal angle of the spline
6. Renderable: to view it in the final rendering this option needs to be on
7. Mapping Parameters: used to set the coordinates of the map according to the object. The U coordinate wraps the map around the thickness of the spline and the V coordinate wraps the map around the le ngth of the spline.
8. Display render mesh: display s the mesh generated by the spline.
9. Use viewport settings : displ ays the mesh generated by the viewport setting s
10. Steps : used to set the number of steps in between each vertex
11. Optimize : Removes the unw anted steps
12. Adaptive: Sets the number of the steps automatically as per the requiremen t.

The spline is divided into 3 sub levels.

1. Vertex
2. Segment
3. Spline

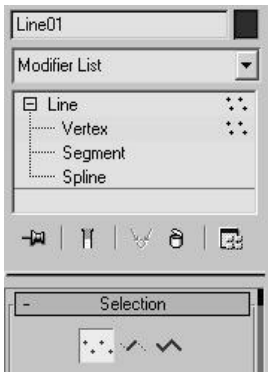


Fig. 2.30: Spline List

2 .4.1 VERTEX

Vertex is the point whe re two edges meet. It is exactly like the anc hor points in graphic suite. A line or curve alw ays passes through two vertices.

2.4.2 SEGMENT

Segment is the line/curve that connects two vertices. It can be called as a small portion of the spline.

2.4.3 SPLINE

We can control the entire shape with the options present in here as follows:

1. New vertex type: used to set the type of the vertex which we will be creating new or while copying the spline.
2. Create line: this option creates a new spline from the desired position. The line that is created is itself a part of the present spline.
3. Break : splits the spline at the selected vertex
4. Attach : lets we attach other splines
5. Attach Multiple: lets we select the splines from the list and attach to the current spline.
6. Reorient: rotates the spline that is attached in such a way that it's mapping coordinates with the previous or the parent spline
7. Cross section: used to set a bridge between vertices of two different splines by drawing a spline
8. Automatic welding: welds the vertices of the two splines when they are brought near in a particular threshold value.

Fig. 2.31: Geometry List

EDITABLE SPLINE (VERTEX)

1. Vertex Type : there are 4 diff erent types of the vertex available in here
   - Smooth : creates no: adj ustable smooth curves
   - Corner : create curves with sharp corners
   - Bezier: creates adjustabl e curves. We can adjust the curves from both t he sides.
   - Bezier Corner: creates adjustable curves. We can adjust the curves i ndividually by handling the tangents.
2. Soft Selection : used to set the area of the selection in such a way that it p artially selects the surrounding vertices
3. Refine: used to create a new vertex on the spline so as to divide the segme t
4. Weld : used to join the 2 ope n vertices

5. Connect: used to connect the two open vertices by drawing a segment between 2 vertices
6. Insert: used to create a new vertexBut it does not settle down on the spline.
7. Make First: this specifies which of the vertex needs to be first.
8. Fuse: coincides the entire selected vertex to the averaged centre
9. Cycle: Selects the successive vertex.
10. Cross insert : Inserts the vertex on all the coinciding splines
11. Fillet : Smoothens the corners made by the vertices
12. Chamfer : Bevels the corners made by the vertices
13. Hide : Hides the selected vertex
14. Un hide all : unhides all the hidden vertex
15. Bind: Used to connect the spline to create a network
16. unbinds : this unbinds the bound object
17. delete : deletes the selected vertices

1. Insert : Inserts one or more segments so as to create additional segments
2. Delete : deletes the selected segment
3. Divides: divides the selected segment into defined numbers.
4. Detach : separates the selected segment from the current one so as to create a new and an individual spline

1. Reverse : reverses the selected spline in term of setting the vertices in a reverse order
2. Outline: creates a thickness to the spline so as to create a border.
3. Boolean: Combines 2 closed shapes. Either it unions, subtracts or intersects them.
4. Mirror : mirrors the spline along the length, width or diagonally
5. Trim : Used to remove the overlapping segments
6. Extends : To clean up the open segments

	Study Notes

	Assessment

1. List the Rendering option for Shapes.
2. Give the different types of Vertex.

	Discussion

Using the software, modify the Flower shape created in the previous assignment.

2.5 Modifiers for Shapes

2.5.1 LATHE

With this modifier, we can spin the spline around on a particular axis in 360 degree to create a 3D object. There is a condition here that either the spline should be having an outline or we can later apply Shell modifier. Can be used to create glass, bowl, etc. we can even define the cap at the start and at the end so as to create desirable shape. This revolves the spline so as to create a 3D object. This is very much useful.

Parameters of lathe modifier

1. Axis: Sets any one of the 3 ax is X, Y or Z for revolution
2. Degree: Specifies the value of angle to be spun
3. Weld Core: This is used to w eld the vertices at the point of revolution.

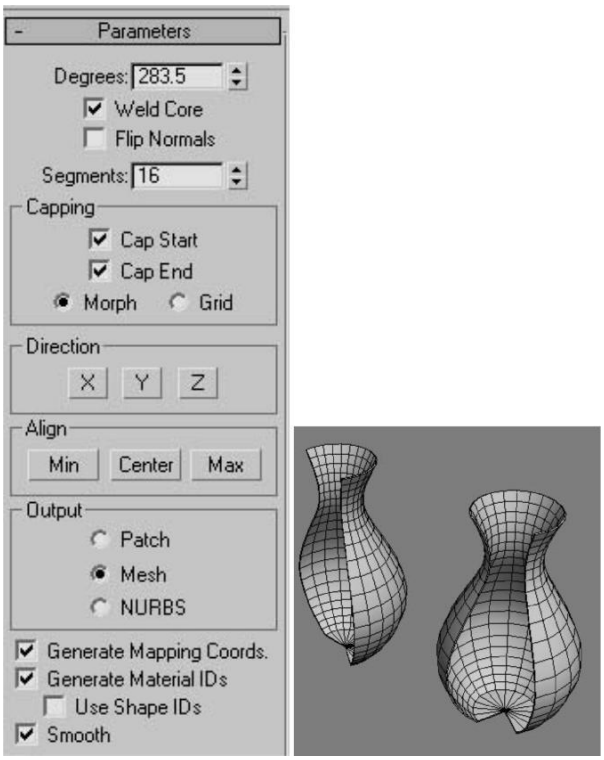


Fig. 2.32: Parameters Lathe Modifier

4. Flip Normal: when the objec t is revolved, the surface may turn inside out. At this time, this option adjusts the surfac e so as to display the surface.
5. Segments: Defines the number of the segments that will define the smooth ness
6. Cap Start: Creates a surface s o as to close the curve at the beginning of the spline
7. Cap End: Creates a surface so as to close the curve at the end of the spline
8. Direction: defines on which a xis should we revolve the spline
9. Output:
   - Patch: this converts the l athed object to patch when collapsed
   - Mesh: this converts the l athed object to mesh when collapsed
   - NURBS: this converts the lathed object to NURBS when collapsed

10. Generate Mapping Coordina tes: Sets the coordinates of the axis according to the lathed object
11. material ID: Allows to apply the materials on the defined shape ID
12. Shape ID: Allows defining th e ID for the segments
13. Smooth: Smoothens the lathed object

2. 5.2 EXTRUDE

This modifier is used to give the height to the drawn spline or to add th e depth to the drawn spline. This can be applied on the closed shape. This modifier does n ot show good result on open spline. This is normally is used to create a solid 3D object out of spline. This type of modelling becomes light in file size as it contains fewer segments and no segments at the cap surfaces. The height segments can be adjusted as required.

Parameters of Extrude modifier

1. Amount: Sets the amount of depth/height
2. Segments: Specifies the num ber of segments
3. Cap Start:Creates a surface a t the top of the extruded spline
4. Cap End:Creates a surface at the bottom of the extruded spline

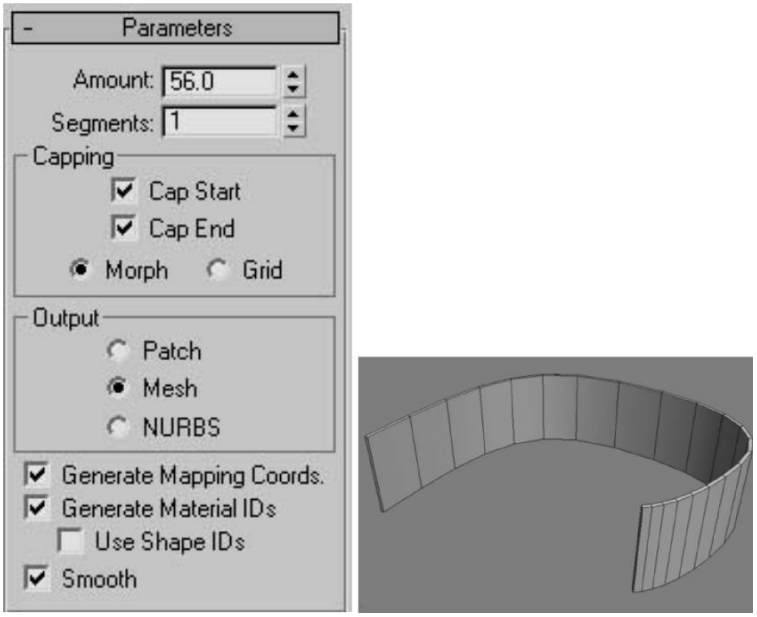


Fig. 2.33: Parameters Extrude modifier

5. Morph: Arranges cap faces in a repeatable pattern, which is necessary for creating Morph targets.
6. Grid: Can be used to create equal sizes faces.
7. Output:
   - Patch: this converts the lathed object to patch when collapsed
   - Mesh: this converts the lathed object to mesh when collapsed
   - NURBS: this converts the lathed object to NURBS when collapsed
8. Generate Mapping Coordinates: Sets the coordinates of the axis according to the lathed object.
9. material ID: Allows to apply the materials on the defined shape ID
10. Shape ID: Allows defining the ID for the segments.
11. Smooth: Smoothens the lathed object

Study Notes

Assessment

1. Define Lathe and give an example.
2. Explain Extrude function and its use.

	Discussion
Use the Lathe function to create various shapes of Pot.	

2.6 Summary

INTRODUCTION TO MODIFIERS

With the modifiers contained in the Modify Panel, you can alter objects in a vast number of ways. Modifiers can work with every aspect of an object, including geometric deformations, materials and general object maintenance. In this chapter, we looked at the Modifier Stack and how modifiers are applied and examined several useful modifier sets.

EXPLAIN THE WORLD SPACE AND OBJECT SPACE

Object-space modifiers straight transform an object's geometry in local object space.World-space modifiers act as object-specific space warps. They are carried with the object

MODIFIERS

The modifiers are used for modifying for altering the shape or size of the object. Unlimited number of modifiers can be applied like bend, twist, ripple etc.

SHAPES

Shapes are the objects which are made up of 2 or more than 2 splines. Spline is a collection of segments or vertices. Shapes are all 2d objects, which look exactly like the lines drawn in graphic suite like Illustrator or Corel Draw.

HOW TO MODIFY SHAPES?

This helps in creating the splines or the shapes in a defined manner.This is divided into 2 groups' initial type and drag type.

MODIFIERS FOR SHAPES

With Lathe modifier we can spin the spline around on a particular axis in 360 degree to create a 3D object. Extrude modifier is used to give the height to the drawn spline or to add the depth to the drawn spline.

2.7 Self-Assessment Test

Broad Questions

1. What are OSM and WSM? Describe various 3d modifiers.
2. Describe various shapes available in 3ds max.
3. Give details about various modifiers for 2D shapes.

    a. Lathe modifier

    b. Extrude modifier

    c. Text Shape

    d. Symmetry modifier

    e. Taper modifier

    f. Bend Modifier

2.8 Further Reading

1. 3ds Max at a Glance, George Maestri
2. 3ds Max Essentials: Autodesk Media and Entertainment Courseware, Autodesk
3. Introducing 3ds Max 9: 3D for Beginners, Dariush Derakhshani, Randi L. Derakhshani and Jon McFarland
4. Introducing 3ds Max, Dariush Derakhshani and Randi L. Derakhshani
5. Mastering Autodesk 3ds Max Design 2011, Mark Gerhard,Jeffery M. Harper

Assignment

Use various modifiers to create better furniture and fixtures for the room.

Unit 3 Mesh and Poly Modelling

Learning Outcome

After reading this unit, you will be able to:

- Define concepts and basics of Modelling
- Explain different types of Modelling and its uses
- Describe Mesh Modelling
- Define Poly Modelling
- Explain difference in Mesh and Poly Modelling

Time Required to Complete the unit

The time required to study this Unit is broken as follows:

1. 1st Reading: It will need 3 Hrs for reading
2. 2nd Reading with understanding: It will need 4 Hrs for reading and understanding
3. Self-Assessment: It will need 3 Hrs for reading and understanding
4. Assignment: It will need 2 Hrs for completing an assignment
5. Revision and Further Reading: It is a continuous process

Content Map

3.1 Introductionto Modelling

Modelling is the process of pure creation. Whether it is sculpting, building with blocks, construction work, carving, architecture or advanced injection modelling, many different ways exist for creating objects. Max includes many different model types and even more ways to work with these model types.

This chapter introduces the various modelling methods in Max. It also explains the common modelling components, including normals and sub-objects. The chapter also covers many utilities and helpers that, well, help as you begin to model objects. The purpose of this unit is to cover some of the general concepts that apply to all models. More specific details on the various modelling types are presented in the subsequent chapters, so onward into the realm of creation.

3.2 HSDS, FFD

Modelling can be defined as creating or sculpting any object out of standard objects like a box, cylinder and sphere or even out of line. Modelling can include product designing, jewellery designing, character designing or whatever that defines a sense is called modelling. The first thing to be kept in mind while modelling is “Concept”. The person who looks upon the model should get an idea either what is it or can really get into the detailing and depth.

The second thing is the arrangement of the segments should be in an equal flow. There should not be any zig-zagged lines. The third thing to be kept in mind is that the models should be made with fewer number of polygons so that the file doesn’t become heavy and later the animation does not become complicated. The smoothness should be applied in a required amount only so that the model doesn’t lose its originality. Let us now see different basic options with which we can model the objects as well as set the object in a defined manner.

HSDS Modifier:

The full form of HSDS modifier is Hierarchical Sub-Division Surface. This cannot be said as a modelling tool but rather used as a finishing tool. It is commonly used to add wrinkles and knuckles to the furniture, characters etc. It mainly features upon local refinement, hierarchical sub division and adaptive tessellation (Sub divides). Any modelling done by this manner is called a “Sub Division Modelling”.

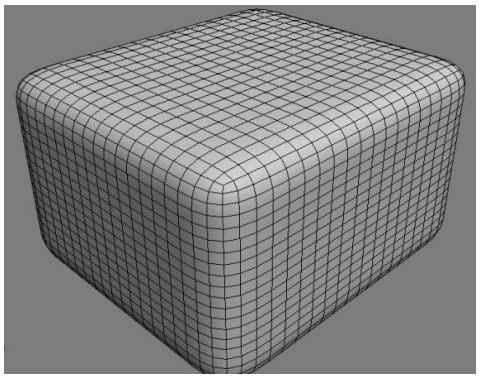


Fig. 3.1: HSDS Modifier

The HSDS modifier divides the object into 4 sub objects.

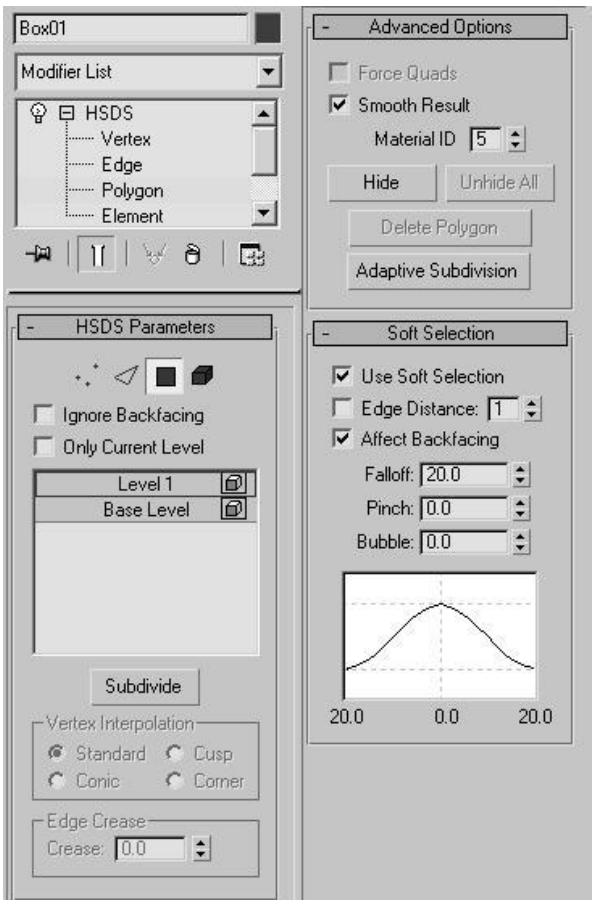


Fig. 3.2: HSDS Parameters

Sub-objects

- Vertex
- Edge
- Polygon
- Element

- Vertex: allows selecting the vertex through where we drag the cursor or choose the selection set if we have made any.
- Edge: selects the segment connecting 2 vertices
- Polygon: selects the area between the vertices.
- Element: Selects the entire object.

1. Ignore back facing: selects the vertices, edge or polygons whose normals are visible in the viewport.
2. Only current level: displays the polygons/tessellation at the selected level
3. Subdivision stack: displays the stack in which all the levels of subdivision are displayed.
4. Subdivide: tessellates the selected polygon through levels.
5. Vertex Interpolation: this controls the movement of the vertex. There are 4 types of interpolation available here: Standard, Cusp, Conic and Corner. Standard provides the least amount. Cusp and Conic provides the most. Corner is activated only when the selected vertex is isolated or not surrounded by other vertices.

FFD Modifier:

The full form of FFD is Free Form Deformation. This can be called as a modelling tool. This modifier is commonly used for making animation related to soft bodies. As the word suggests it normally deforms the shape or the object. There is a cage like lattice which contains the control points with which we can easily control the way we deform the objects.

The FFD is sub divided into 3 parts: Control Points, Lattice and Set Volume.

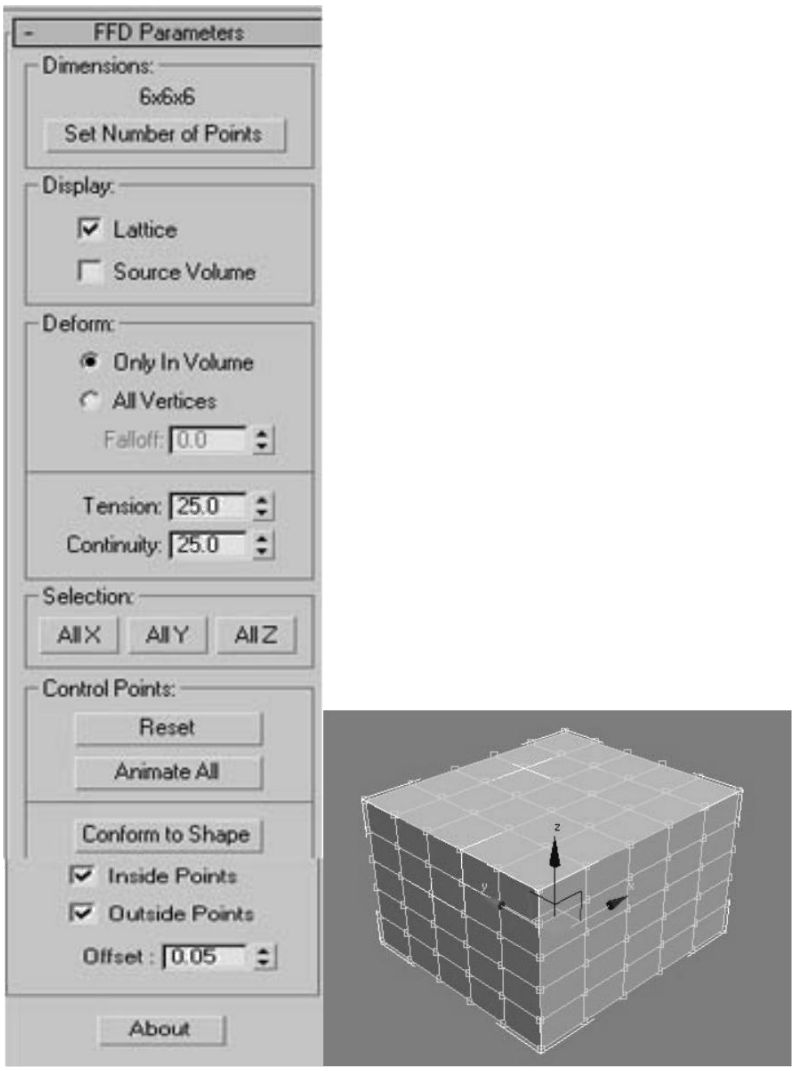


Fig. 3.3: FFD Parameters

Control Points: this works exactly like vertex

Lattice: it acts exactly like gizmo in other modifiers. When we move th e lattice the strength of the modified area shifts along with that and affects the current place.

Set Volume: This option is u sed to transform the gizmo without affecting the modified object.

1. Lattice: Displays the line connecting the 2 vertices
2. Source Volume: Displays the lattices and control points in their unmodified state.
3. Only volume: deforms vertices present inside the source volume.
4. All vertices: deforms all vertices.

5. Reset: returns to its original position.
6. Animate All: To display the control points that are animated with FFD, in the track view, this option needs to be switched ON.
7. Conform to Shape: Wraps the lattices and the control points to the current shape.
8. inside points: only the inner control points are affected while conforming
9. outside points: only the outer control points are affected while conforming
10. Offset: distance between two control points while conforming

There are 3 different types of FFD with different resolution: 2 x 2, 3 x 3 and 4 x 4. Each of them has control points depending upon the resolution.

Study Notes

Assessment

1. Explain mesh Modelling.
2. Write a short note on Faces used for modelling.

	Discussion
Using FFD modifier, change the shape of the pot created in the previous unit.	

3.3 Mesh Modelling

An editable mesh is a type of deformable object. An editable mesh is a triangular mesh: that is, it uses triangular polygons. Editable meshes are useful for creating simple, low-polygonal objects or control meshes for MeshSmooth and HSDS modelling.

You can convert a NURBS or patch surface to an editable mesh. Editable meshes require little memory and are a natural method of modelling with polygonal objects. It has three sub-object levels: vertex, edge and face. Other than these it also has Polygon and Element sub-object level. You can convert an object into Mesh either by applying Edit Mesh modifier to it or you can also convert it into Editable Mesh. Not every object can be converted into mesh in 3ds max.

Most of the parameters and the options in the “Mesh Modelling” are comparatively same as Poly modelling.

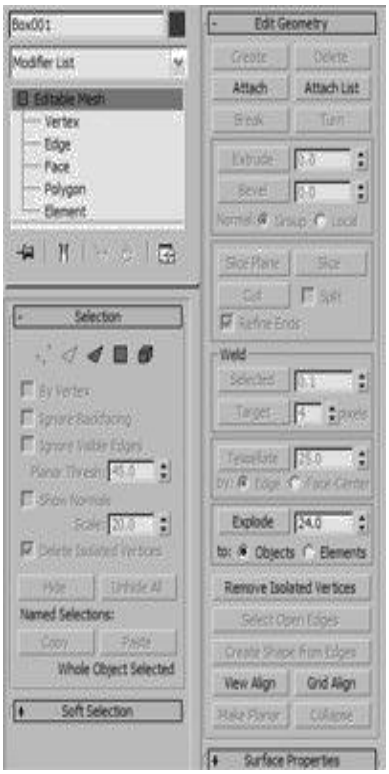


Fig. 3.4: Mesh Modify Panel

3.3.1 VERTEX

- Remove: This remove the selected vertices.
- Extrude: This helps us to extrude the selected vertices.
- Weld: This helps us to weld the selected vertices.
- Chamfer: With this, we can add chamfer to the selected vertices.
- Connect: Helps us to create a new edge in between the selected vertices.
- Remove Isolated Vertices: With this, we can easily remove the vertices that do not belong to any of the polygon.
- Remove Unused Map Verts: This helps us to remove the vertices which cannot be used in mapping.
- Constraints: Lets us in transforming the object's sub: object level. There are 3 types of constraints available.
- None: Does not apply any constraint
- Edge: The transformation of the vertex is done according to follow the edges.

- Face: The transformation of the vertex is done according to follow the faces.

3.3.2 Edge / Border

- Edit Triangulation: Modifies the selected Edge and transforms the polygons into triangles.
- Turn: The polygons that are sub divided into triangles can be modified by clicking on the diagonals.

3.3.3 Face

- Extrude: It is similar to extrude modifier. It pulls/pushes out a face.
- Bevel: It extrudes the face as well as allows you to control the beveling of the face.
- Slice and Cut: with the help of slice plane and cut you can create new segments in the mesh surface.

Study Notes

Assessment

1. Explain mesh Modelling.
2. Write a short note on Faces used for modelling.

	Discussion
Open the Software and study the various options available in the mesh modify panel.	

3.4 Poly Modelling

The “Poly Modelling” is also a kind of the modelling tool with which we can easily modify the objects and convert it into desirable objects and shapes. The object can be converted into poly object in 2 ways – 1. Select he object >rt.click> convert to >editable poly or 2. Select the object and add the edit poly modifier. The “Poly Modelling” is divided again into 5 subs: levels like

- Vertex
- Edge
- Border
- Polygon
- Element

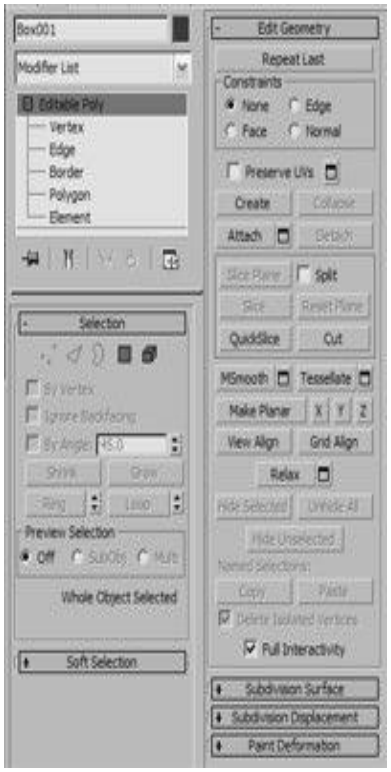


Fig. 3.5: Poly Modify Panel

Most of the parameters and the options in the “Poly Modelling” are comparatively same as mesh modelling, so we will be covering only the new options in the “Poly Modelling”. In this type of modelling, we can individually animate each sub: object level and the transformation.

3.4.1 VERTEX

- Remove: This removed the selected vertices.
- Extrude: This helps us to extrude the selected vertices.
- Weld: This helps us to weld the selected vertices.
- Chamfer: With this, we can add chamfer to the selected vertices.
- Connect: Helps us to create a new edge in between the selected vertices.
- Remove Isolated Vertices: With this, we can easily remove the vertices that do not belong to any of the polygon.
- Remove Unused Map Verts: This helps us to remove the vertices, which cannot be used in mapping.
- Constraints: This lets us in transforming the object’s sub: object level. There are 3 types of constraints available.
- None: This does not apply any constraint
- Edge: The transformation of the vertex is done according to follow the edges.
- Face: The transformation of the vertex is done according to follow the faces.

3.4.2 EDGE / BORDER

- Edit Triangulation: Modifies the selected Edge and transforms the polygons into triangles.
- Turn: The polygons that are sub divided into triangles can be modified by clicking on the diagonals.

3.4.3 POLYGON / ELEMENT

- Bridge: With this, we can easily connect the 2 selected polygons which were done earlier by the “Connect” compound object.

- Hinge from edge: With this option, we can easily create a hinge out of the selected polygon. We can set the angle as well as set the number of segments for the hinge that we have created.
- Extrude along spline: This helps us to extrude the polygons depending upon the spline that we have drawn.
- Edit Triangulation: Modifies the selected Edge and transforms the polygons into triangles.
- Turn: Modifies how polygons are subdivided into triangles by clicking diagonals.
- Relax : Allows us to apply the relax function to the current selection, using the Relax dialog settings
- Relax Settings: Opens the Relax dialog, which lets us specify how the Relax function is applied.
- Make Planar: Forces all selected polygons to become coplanar. The plane's normal is the average surface normal of the selected polygons.
- X/Y/Z: Makes the selected polygons planar and aligns the plane with the corresponding plane in the object's local coordinate system.

Study Notes

	Assessment

1. Write a short note on Poly Modelling.
2. List down the settings required for poly modelling in the Poly Modify Panel.

	Discussion

Discuss the difference between Mesh and Poly modelling.

3.5 Practice

Why model the body if the final character has clothes?

First of all it is a good exercise and you should never miss the opportunity to go in at the bottom of the things andbecause it will be very easy to take support from the body to model clothing later, thus giving a true volume to the character.

Of course, there is no need to make the body with lots of details.Thus, the feet will be very simplified and the hands will be modelled as gloves.

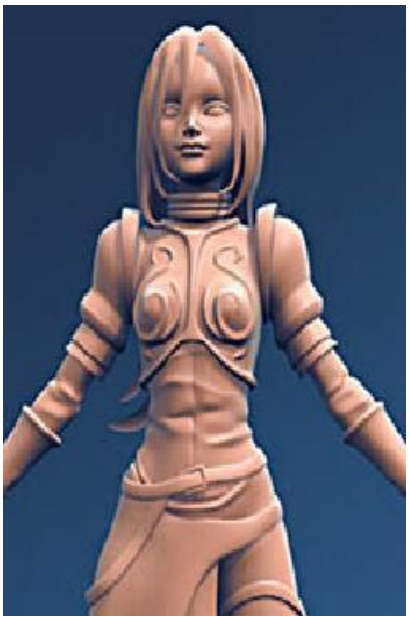


Fig. 3.6: Modelling Tutorial by Joan of Arc by Michel Roger

1. As usual, use the templates and regulate the size of displayable textures on 512 pixels in Preferences/Viewport/Configure Drivers.

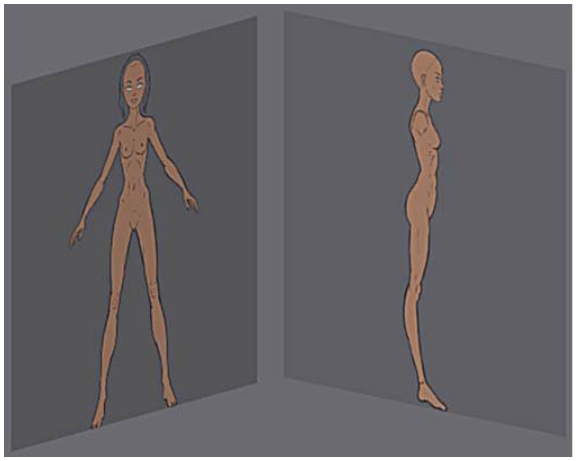


Fig. 3.7: Reference Image for Modelling

2. The return of the basic cube: As in the Crash Bandicoot LPM tutorial, the base of modelling is a cube, the simplest primitive in 3d.

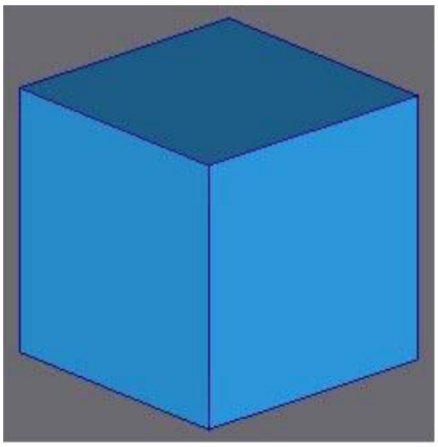


Fig. 3.8: Basic Box

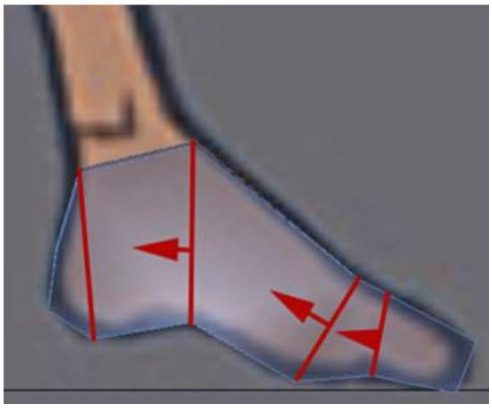


Fig. 3.9: Extruding Foot from Cube

3. Apply "Edit Mesh" and Collapse Stack. For the beginning start in left viewport, extrude one face from the cube, like show on picture on the left. Repeat this process and adjust the vertexes.

4. To see through mesh, activate the mode "See Through" in Properties of the object. A short cut can be configured to pass from one mode to the other, check out Customise/Custumise User Interface and "See Through" Toggle

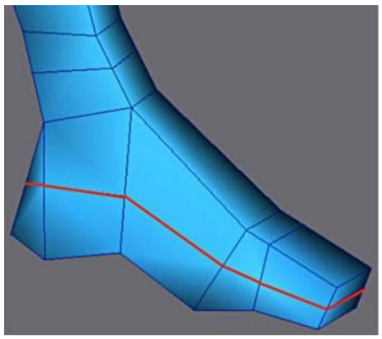


Fig. 3.10: Inserting Cut

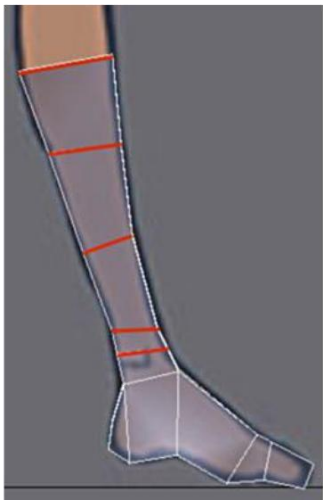


Fig. 3.11: See through activated

5. Still in left viewport, extrude the beginning of the leg and adjust the vertexes.

6. With Cut, insert the edges (left picture) around whole foot. (rotate the viewport so you can cut the opposite side of foot)

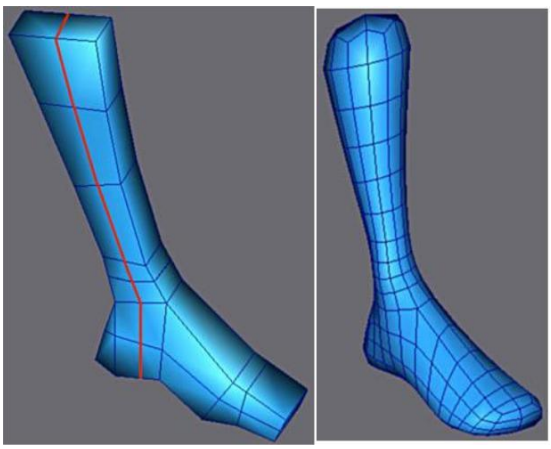


Fig. 3.12: Inserting Cut to leg

7. Again, add one line for the leg and the heel. (From both sides)

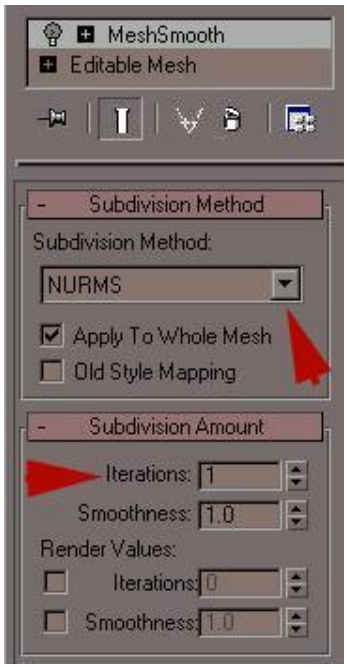


Fig. 3.13: Mesh Smooth

8. Unlike in the tutorial on Crash Bandicoot LPM, here we will use Meshsmooth smoothing while modelling on LPM.That combines the advantages of the LPM (simple and fast) and the quality of the smoothing of Meshsmooth.

9. Add Meshsmooth modifier.We will use NURMS mode with an iteration of 1, its fast and detailed enough for modelling.It should be noted that this technique of smoothing is universal since you can find it in most of 3D software FE: Maya, Softimage, Lightwave or Nendo Software. Therefore, the LPM mesh will looks the same in this software after smoothing.

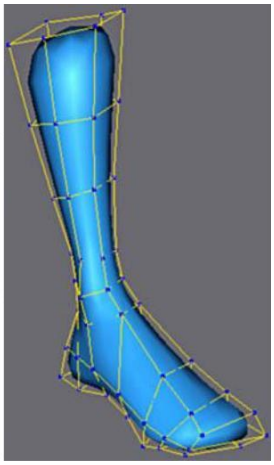


Fig. 3.14: Adding Mesh Smooth Modified Fig. 3.15: Vertex Mode

10. In the stack, click on Editable Mesh and activate the button Show End Toggle Result and go to Vertex mode.That makes it possible to see the mesh low definition (LPM) and the subdivided mesh at the same time.LPM mesh behaves as a cage of deformation of the subdivided mesh .However its one object.

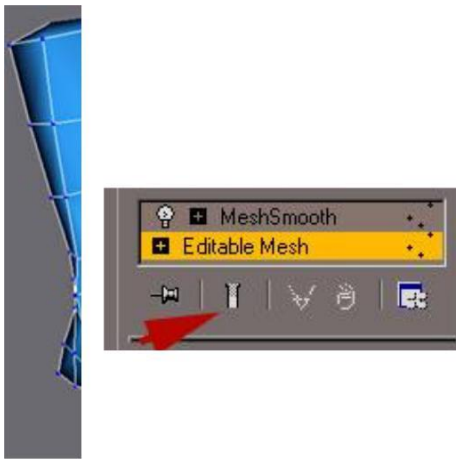


Fig. 3.16: Activating Vertex Mode

Fig. 3.17: Adjusting Vertex

If you would like to temporarily see only LPM mesh, just turn of "show end result" toggle. In general, when you edit the mesh FE adding edges, it is more practical to work with this settings.When you are creating forms, the subdivided mode is better.

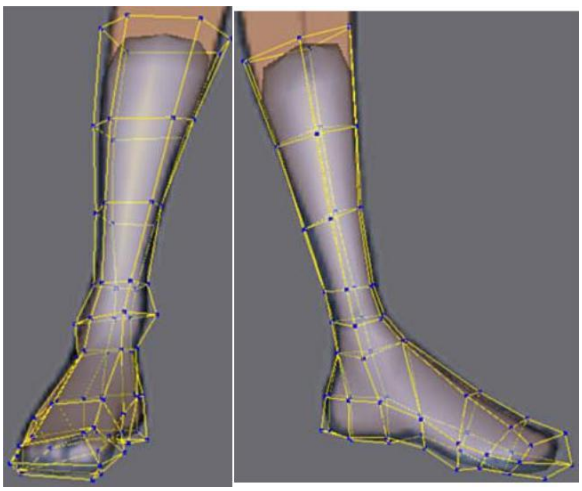


Fig. 3.18: See Through mode

11. In See Through mode, adjust the vertexes with help of the references on the two sights.Finish the adjustments in User View and use see through again for so you can see references easily.

12. Add an edge which passes by the medium of the foot and goes up along the leg.

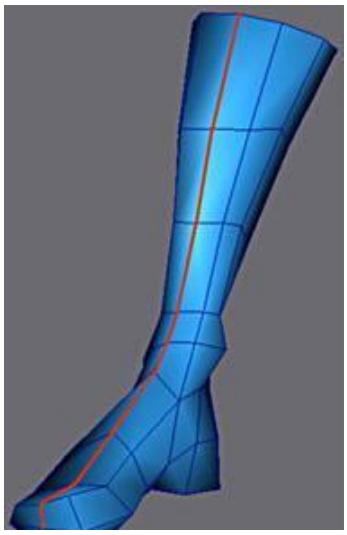


Fig. 3.19: Adding Edge

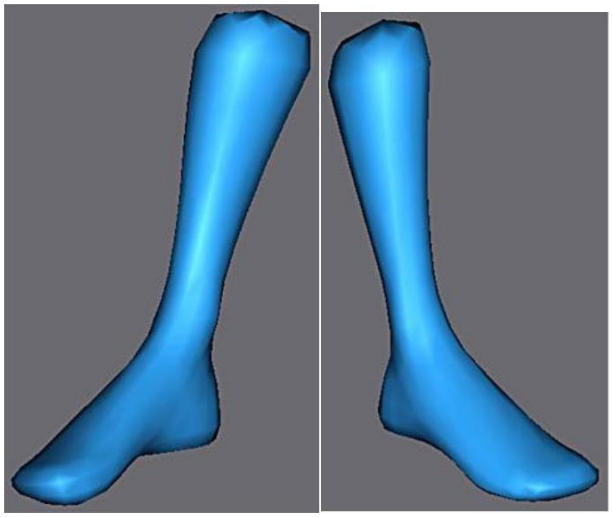


Fig. 3.20: Smooth Preview of the Results

13. Image of the foot and the beginning of the leg after adjustment of the vertexes.It should be noted that the orientation of the invisible edges of the faces is not important and does not influence the subdivided mesh.It is affected only by the visible edges.In general, try to use as much square faces as possible because that gives best possible smoothing after subdivision.

14. Try to use as few cuts as possible and avoid faces with more than 4 corners.

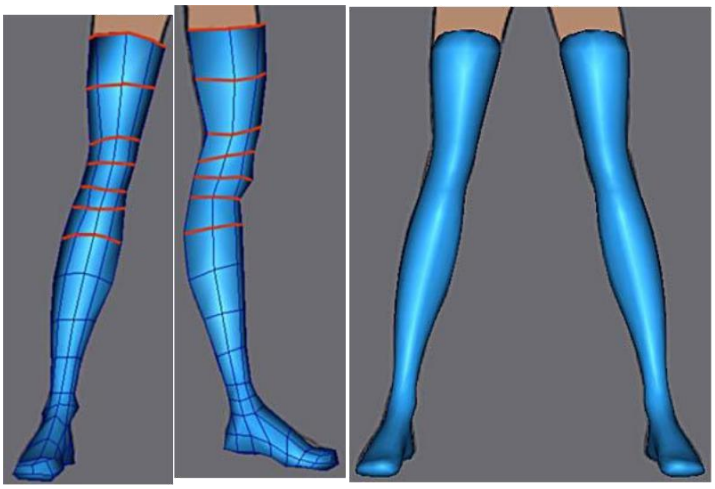


Fig. 3.21: Cuts added at Knee and Thigh

15. The knee and the thigh are made again with extrusion and adjustments of vertexes. You can mirror reference the leg for better view of it.

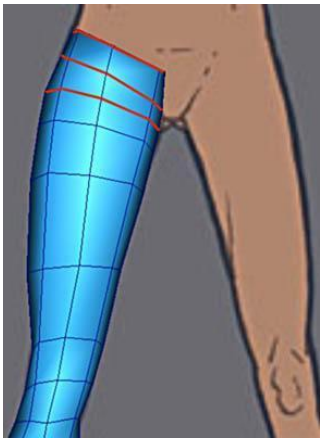


Fig. 3.22: Check the Subdivision

16. The joint of the leg to the abdomen must be subdivided well to allow a correct folding.

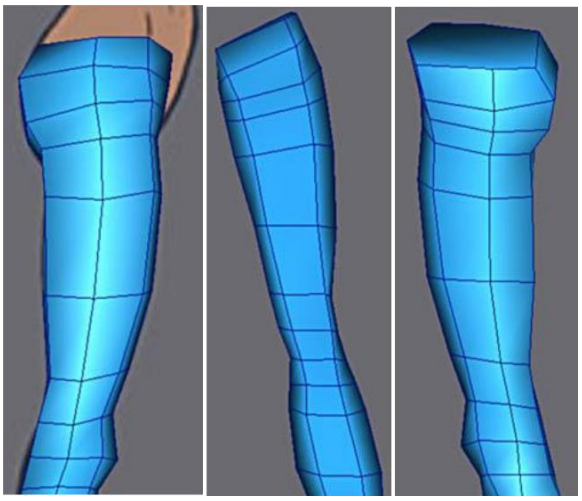


Fig. 3.23: Views from Left, Back and Right

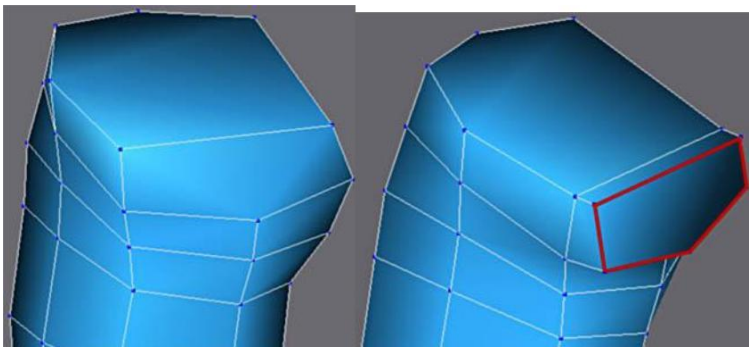


Fig. 3.24: Using Weld Target Option

17. Use "weld target" for welding this vertex to the side one. Extrude the resulting polygon. Select vertexes of this face and scale them in X to 0 so they are in one plane.

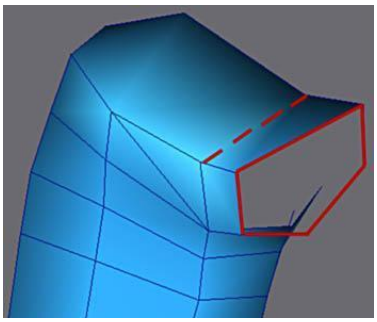


Fig. 3.25: Deleting the Face

18. Delete the face and make the spotted line invisible ... (meshsmooth use visible edges for smoothing, try to turn visible on and off while in "show end result mode)

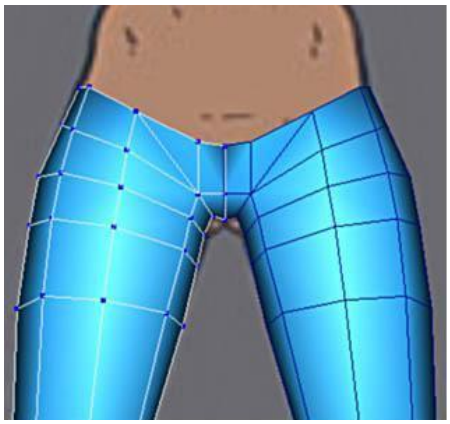


Fig. 3.26: Creating Mirror

19. Front view with the mirror reference of mesh

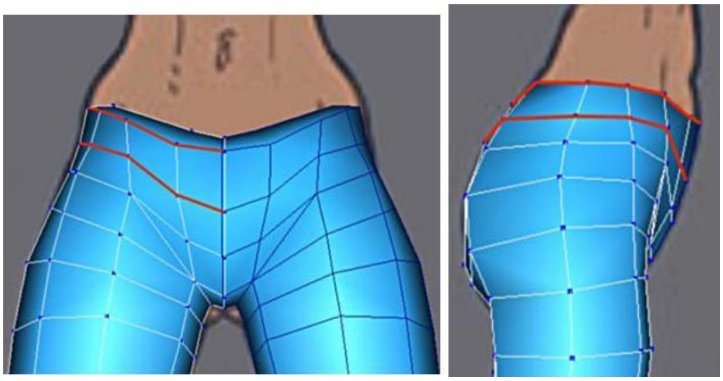


Fig. 3.27: Extrusion of the Basin

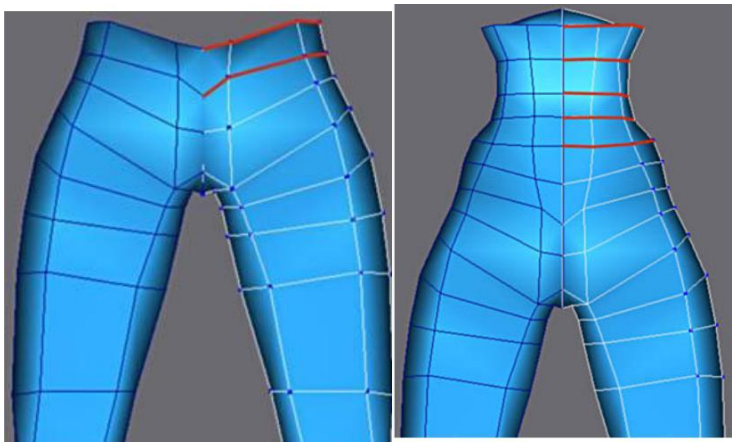


Fig. 3.28: Front ViewFig. 3.29: Extrusion of the Abdomen

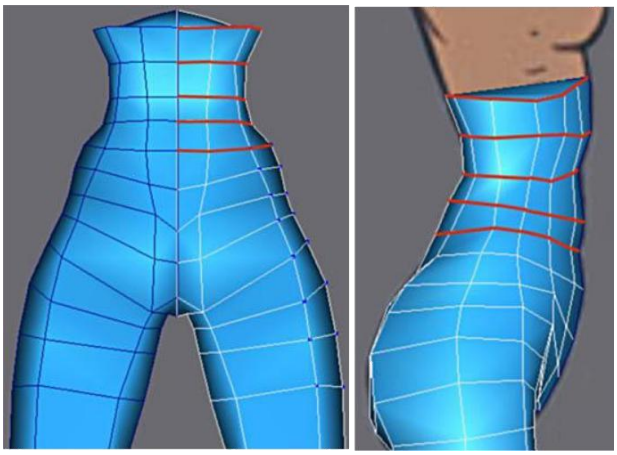


Fig. 3.30: Front Side View

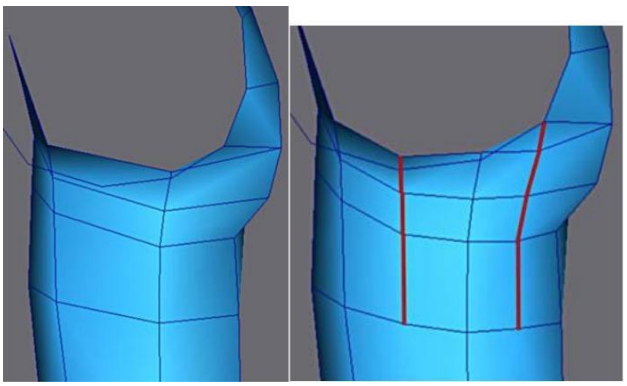


Fig. 3.31: Get rid of that Triangle

20. We need to get rid of that triangle because of bad subdivision. Use cut for creating line that correspond with fold line and make doted line edge invisible (right picture)

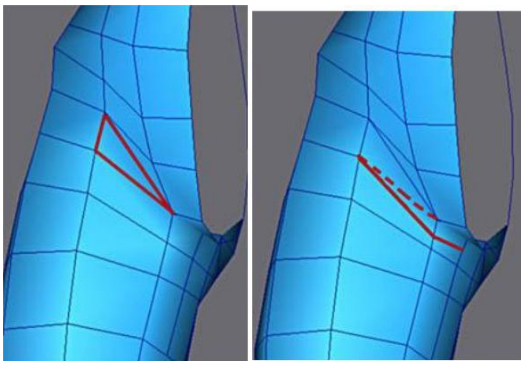


Fig. 3.32: Removing Triangle

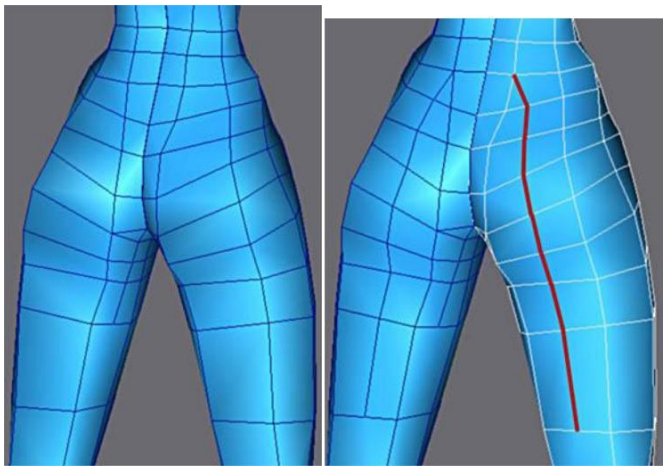


Fig. 3.33: Adding Cut Edge to Hips

21. Extrusion was quite fast but the buttocks are not round enough yet. Two series of Cut Edges allow to round all that.

22. Position the vertical edges regularly around the back and side part of the thigh and the hips.

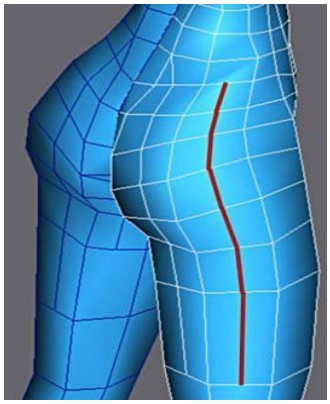


Fig. 3.34: Adjusting the Edge

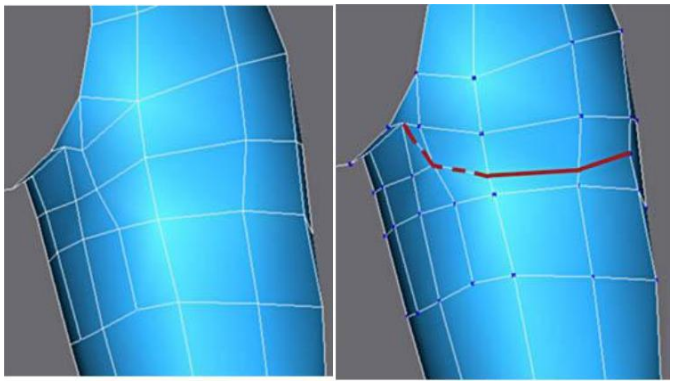


Fig. 3.35: Mark Edges

23. To mark the fold gluteus, add the marked edges and turn them visible (the dotted edges). Make invisible the others to have the same aspect as on the image on right side.

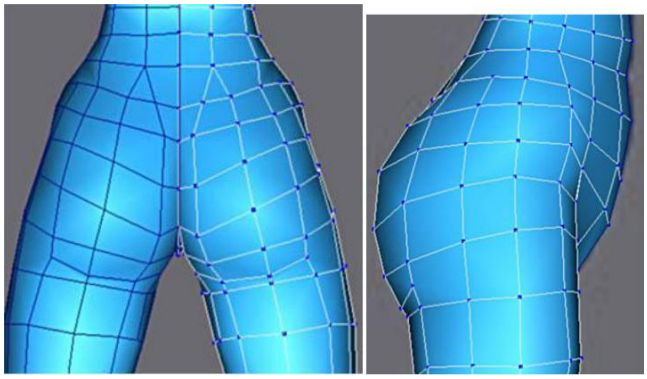


Fig. 3.36: Front and Side View

24. Aspect of the grid of the buttocks seen from back and left

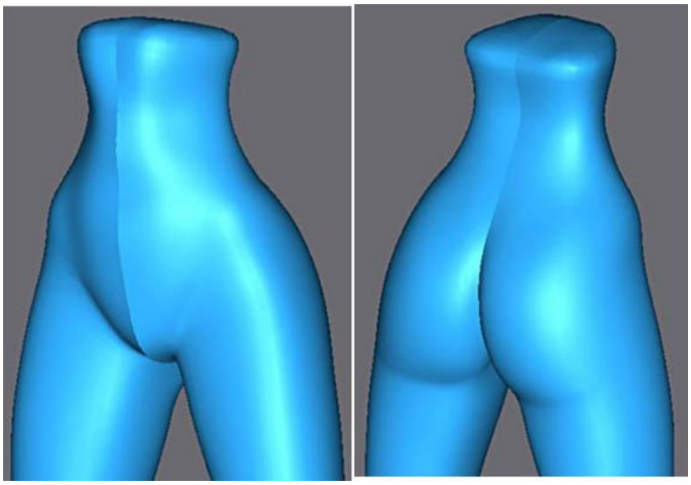


Fig. 3.37: Mesh Smooth View

25. The subdivided mesh, iteration 2 in Meshsmooth

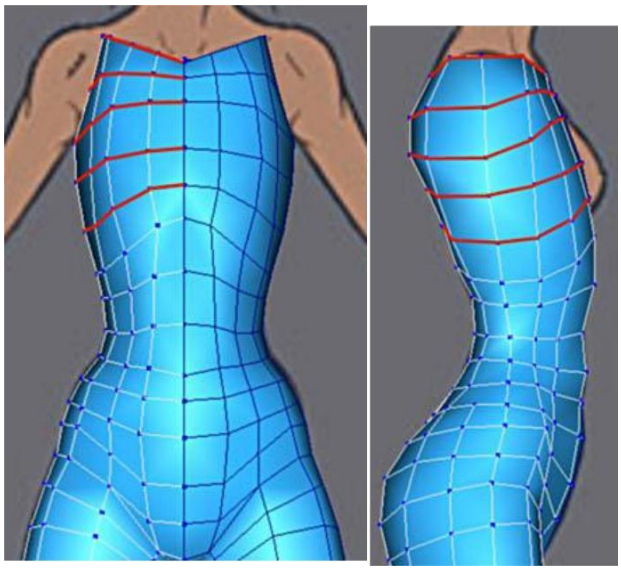


Fig. 3.38: Extruding the Bust

26. Extrusions for the top of the bust

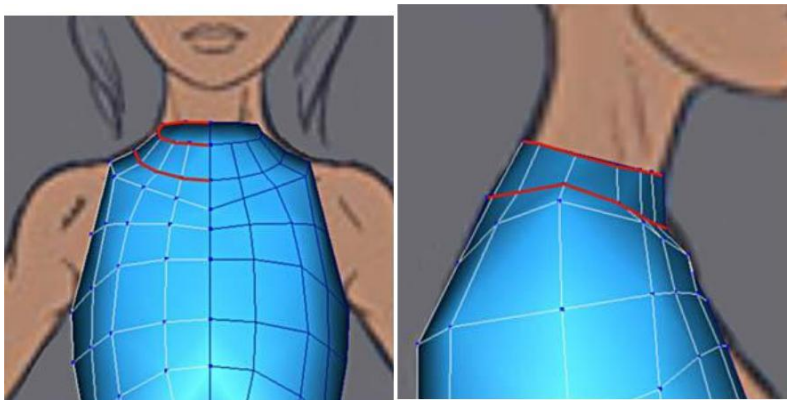


Fig. 3.39: Extruding the Neck

27. Two extrusions for the start of the neck

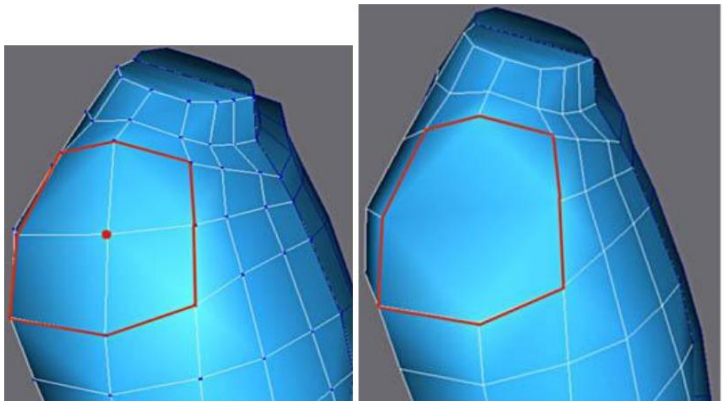


Fig. 3.40: Modelling Arm

28. While preparing for modelling of arm, simplify the four faces into one polygon (Weld Target).

29. Insert the edges (see picture on left) for a better round-off of the arm.

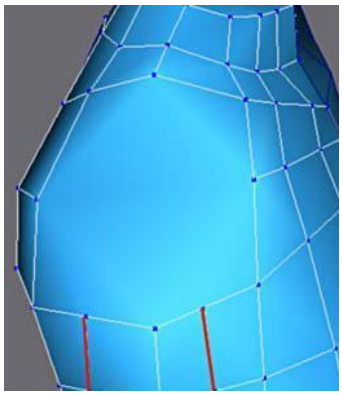


Fig. 3.41: Inserting Edge

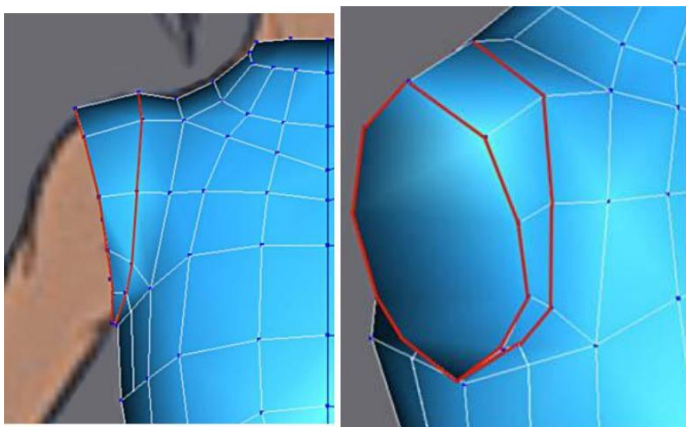


Fig. 3.42: Extruding Shoulder

30. Extrusion of the shoulders as Shown in the figure

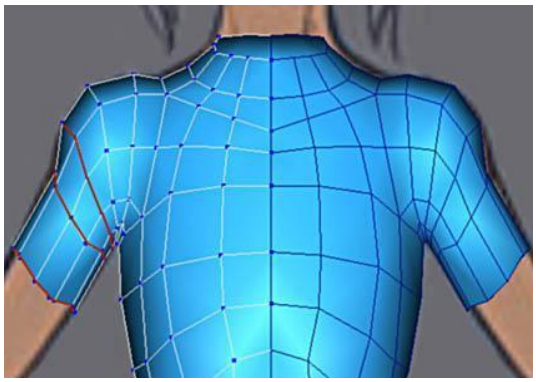


Fig. 3.43: Continue Extruding Arm

31. Continue with extrusion of the arm. This part is make up from group of edges, it is necessary for animation.

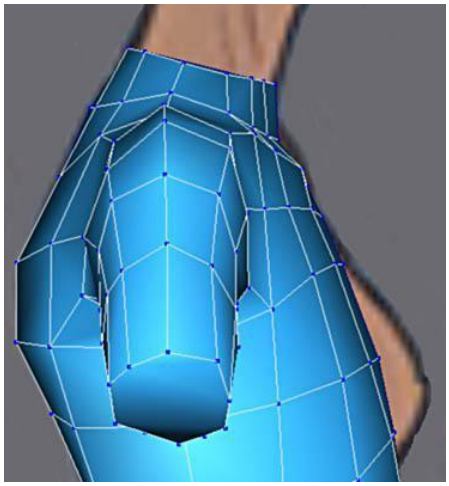


Fig. 3.44: Side View

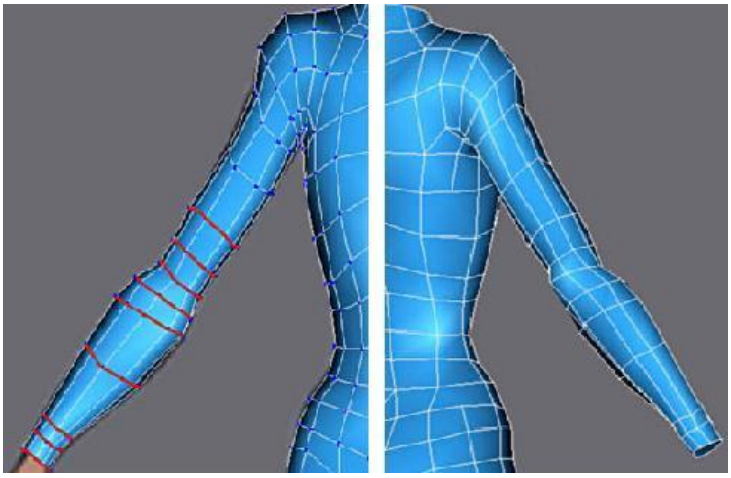


Fig. 3.45: Adjusting Vertex of Elbow

32. Continue to extrude elbow and forearm.

Fig. 3.46: Perspective View of Arm

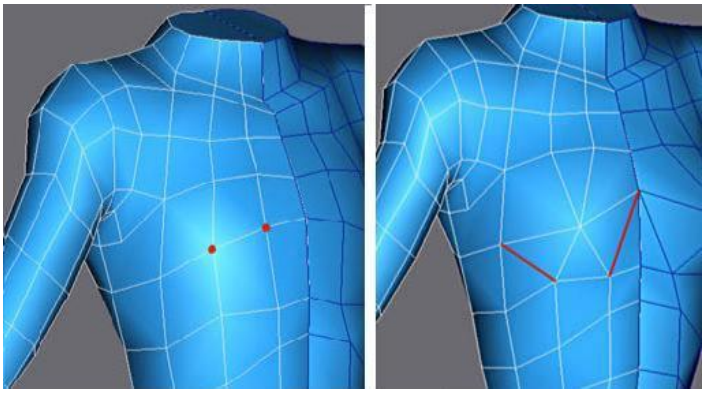


Fig. 3.47: Collapsing the Vertex

33. Now we are going to work on breast. Collapse the two vertexes marked red and you got the centre point. Make visible both edges to outline the base.

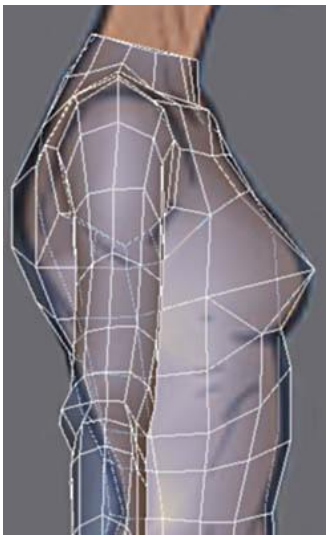


Fig. 3.48: Transparent View

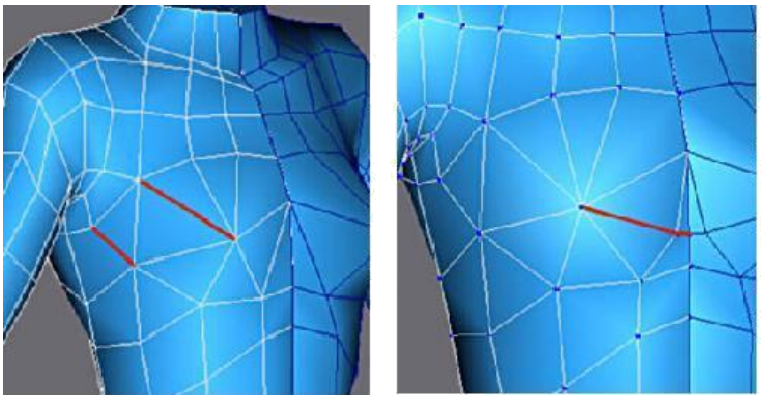


Fig. 3.49: Adding Edges

34. Make visible these edges on the left and on the right picture for a better round-off.

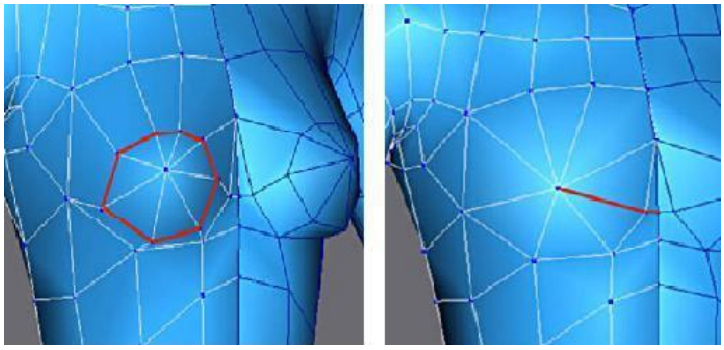


Fig. 3.50: Adding Edge to Chest

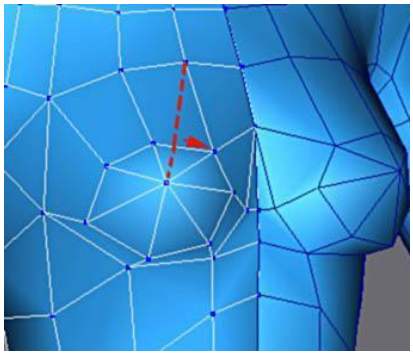


Fig. 3.51: Front View of the Chest

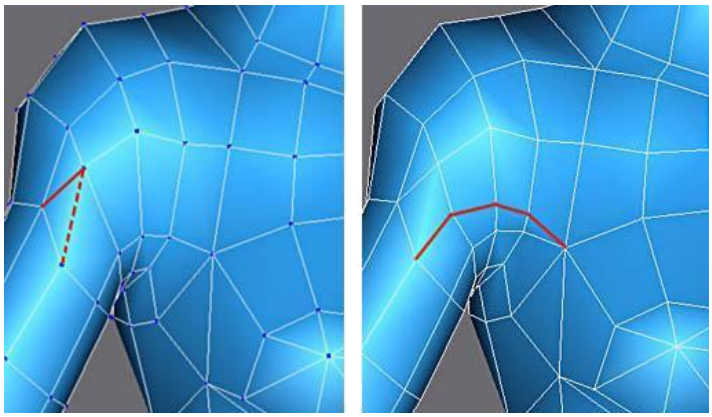


Fig. 3.52: Modify the Edges

35. Modify the edges like above, to make visible (fullline) and invisible (dotted line). Then Insert the edges like on the right.

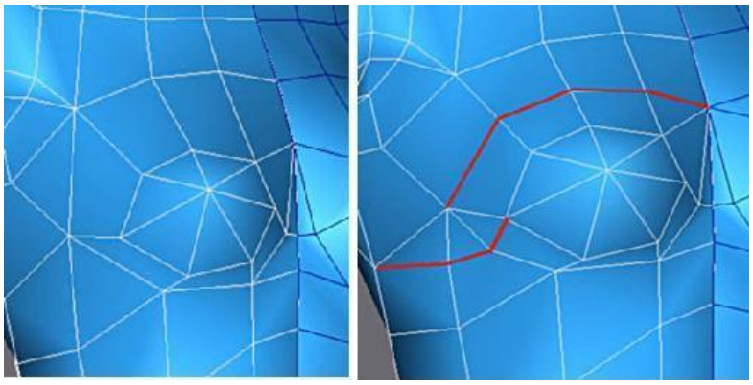


Fig. 3.53: Adjust Edges of the Chest

36. Insert the edges as on the right image.

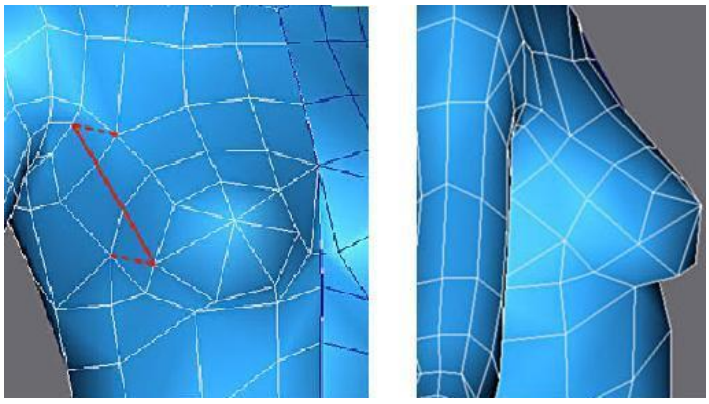


Fig. 3.54: Inserting Edges of the Chest

37. Insert edges here to make the fold under breast.

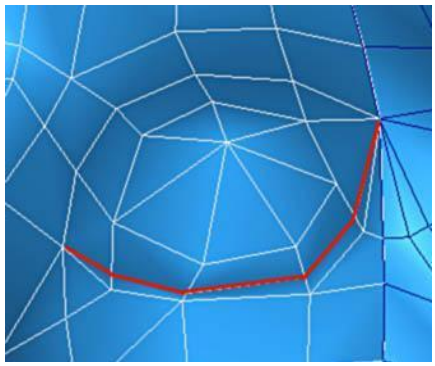


Fig. 3.55: Weld Target

38. Finally insert these edges and simplify the resulting geometry with Weld Target to remove the triangle. Mark the median furrow while inserting these edges.

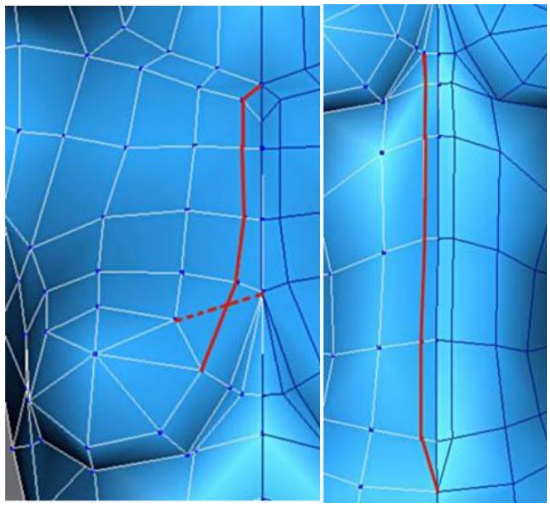


Fig. 3.56: Arranging Edges

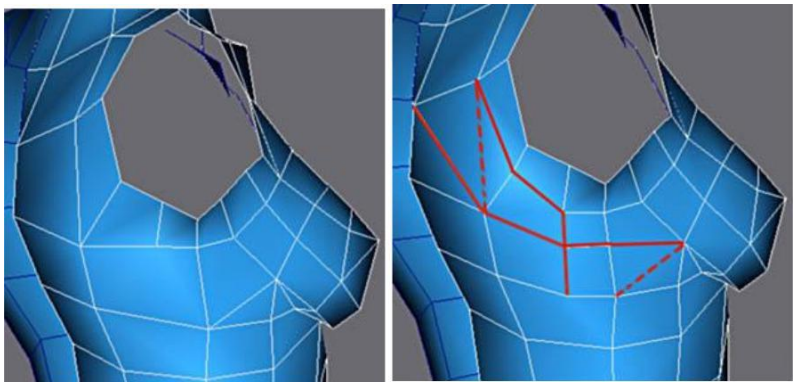


Fig. 3.57: Removing Triangles

39. Finally add edges (full lines) and make invisible dotted lines to create quads. There are nothing more but bands of quads for the junction arm-bust, giving best possible smoothing and avoiding concern in animation.

40. Faces of the arm were hidden for better legibility (Hide in the face mode).

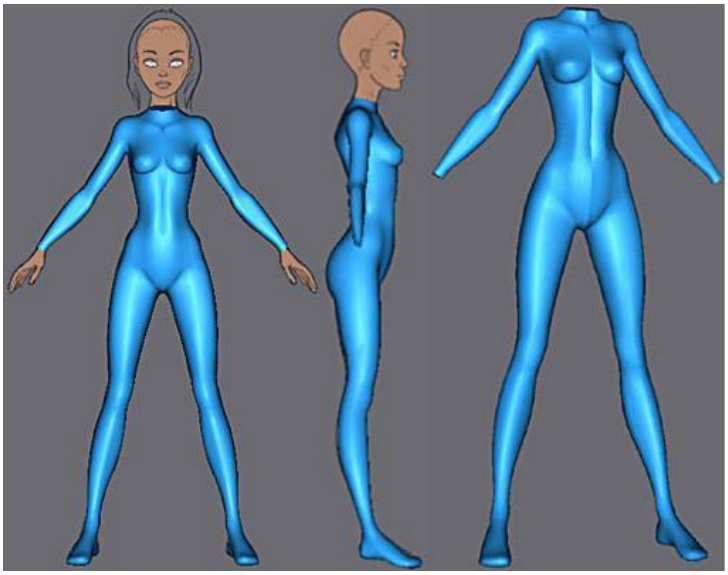


Fig. 3.58: Final Model 1

41. Finished modelling: Low poly images are above and subdivided ones below (NURMS with iteration 1).

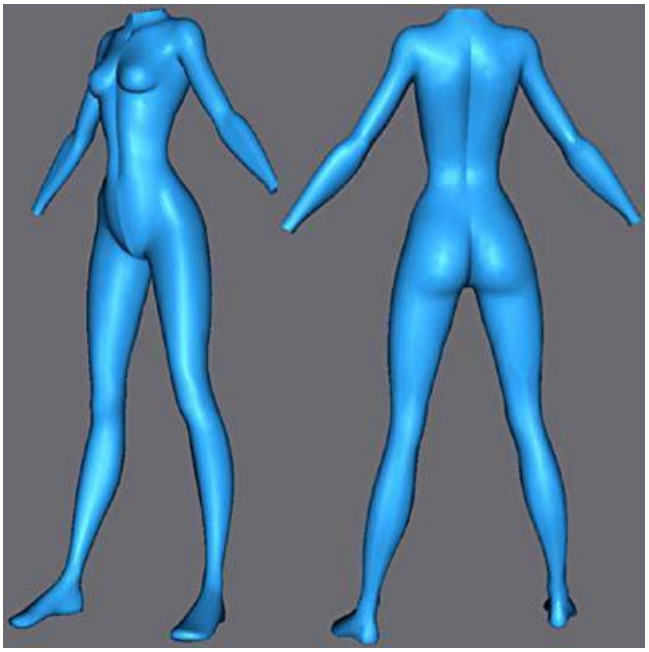


Fig. 3.59: Final Model 2

	Study Notes

	Assessment

1. What is the procedure to remove the triangles?
2. How does one add a Cut?

	Discussion

Practice the exercise given above.

3.6 Summary

Understanding the basics of modelling helps you as you build scenes. In this chapter, you have seen several different object types that are available in max. Many of these types have similar features such as soft selection. Several helper objects can assist as well. This chapter covered the following topics:

- Understanding parametric objects and the various modelling types
- Viewing normals

- Using sub objects and soft selections
- Using helper objects and utilities

Now that you have the basics covered, you're ready to dive into the various modelling types.

Modelling can be defined as creating or sculpting any object out of standard objects like a box, cylinder and sphere or even out of line. Modelling can include product designing, jewellery designing, character designing or whatever that defines a sense is called modelling. The first thing to be kept in mind while modelling is "Concept". The person who looks upon the model should get an idea either what is it or can really get into the detailing and depth.

HSDS MODIFIER

The full form of HSDS modifier is Hierarchical Sub-Division Surface. This cannot be said as a modelling tool but rather used as a finishing tool. It is commonly used to add wrinkles and knuckles to the furniture, characters, etc. it mainly features upon local refinement, hierarchical sub division and adaptive tessellation (Sub divides).

FFD MODIFIER

The full form of FFD is Free Form Deformation. This can be called as a modelling tool. This modifier is commonly used for making animation related to soft bodies. As the word suggests it normally deforms the shape or the object. There is a cage like lattice which contains the control points with which we can easily control the way we deform the objects.

EDITABLE MESH

An editable mesh is a type of deformable object. An editable mesh is a triangular mesh: that is, it uses triangular polygons. Editable meshes are useful for creating simple, low-polygonal objects or control meshes for MeshSmooth and HSDS modelling. You can convert a NURBS or patch surface to an editable mesh. Editable meshes require little memory and are a natural method of modelling with polygonal objects. Its sub-objects are:

- Vertex, Edge, Face, Polygon, Element

EDIT MESH MODIFIER

You can convert an object into Mesh either by applying Edit Mesh modifier to it or you can also convert it into Editable Mesh.

The “Poly Modelling” is also a kind of the modelling tool with which we can easily modify the objects and convert it into desirable objects and shapes. Similar to mesh Poly has five sub-objects:

- Vertex, Edge, Border, Polygon, Element

3.7 Self-Assessment Test

Broad Questions

1. What is the full form of HSDS and FFD? Describe the usage of FFD and HSDS.
2. Define Editable Mesh and Editable Poly. Explain the difference between them.

a. Mesh sub-object face

b. Poly sub-object border

c. Vertex sub-object

d. Edge sub-object

e. Polygon sub-object

f. Element sub-object

3.8 Further Reading

1. 3ds Max at a Glance, George Maestri
2. 3ds Max Essentials: Autodesk Media and Entertainment Courseware, Autodesk
3. Introducing 3ds Max 9: 3D for Beginners, Dariush Derakhshani, Randi L. Derakhshani and Jon McFarland
4. Introducing 3ds Max, Dariush Derakhshani and Randi L. Derakhshani
5. Learning Autodesk 3ds Max 2008 Foundation, Autodesk
6. Mastering Autodesk 3ds Max Design 2011, Mark Gerhard,Jeffery M. Harper
7. Poly-Modelling with 3ds Max: Thinking Outside of the Box, Todd Daniele

Assignment

Create a Human model using Poly modelling. Create a Computer using Mesh modelling.

ARCHITECTURE DESIGN 1

BCADES-203

BLOCK 2:
MODIFIERS

Dr. Babasaheb Ambedkar Open University, Ahmedabad

Education is something which ought to be brought within the reach of every one.

- Dr. B. R. Ambedkar

Dr. Babasaheb Ambedkar Open University
'Jyotirmay' Parisar, Sarkhej-Gandhinagar Highway,
Chharodi, Ahmedabd-382481

Dr. Babasaheb Ambedkar
Open University

BCADES-203

ARCHITECTURE DESIGN 1

Block

2

MODIFIERS

UNIT 1 Compound Objects

UNIT 2 Surface Modifier

UNIT 3 NURBS

Acknowledgment

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ROLE OF SELF INSTRUCTIONAL MATERIAL IN DISTANCE LEARNING

The need to plan effective instruction is imperative for a successful distance teaching repertoire. This is due to the fact that the instructional designer, the tutor, the author (s) and the student are often separated by distance and may never meet in person. This is an increasingly common scenario in distance education instruction. As much as possible, teaching by distance should stimulate the student's intellectual involvement and contain all the necessary learning instructional activities that are capable of guiding the student through the course objectives. Therefore, the course / self-instructional material are completely equipped with everything that the syllabus prescribes.

To ensure effective instruction, a number of instructional design ideas are used and these help students to acquire knowledge, intellectual skills, motor skills and necessary attitudinal changes. In this respect, students' assessment and course evaluation are incorporated in the text.

The nature of instructional activities used in distance education self- instructional materials depends on the domain of learning that they reinforce in the text, that is, the cognitive, psychomotor and affective. These are further interpreted in the acquisition of knowledge, intellectual skills and motor skills. Students may be encouraged to gain, apply and communicate (orally or in writing) the knowledge acquired. Intellectual- skills objectives may be met by designing instructions that make use of students' prior knowledge and experiences in the discourse as the foundation on which newly acquired knowledge is built.

The provision of exercises in the form of assignments, projects and tutorial feedback is necessary. Instructional activities that teach motor skills need to be graphically demonstrated and the correct practices provided during tutorials. Instructional activities for inculcating change in attitude and behavior should create interest and demonstrate need and benefits gained by adopting the required change. Information on the adoption and procedures for practice of new attitudes may then be introduced.

Teaching and learning at a distance eliminates interactive communication cues, such as pauses, intonation and gestures, associated with the face-to-face method of teaching. This is particularly so with the exclusive use of print media. Instructional activities built into the instructional repertoire provide this missing interaction between the student and the teacher. Therefore, the use of instructional activities to affect better distance teaching is not optional, but mandatory.

Our team of successful writers and authors has tried to reduce this.

Divide and to bring this Self Instructional Material as the best teaching and communication tool. Instructional activities are varied in order to assess the different facets of the domains of learning.

Distance education teaching repertoire involves extensive use of self- instructional materials, be they print or otherwise. These materials are designed to achieve certain pre-determined learning outcomes, namely goals and objectives that are contained in an instructional plan. Since the teaching process is affected over a distance, there is need to ensure that students actively participate in their learning by performing specific tasks that help them to understand the relevant concepts. Therefore, a set of exercises is built into the teaching repertoire in order to link what students and tutors do in the framework of the course outline. These could be in the form of students' assignments, a research project or a science practical exercise. Examples of instructional activities in distance education are too numerous to list. Instructional activities, when used in this context, help to motivate students, guide and measure students' performance (continuous assessment)

Unit 1 Compound Objects

Learning Outcome

After reading this unit, you will be able to:

- Explain different Compound Objects and uses
- Demonstrate using the Scatter and Connect compound object
- Illustrate using the Conform and Shape Merge compound objects
- Point out Morphing objects
- Explain creating Mesher object
- Define lofting objects
- Interpret deforming lofted objects

Time Required to Complete the unit

The time required to study this Unit is broken as follows:

1. 1st Reading: It will need 3 Hrs for reading
2. 2nd Reading with understanding: It will need 4 Hrs for reading and understanding
3. Self-Assessment: It will need 3 Hrs for reading and understanding
4. Assignment: It will need 2 Hrs for completing an assignment
5. Revision and Further Reading: It is a continuous process

Content Map

4.1 Introduction to Compound Object

The Compound Objects subcategory includes several unique object types. You can access these object types with the Create – Compound menu or by clicking the geometry category button in the Create P anel and selecting Compound. Objects in the subcategory drop-down list. All the object t ypes included in the Compound Objects subcategory are displayed as buttons at the top o f the Create panel. They include the following:

Fig. 4.1: Compound Objects

4.2 Scatter

In Scatter option, the selected objects are scattered over the base ob ject that we select later may be in the form of array or on the surface.

To apply Scatter object:

1. Select an source object.
2. Create an object to be us ed as a distribution object.
3. Press Shift Select the source object and then click Scatter in the Compound Ob jects panel.

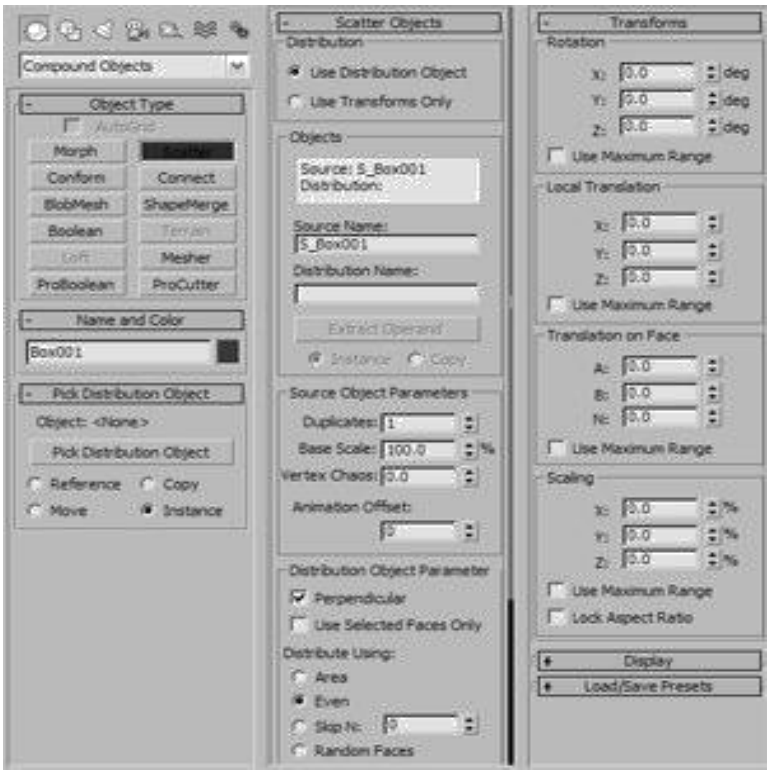

Fig. 4.2: Options of the Scatter Object

Following are the options available in Scatter Parameter:

1. Pick Distribution Object Rollout: This helps in selection of the distribution object.
2. Scatter Object Rollout: It contains parameter to specify scattering of source object.
3. Distribution Group: This contains basic parameters of scattering
4. Source object parameter group: This is used to duplicate, animate the source object.
5. Distributing:Using options like Area, Volume etc.
6. Transformation rollout: This help to apply various transform rollout.

1. Choose Use Transforms Only in the Scatter Objects rollout > Distribution group.
2. Set the Duplicates spinner – specify the total number of duplicates of the source object.
3. Adjust the spinners on the Transforms rollout - to adjust the random transformation offsets of the source object.

To scatter the source object using a distribution object:

1. Select source object.
2. Choose the method of cloning the distribution object.
3. Click Pick Distribution Object andselect the distribution object.
4. Choose Use Distribution Object on the Scatter Object rollout.
5. Use the Duplicates spinner to specify the number of duplicates.
6. Choose a distribution method in the Scatter Object rollout > Distribute Object Parameters group under Distribute Using.
7. Adjust the Transform spinners to randomly transform the duplicates.
8. If the display is too slow, choosing Proxy on the Display rollout or decreasing the percentage of displayed duplicates.

Study Notes

Assessment

1. Write a note on Scatter.
2. Explain the two different methods of applying scatter.

	Discussion
Using the scatter option create an Exploding Planet.	

4.3 Conform

Conform is a compound object with which we can wrap the selected object to the base object. It projects the vertices of the wrapper on to other surface which is called as wrap-to object.

To create a Conform object:

1. Create two objects; one will be the Wrapper and the other Wrap-To.
2. Select the Wrapper object (eg: the sphere) and click Create panel> Geometry > Compound Objects > Object Type rollout > Conform button.
3. In the Vertex Projection Direction group specify vertex projection.
4. specify the type of cloning to perform on the Wrap-To object (eg: Choose Reference, Copy, Move or Instance)
5. Click Pick Wrap-To Object and then click the object onto which to project the vertices.
6. Use the parameters and settings to alter the vertex projection direction.

For example: Use Conform Compound to apply facial scar or drop on the petals.

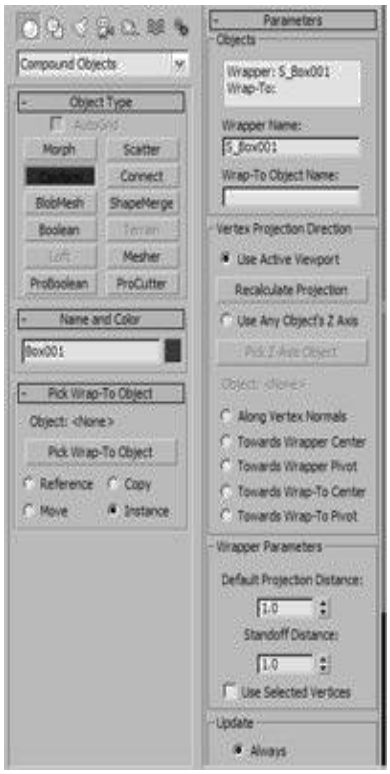

Fig. 4.3: Conform Compound Object

This parameter rollout contains parameters for Conform Compound Object.

1. Object Group: It provides a list window and edit field to navigate the compound object
2. Vertex Projection Direction Group: It provides option to choose the 7 projection of vertices.
3. Wrapper parameter: This helps to determine the distance the vertices are projected.

	Study Notes

	Assessment
1. Define Conform with example. 2. Give the process of using Conform on the object.	

	Discussion
Create furniture using the Conform compound.	

4.4 Connect

With this, we can select the polygons of any 2 objects and connect it so as to create bridge. For Example: this option is used to bridge handle of a cup, Teapot etc.

This option generates very good mapping coordinates through bridging the objects. This option is used for connecting object that contains multiple holes.

To create a Connect object:

1. Create two mesh objects.
2. Delete some faces on each to create holes.

   Position the objects to point the normals one object's deleted faces points toward the normals other object's deleted faces of the

3. Select one object. On the Create panel > Geometry > Compound Object Type rollout, click Connect.
4. Click the Pick Operand button andSelect the other object.
5. Faces are generated that connect the holes in the two objects.
6. Adjust the connection with the various options.

	Study Notes

	Assessment
1. Define Connect. 2. Give the process of using Connect on the object.	

	Discussion
Create furniture using the Connect compound.	

4.5 Boolean

With this, we can get either the union, subtraction or the intersection area of the 2 objects by Boolean operations.

Following are the Boolean operations:

1. Union

With this option the intersecting or overlapping portion of the geometry is removed and becomes a single object.

2. Intersection

The overlapping objects are removed with the help of Intersection Boolean

3. Subtraction

With this option the two objects intersecting, will subtract the overlapping portion.The two original objects are designated operands A and B.

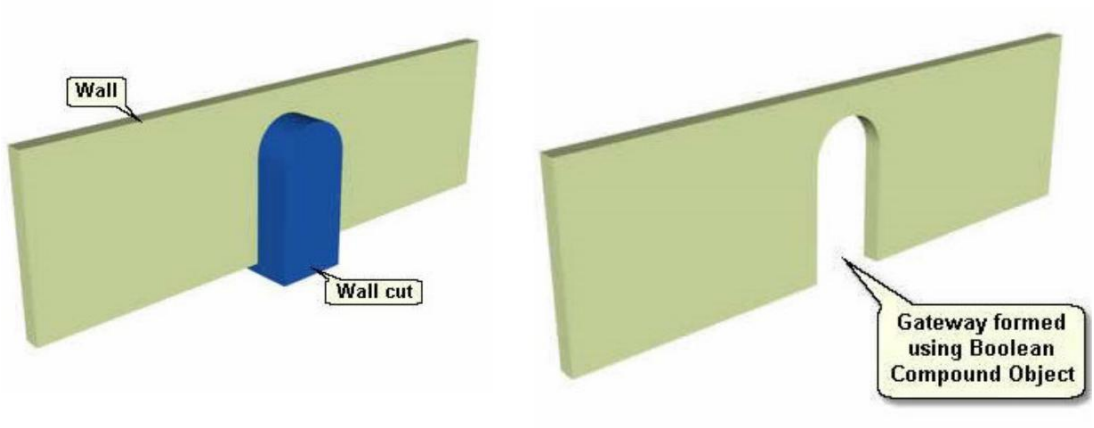

Fig. 4.4: Boolean used to create Gateway for Door.

Example:

To perform the above example, Select the Door an

1. Create a wall using cube.
2. Place a modified cylinder intersecting the wall, at the position where you want the gateway.
3. Click Boolean. On the Pick Boolean rollout, choose Reference, Move, Copy or Instance. On the Parameters rollout, choose the Boolean operation to perform: Union, Intersection, Subtraction (A-B) or Subtraction (B-A).
4. On the Pick Boolean rollout, click Pick Wall
5. Click in a viewport to select Cylinder. 3ds Max performs the Boolean operation.

	Study Notes

	Assessment
1. Define Boolean. 2. Give the process of using Boolean on an object.	

	Discussion
Create a Lock using Boolean.	

4.6 Terrain

With Terrain, we can create the terrain with the help of splines. In this at least you should have one set of spline in the form of the terrain. The terrain objects can be created using editable splines like elevated spline.

Following are examples:

- Creating effects of grading plans in 3D
- Creating topographical of land forms
- Using colour on the data to analysing elevation change
- Adding buildings, landscaping and roads to a terrain

	Study Notes

	Assessment

1. What is Terrain?
2. Give the use of Terrain Compound.

	Discussion
Create a Landscape using the terrain compound.	

4.7 Loft

Loft: With this, we can extrude 2 splines on the third dimensional axis. This takes a Path and minimum one profile and extrudes the profile along the path. We can change the profiles at various stages to form distinctive surfaces.

To create a loft object:

1. Create a shape to be the loft path.
2. Create one or more shapes to be loft cross sections.
3. Follow one of the steps:
   - Select the path shape and use Get Shape to add the cross sections to the loft.
   - Select a shape and use Get Path to assign a path to the loft.

To create a loft with Get Path:

1. Select a shape as the first cross-section shape.
2. Click Create panel > Geometry > Compound Objects > Loft.
3. On the Creation Method rollout, click Get Path.
4. Choose Move, Copy or Instance.
5. Click a shape for the path.

The cursor changes to the Get Path cursor as you move. If the cursor does not change over a shape, that shape is not a valid path shape and cannot be selected.

	Study Notes

	Assessment

1. Define Loft.
2. Explain the procedure of creating Loft with a path.

	Discussion

Create a Curved Bridge using Loft compound.

4.8 Summary

Compound objects provide several additional modelling types to our bulging Modelling toolkit. From morph objects to complex deformed lofts, you can see these special-purpose types to model many different objects.

SCATTER

In this tool, the selected objects are scattered over the base object that we select later may be in the form of array or on the surface.

CONFORM

Conform is a compound object with which we can wrap the selected object to the base object.

CONNECT

With this, we can select the polygons of any 2 objects and connect it so as to create bridge.

BOOLEAN

With this, we can get either the union, subtraction or the intersection area of the 2 objects by Boolean operations.

TERRAIN

With Terrain, we can create the terrain with the help of splines. In this at least you should have one set of spline in the form of the terrain.

LOFT

With this, we can extrude 2 splines on the third dimensional axis. This takes a Path and minimum one profile and extrudes the profile along the path.

4.9 Self-Assessment Test

Broad Questions

1. What are compound object? Give brief description about various compound objects.
2. What is Boolean compound object? Give in detail its functions.
3. What is Loft compound object? Give in detail its procedures.

Short Notes

a. Scatter

b. Conform

c. Connect

d. Boolean

e. Terrain

f. Loft

4.10 Further Reading

1. 3ds Max 2011 Bible, Kelly L. Murdock
2. 3ds Max at a Glance, George Maestri
3. Introducing 3ds Max, Dariush Derakhshani and Randi L. Derakhshani
4. Introducing 3ds Max 9: 3D for Beginners, Dariush Derakhshani, Randi L. Derakhshani and Jon McFarland
5. Learning Autodesk 3ds Max 2008 Foundation, Autodesk3ds Max Essentials: Autodesk Media and Entertainment Courseware, Autodesk
6. So You Wanna Learn 3ds MAX, Eyeballistic, Inc.

Assignment

Create a Pool Table with environment using various compound objects.

Unit 2 Surface Modifier

Learning Outcome

After reading this unit, you will be able to:

- Create patch grids
- Edit patches
- Work with patch sub-objects
- Use surface modifier
- Use handles

Time Required to Complete the unit

The time required to study this Unit is broken as follows:

1. 1st Reading: It will need 3 Hrs for reading
2. 2nd Reading with understanding: It will need 4 Hrs for reading and understanding
3. Self-Assessment: It will need 3 Hrs for reading and understanding
4. Assignment: It will need 2 Hrs for completing an assignment
5. Revision and Further Reading: It is a continuous process

Content Map

5.1 Introduction to Surface Modifiers

The Surface modifier ge nerates a patch surface based on the contours of a spline network. A patch is created wherever the segments of the interwoven splines f orm a three- or four-sided polygon. The Surface modifier and the Cross Section modifier, tak en together, are referred to as Surface Tools. They allow you to create complex or organic surfaces, like the fuselage of a plane or a thre e-dimensional character.

The surface modifier is t he other part of the surface tools. It creates a surface from several combined splines. Its can use any spline network but ors best wit h structures created with the cross section modifier. The surface create with this modifi er is a patch surface.

5.2 Surface Modelling

With this kind of modelli ng, we can easily create a patch surface depend ing upon the splines that we select. This modelling can be said done after we apply the surf ace modifier to the contours that connects each other in such a way that each intersection creates a polygon / surface. Here the patch is completed only after the spline is closed from either the 3 or 4 sides.

The surface modifier and the Cross section modifier can be said to be the same as both are the surface tools.The o bjects modelled with this are extremely smooth and nicely interwoven.

The place where the spline is missing the surface will not appear there , with which we can conclude that somewhere something has gone wrong

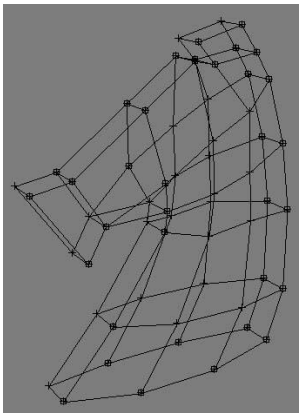

Fig. 5.1: Surface Modelling

Now let us go through the options of the Surface Modifier:

1. Threshold: With this option, we can set the area of the welding of the vertices.
2. Flip normal:The normal direction of the objects is flipped.
3. Remove Interior patches: This helps us to remove the surface which is inside and that are not visible for us.
4. Use only selected segments: With this option, we can set the surface modifier only to the selected splines through the Editable Spline options.
5. Steps: With this, we can determine the number of the steps between each vertices.

Study Notes

Assessment

Explain Surface Modelling.

Discussion

Explore the options for Surface Modelling.

5.3 Patch Grids

These are normally the simple planes, which can be later modified int o the desired objects, either by converting int o Editable patch or by certain modifiers.

Now let us have a look over both the types of patches.

Fig. 5.2: Surface Modelling

Here we can create two kinds of patch objects in two forms of grids:

1. Quad Patch
2. Tri Patch

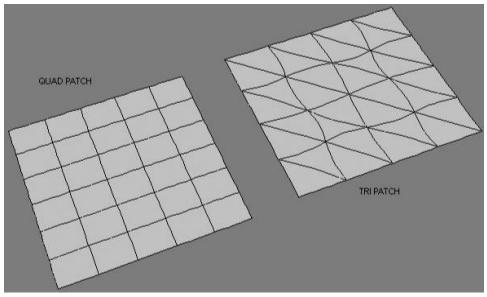

Fig. 5.3: Quad Patch

Quad Patch:

In the quad patch, we c an create a plane of 32 visible facets. Each fac et is divided into 2 triangular faces to make t he total of 72 faces.

Name and colour

Through this option, we can set the name of the selected patch as w ell as set the

colour of the patch as per neede d.

Keyboard Entry

X / Y / Z: Defines the origin of the patch.

Length: With this, we can set th e length of the patch.

Width: With this, we can set the width of the patch.

Create: with this, we can give the command to create the patch according to the parameters that we have set.

Length: With this, we can manipulate the length of the patch.

Width: With this, we can manip ulate the width of the patch.

Length segments: With this, we can manipulate the length segments of the pat ch.

Width segments: With this, we can manipulate the width segments of the patc h.

Generate Mapping Coordinates: Creates map coordinates for applying mapped materials.

Tri Patch:

This creates a patch wit h 72 triangular faces. As we scale the patch, the faces also scale itself regardless of its size.

Name and colour:

Through this option, we can set the name of the selected patch as well as set the colour of the patch as per neede d.

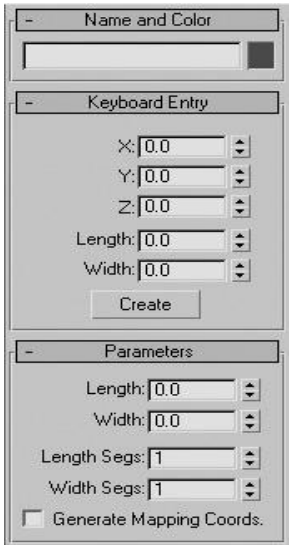

Fig. 5.4: Tri Patch

Keyboard Entry:

X / Y / Z: Defines the origin of the patch.

Length: With this, we can set the length of the patch.

Width: With this, we can set the width of the patch.

Create: With this, we can give the command to create the patch according to the parameters that we have set.

Parameters Rollout:

Length: With this, we can manipulate the length of the patch.

Width: With this, we can manipulate the width of the patch.

Generate Mapping Coordinates: Creates map coordinates for applying mapped materials.

5.3.1 EDITABLE PATCH

This is the option with which we can convert a patch into editable as and when we want. This is useful when we want to manipulate the patch according to our need so as to model something desirable.

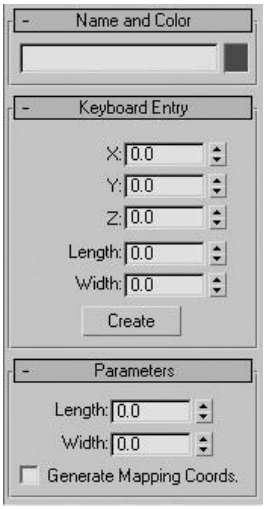

Fig. 5.5: Editable Patch

5.3.2 VERTEX

With this, we can select the vertex or the control points so that we can modify the patch as desired.

5.3.3 EDGE

With this, we can select the bounding edge of the patch.

5.3.4 PATCH

With this, we can select the patch enclosed by edges.

5.3.5 ELEMENTS

With this, we can select the entire segment or piece of patch object.

5.3.6 HANDLES

With this, we can modify the patch just by moving the handles same as in the Bezier curves available in the spline modelling.

Study Notes

Assessment

1. Define Patch Grid.
2. Write a short note on Quad patch.

	Discussion
Using the software, practice the various surface modifiers available to create a basic Chair from a sphere.	

5.4 Summary

INTRODUCTION TO SURFACE MODELLING

With this kind of modelling, we can easily create a patch surface depending upon the splines that we select. This modelling can be said done after we apply the surface modifier to the contours that connects each other in such a way that each intersection creates a polygon / surface.

PATCH GRID

Patches do not have the overhead of NURBS objects and are better optimised than mesh objects. Editable Patch objects include a huge list of tools that you can use to edit and modify them. In addition to Patches, NURBS are an ideal method for modelling if you require free-flowing models. This chapter covered the following topics:

- Discovering the features of an Editable Patch object
- Working with the Editable Patch sub objects
- Working with patch-specific modifiers such as the surface tools

QUAD PATCH

In the quad patch, we can create a plane of 32 visible facets. Each facet is divided into 2 triangular faces to make the total of 72 faces.

TRI PATCH

This creates a patch with 72 triangular faces. As we scale the patch, the faces also scale itself regardless of its size.

EDITABLE PATCH

This is the option with which we can convert a patch into editable as and when we want.

5.5 Self-Assessment Test

Broad Questions

1. Define surface modifier and explain its options and requirements.
2. What is patch surface? How many types of patch surfaces are there?

    a. Surface modelling
    b. Editable patch
    c. Vertex sub-object
    d. Patch sub-object
    e. Handles sub-object

5.6 Further Reading

1. 3ds Max at a Glance, George Maestri
2. 3ds Max Essentials: Autodesk Media and Entertainment Courseware, Autodesk
3. Introducing 3ds Max, Dariush Derakhshani and Randi L. Derakhshani
4. Introducing 3ds Max 9: 3D for Beginners, Dariush Derakhshani, Randi L. Derakhshani and Jon McFarland
5. Learning Autodesk 3ds Max 2008 Foundation, Autodesk
6. Poly-Modelling with 3ds Max: Thinking Outside of the Box, Todd Daniele

Assignment

Create the knight of the chess set using surface modifier. Also complete the chess set using other modelling methods.

Unit 3 NURBS

Learning Outcome

After reading this unit, you will be able to:

- Create NURBS curves and surfaces
- Convert primitive objects to NURBS
- Edit point and CV curves and surfaces
- Use the NURBS Creation Toolbox
- Practiselofting, lathing and sweeping NURBS

Time Required to Complete the unit

The time required to study this Unit is broken as follows:

1. 1st Reading: It will need 3 Hrs for reading
2. 2nd Reading with understanding: It will need 4 Hrs for reading and understanding
3. Self-Assessment: It will need 3 Hrs for reading and understanding
4. Assignment: It will need 2 Hrs for completing an assignment
5. Revision and Further Reading: It is a continuous process

Content Map

6.1 Introduction

NURBS is an acronym for Non-Uniform Rational B-Splines. They are the ideal modelling tools for creating organic characters because they are easy to work with they give you good interactive control, they blend together seamlessly and their surfaces remain smooth even then distorted.

NURBS are superior to polygonal modelling methods, building models with smooth flowing contours such as plants, flower, animals and skin.In this chapter, we explore different methods of NURBS model construction and then look at some advanced NURBS tutorials.

6.2 NURBS: Meaning

NURBS stands for Non-Uniform Rational B-Splines. It has become an industry standard for designing and modelling surfaces and are suited for modelling surfaces with complicated curves.

NURBS are popular because they are easy to manipulate interactively.

NURBS curves and NURBS surfaces are controlled by either point or control vertex:

- Non-Uniform means that the extent of a control vertex's influence can vary. This is useful when modelling irregular surfaces.
- Rational means that the equation used to represent the curve or surface is expressed as a ratio of two polynomials, rather than a single summed polynomial. The rational equation provides a better model of some important curves and surfaces, especially conic sections, cones, spheres and so on.
- A B-spline (for basis spline) is a way to construct a curve that is interpolated between three or more points.

Study Notes

	Assessment
1. Explain what NURBS is. 2. How is NURBS curve and spline controlled?	

	Discussion
Explore and study the different types of NURBS available in3D Max.	

6.3 Why are NURBSused

NURBS curves and surfaces did not exist in the traditional drafting world. They were created specifically for 3D modelling using computers. Curves and surfaces represent contours or shapes within a 3D modelling space.

They are constructed mathematically. NURBS are the ultimate form of spline (curve) available to the 3D modeller. NURBS curves are used to build NURBS surfaces, which are essentially networks of NURBS curves. NURBS modelling is characterised by the interdependence of curves and surfaces. NURBS curves can be used to create surfaces by lofting, lathing and extruding.

Splines can be extracted from a NURBS surface; therefore, the modelling process is not only from splines to surfaces, but also from surfaces to splines.

The non-uniform property of NURBS brings up an important point. Because they are generated mathematically, NURBS objects have a parameter space in addition to the 3D geometric space in which they are displayed. Specifically, an array of values called knots specifies the extent of influence of each control vertex (CV) on the curve or surface. Knots are invisible in 3D space and you cannot manipulate them directly, but occasionally their behaviour affects the visible appearance of the NURBS object. This topic mentions those situations. Parameter space is one-dimensional for curves, which have only a single U dimension topologically, even though they exist geometrically in 3D space. Surfaces have two dimensions in parameter space, called U and V.

NURBS curves and surfaces have the important properties of not changing under the

standard geometric affine transformations (Transforms) or under perspective projections. The CVs have local control of the object: moving a CV or changing its weight does not affect any part of the object beyond the neighbouring CVs.

Study Notes

Assessment

List the uses of NURBS in the 3d world.

Discussion

Discuss more about the use of NURBS and the objects that can be created from them.

6.4 Utility of NURBS

NURBS are very smooth. You normally cannot create edges or corners using NURBS. Because of their smoothness, NURBS are largely used to create organic models, as organic models do not have sharp corners. Even though modelling smooth surfaces is easy in NURBS, the final output has to be in Poly or Mesh. If you will not convert them, the software will convert them into poly at the time of rendering. You have various tools to sculpt geometry from the NURBS curves like, Lathe, Loft, Ruled, Rail-1 and Extrude to name some.

Types of NURBS:

1. Surfaces

There are two kinds of NURBS surfaces. A point surfaceis controlled by points that lie on the surface. A CV surface is controlled by control vertices (CVs) forming a control lattice that surrounds the surface.

2. Curves

There are also two kinds of NURBS curves same as surface NURBS. A point curve is controlled by points lying on the curve. A CV curveis controlled by CVs that do not necessarily lie on the curve.

3. Points

Point surfaces and point curves have point sub-objects. You can also create separate point sub-objects that are not part of a surface or a curve.

4. CV's

CV surfaces and CV curves have CV sub-objects. Unlike points, CVs are always part of a surface or a curve.

5. Imports

Imports are 3ds Max objects that including other NURBS objects. They render as NURBS within the NURBS model, but they retain their original parameters and modifiers.

Study Notes

Assessment

List the types of Curves NURBS and Surface NURBS.

Discussion

Explore more about and note the types of NURBS.

6.5 Summary

WHAT ARE NURBS?

NURBS stands for Non-Uniform Rational B-Splines. It has become an industry standard for designing and modelling surfaces and are suited for modelling surfaces with complicated curves.

Modelling is the process of pure creation. Whether it is sculpting, building with blocks, construction work, carving, architecture or advanced injection modelling, many different ways exist for creating objects. Max includes many different model types and even

more ways to work with these model types.

WHY ARE THEY USED?

NURBS curves and surfaces have the important properties of not changing under the standard geometric affine transformations (Transforms) or under perspective projections.

WHAT IS THEIR UTILITY

NURBS are very smooth. You normally cannot create edges or corners using NURBS. Because of their smoothness, NURBS are highly used to create organic models, as organic models donot have sharp corners.

6.6 Self-Assessment Test

Broad Questions

1. Define NURBS. Give its uses.
2. Describe options given in the NURBS modifier panel.

Short Notes

a. NURBS curves (CV and Point)

b. Lathe

c. Ruled

d. UV-loft

e. Rail- 1 and Rail- 2

6.7 Further Reading

1. 3ds Max at a Glance, George Maestri
2. 3ds Max Essentials: Autodesk Media and Entertainment Courseware, Autodesk
3. Introducing 3ds Max, Dariush Derakhshani and Randi L. Derakhshani
4. Introducing 3ds Max 9: 3D for Beginners, Dariush Derakhshani, Randi L. Derakhshani and Jon McFarland
5. Learning Autodesk 3ds Max 2008 Foundation, Autodesk

Assignment

Create a spoon using NURBS loft option.

ARCHITECTURE DESIGN 1

BCADES-203

BLOCK 3:
RENDERING TECHNIQUES

Dr. Babasaheb Ambedkar Open University, Ahmedabad

Education is something which ought to be brought within the reach of every one.

- Dr. B. R. Ambedkar

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BCADES-203
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Block

3

RENDERING TECHNIQUES

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ROLE OF SELF INSTRUCTIONAL MATERIAL IN DISTANCE LEARNING

The need to plan effective instruction is imperative for a successful distance teaching repertoire. This is due to the fact that the instructional designer, the tutor, the author (s) and the student are often separated by distance and may never meet in person. This is an increasingly common scenario in distance education instruction. As much as possible, teaching by distance should stimulate the student's intellectual involvement and contain all the necessary learning instructional activities that are capable of guiding the student through the course objectives. Therefore, the course / self-instructional material are completely equipped with everything that the syllabus prescribes.

To ensure effective instruction, a number of instructional design ideas are used and these help students to acquire knowledge, intellectual skills, motor skills and necessary attitudinal changes. In this respect, students' assessment and course evaluation are incorporated in the text.

The nature of instructional activities used in distance education self- instructional materials depends on the domain of learning that they reinforce in the text, that is, the cognitive, psychomotor and affective. These are further interpreted in the acquisition of knowledge, intellectual skills and motor skills. Students may be encouraged to gain, apply and communicate (orally or in writing) the knowledge acquired. Intellectual- skills objectives may be met by designing instructions that make use of students' prior knowledge and experiences in the discourse as the foundation on which newly acquired knowledge is built.

The provision of exercises in the form of assignments, projects and tutorial feedback is necessary. Instructional activities that teach motor skills need to be graphically demonstrated and the correct practices provided during tutorials. Instructional activities for inculcating change in attitude and behavior should create interest and demonstrate need and benefits gained by adopting the required change. Information on the adoption and procedures for practice of new attitudes may then be introduced.

Teaching and learning at a distance eliminates interactive communication cues, such as pauses, intonation and gestures, associated with the face-to-face method of teaching. This is particularly so with the exclusive use of print media. Instructional activities built into the instructional repertoire provide this missing interaction between the student and the teacher. Therefore, the use of instructional activities to affect better distance teaching is not optional, but mandatory.

Our team of successful writers and authors has tried to reduce this.

Divide and to bring this Self Instructional Material as the best teaching and communication tool. Instructional activities are varied in order to assess the different facets of the domains of learning.

Distance education teaching repertoire involves extensive use of self- instructional materials, be they print or otherwise. These materials are designed to achieve certain pre-determined learning outcomes, namely goals and objectives that are contained in an instructional plan. Since the teaching process is affected over a distance, there is need to ensure that students actively participate in their learning by performing specific tasks that help them to understand the relevant concepts. Therefore, a set of exercises is built into the teaching repertoire in order to link what students and tutors do in the framework of the course outline. These could be in the form of students' assignments, a research project or a science practical exercise. Examples of instructional activities in distance education are too numerous to list. Instructional activities, when used in this context, help to motivate students, guide and measure students' performance (continuous assessment)

Unit 1 Materials and UVW Mapping

Learning Outcome

After reading this unit, you will be able to:

- Explore the Material Editor
- Create and Apply Simple Materials
- Create Advanced Multi-Layer Materials
- Add Material Details with Maps
- DemonstrateUnwrapping UVs and Pelt Mapping
- Create Baked Textures and Normal Maps
- Use standard materials
- Discuss the various shaders
- Explore the Material rollouts
- Create textures with Photoshop
- Create and use compound materials
- Use matte/shadow materials, Ink ‘n’ Paint materials, architectural materials and material IDs to apply multiple materials
- Work with material modifiers
- Discuss Matte/shadow, Ink ‘n’ Paint, architectural and compound materials
- Apply multiple materials to an object with material IDs
- Explore several material modifiers, including the Material and Material By Element
- Explain different displacement methods

Time Required to Complete the unit

The time required to study this Unit is broken as follows:

1. 1st Reading: It will need 2 Hrs for reading
2. 2nd Reading with understanding: It will need 3 Hrs for reading and understanding
3. Self-Assessment: It will need 2 Hrs for reading and understanding
4. Assignment: It will need 1 Hrs for completing an assignment
5. Revision and Further Reading: It is a continuous process

Content Map

7.1 Introduction to Materials and Maps

Materials are used to dress, colour and paint objects. Just as materials in real life can be described as scaly, soft, smooth, opaque or blue, materials applied to 3D objects can mimic properties such as colour, texture, transparency, shininess and so on.

In this chapter, you learn the basics of working with materials and all the features of the Material Editor.

7.2 Understanding Materials and Maps

In max, there are 2 types of options to apply texture to the object or a model.

Maps: maps are just the textures. There are two types of maps in 3ds max: Bitmaps and Procedural maps.

Bitmaps are the textures, which are in the form of bitmaps or raster images or made of pixels. Procedural maps are the in-built maps of the 3ds max. They are based on certain algorithm or calculations. These are pixel independent.

Materials: materials are the major once that not only provide a texture to the surface but also provide various surface options like shaders, bump, opacity, shine, reflectance, refractions etc.

Study Notes

Assessment

What are the two different types of maps available in 3D Max?

	Discussion
Explore the types of Bitmaps available.	

7.3 Types of Maps

3D MAPS

In 3d, maps are patterns generated procedurally in three dimensions. Procedurally means the maps that we can edit according to our requirement. Like we can change the tiling, apply another map to it, set the levels, change the phase, give noise, set the high and the low levels etc. In max the procedural maps are:

1. Cellular
2. Dent
3. Falloff
4. Marble
5. Noise
6. Particle Age
7. Particle Mblur
8. Perlin Marble
9. Planet
10. Smoke
11. Speckle
12. Splat
13. Stucco
14. Waves
15. Wood

Cellular: With this, we can generate a cellular pattern that can be useful for visual effects.

Dent: With this, we can generate 3D bumps over a surface.

Falloff: With this, we can generate a value from white to black based on the angular falloff of the face normals on the surface of the geometry. We can even create opacity falloff effects.

Marble: With this, we can maintain or change the grain of marble with two colours and a third intermediate colour.

Noise: With this, we can apply noise, which is exactly a turbulence pattern in 3D.

Particle Age: With this, we can alter the colour or map of a particle.

Particle Motion Blur: With this, we can alter the opacity of the start and ends of particles according to the rate of movement.

Perlin Marble: With this, we can create a procedural marble map with a turbulence pattern.

Planet: With this, we can simulate the splines of a planet.

Smoke: With this, we can generate fractal based turbulence patterns to simulate the effects of smoke.

Speckle: With this, we can generate a speckled surface for creating patterned surfaces that can simulate granite and similar materials.

Splat: With this, we can generate a fractal pattern similar to slashed paint.

Stucco: With this, we can generate a fractal pattern.

Waves: With this, we can create watery.

Wood: With this, we can create a 3D wood grain pattern.

2D MAPS

2D Maps are two-dimensional images that are mapped over the surface of objects or used as environment maps to create a background for the scene. The simplest 2D maps are bitmaps. Other kinds of 2D maps are developed procedurally. The 2d maps in 3ds max are:

1. Bitmap:
2. Checker
3. Combustion

4. Gradient
5. Gradient Ramp
6. Swirl
7. Tiles

Bitmap: With this, we can call an image saved as a sequence of pixels. The file formats such as .tga, .bmp and so on or an animation file such as .avi, .flc or .ifl.can be called.

Checker: With this, we can combine two colours in a checker pattern

Combustion: With this, we can work in relation with the Discreet combustion software.

Gradient: With this, we can create a linear or radial ramp of three colours.

Gradient Ramp: With this, we can create a variety of ramps by using many colours and maps.

Swirl: With this, we can create spiral patterns.

Tiles: With this, we can create tiled materials with colours or material mappings.

Fundamentals of Texturing

Texture, also known as a texture map, is an image used to add colour and patterns to an object surface. A texture takes the form of a bitmap used as the diffuse map in a material. For example, you could use a photo of sand to make an object look like a beach or desert.

Study Notes

	Assessment
1. Write a short note on 3D Maps. 2. List the types if 2D amps available.	

	Discussion
Discuss where 3D maps can be used.	

7.4 Bitmaps and Procedural Maps

A material is data that we assign to the surface or faces of an object so that it appears a certain way when rendered. Materials affect the colour of objects, their glossiness, their opacity and so on.

A standard material consists of ambient, diffuse and specular components. We can assign maps to the various components of a standard material.

The standard material is the default material in the six sample slots of the Material Editor.

However, we can change the type of material we were working on by clicking the button labelled Type below the sample slots. This displays the Material/Map Browser and lets we select from a list of alternative material types. We can also change the type of material we're working on by clicking the Get Material button below the sample slots. This displays the Material/Map Browser and lets we select from a list of alternative material types.

7.4.1 PART 1

1. Perlin Marble Map

The Perlin Marble Map generates a marble pattern using the Perline Turbulence algorithm. This map is an alternative to Marble, which is also a 3D material.

Now let us see the options in brief:-

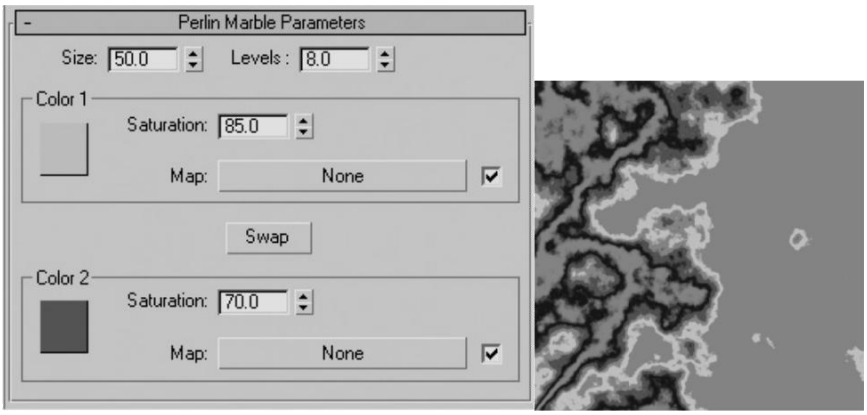


Fig. 7.1:Perlin Marble Parameters Fig. 7.2:Perlin Marble Map

Size: With this, we can set the size of the marble pattern.

Levels: With this, we c an set the number of times the turbulence algorithm is applied.

Colour 1 and Colour 2 groups

The controls in these gro ups are identical. They determine the two ma in colours of the marble.

Colour swatch: With this, we can display the colour selector and change the colour.

Map: With this, we can assign a map instead of a solid colour.

Saturation: With this, w e can control the saturation of the colour in the map, without altering the colour displ ayed in the colour swatch.

Swap: With this, we can swap Colour 1 and Colour 2.

2. Checker Map

Following are the parameters:

Soften: With this, we can blur the edges between the checkers.

Swap: With this, we can switch the position of the two checkers.

Colour #1: With this, we can set the colour of one of the checkers.

Colour #2: With this, we can set the colour of one of the checkers.

Maps: With this, we can select a map to use within the area of the chec ker colour.

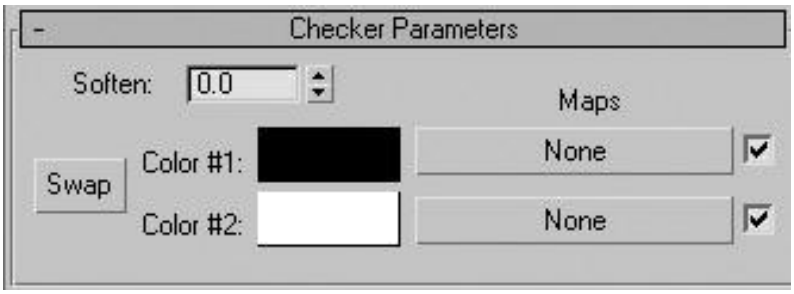


Fig. 7.3: Checker Parameters

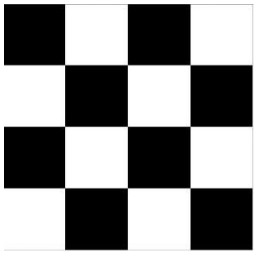
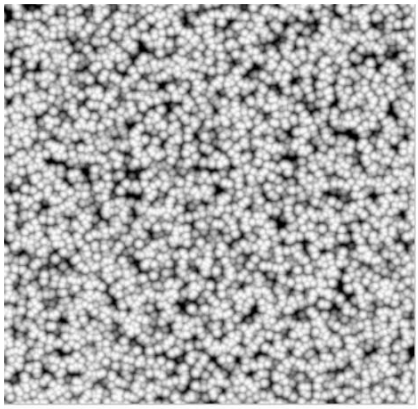


Fig. 7.4: Checker Marble Map

3. Cellular Map

Generates a cellular pattern that is useful for a variety of visual effects, including mosaic tiling, pebbled surfaces a nd ocean surfaces



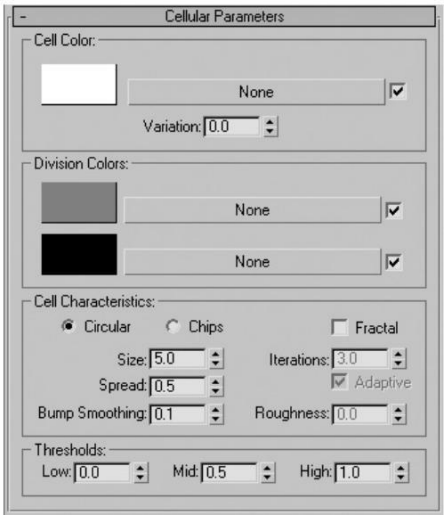


Fig. 7.5: Cellular Map and Parameters

ColourSwatch: With this , we can display the Colour Selector.

Map Button: With this, w e can assign a map to the cells, rather than a solid colour.

Check Box: With this, we can when on, enables the map

Variation: With this, we can vary the colour of the cells by randomly altering RGB values.

Colour swatches: With this, we can display the Colour Selector for choosing a cell division colour.

Map buttons: With this, we can assign a map to one of the cell division colours.

Check boxes: With this, we can enable the associated map. When off, disables the associated map (the division colour reverts to the colour swatch).

Circular / Chips: With this, we can set the cells are circular. This gives a more organic or bubbly look.

Size: With this, we can alter the overall scale of the map.

Spread: With this, we can alter the size of individual cells.

Bump Smoothing: With this, we can use a cellular map as a bump map; we might encounter aliasing or jagginess at the boundaries of the cells.

Fractal: With this, we can make the cellular pattern a fractal pattern.

Iterations: With this, we can set the number of times the fractal function is applied.

Adaptive: With this, we can set the number of fractal iterations is set adaptively.

Roughness: With this, we can set the Cellular map as a bump map.

Low: With this, we can adjust the size of the cells.

Mid: With this, we can adjust the size of the first division colour, relative to the second.

High: With this, we can adjust the overall size of divisions.

4. Planet Map

Following are the parameters:

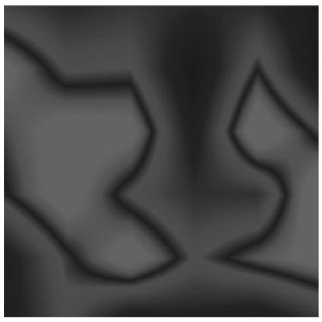
Continent Size: With this, we can set the size of the fractal noise pattern used to generate the continents.

Island Factor: With this, we can set the size of the fractal noise pattern used to generate islands and mountains

Ocean %: With this, we can set the percentage of the planet's surface that is covered by water.

Random Seed: With this, we can set the seed for pseudo random gene ration of the pattern.

Water colours: With thi s, we can click a swatch to display the Colour Selector and change the colour.



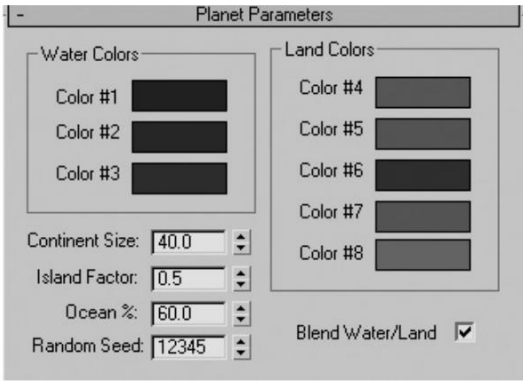


Fig. 7.6: Planet ParametersFig. 7 .7: Planet Map

LAND COLOURS GROUP

Land colours: With this, we can click a swatch to display the Colour Selector and change the colour.

Blend Water/Land: With this, we can set the boundary between wate r and land is blended, giving a hazy appearance.

5. Smoke Map

Followingare the parameters:

Size: With this, we can c hange the scale of the smoke clumps.

Iterations: With this, we can set the number of times the fractal function is applied. The higher the value, the more d etail within the smoke, but the longer the calc ulation time.

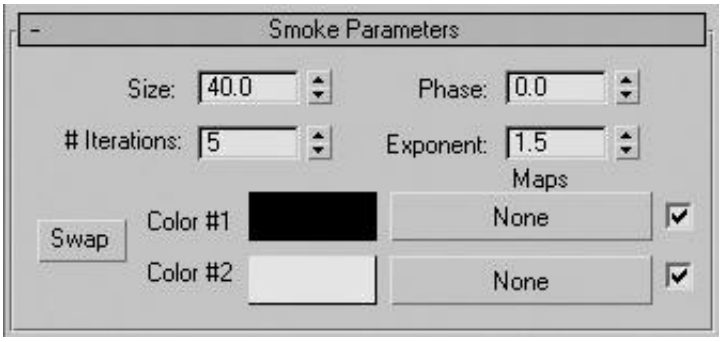
Phase: With this, we can shift the turbulence within the smoke pattern. Animate this parameter to animate the movement of the smoke.

Exponent: With this, we can make colour #2, representing the smoke, sharper and wispier.

Swap: With this, we can exchange the colours.

Colour #1: With this, we can represent the smokeless portion of the eff ect.

Colour #2: with this, we can repr esent the smoke.



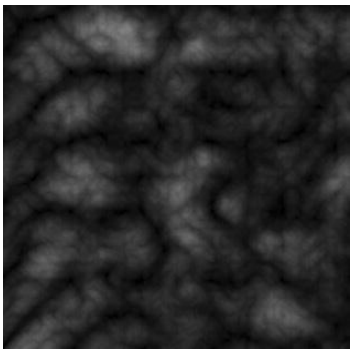


Fig. 7.8 Planet Parameters

Fig. 7.9: Smoke Map

6. Splat Map

Following are the parameters:

Size: With this, we can ad just the size of the splats.

Iterations: With this, w e can set the number of times the fractal function is evaluated.

Threshold: With this, w e can determine how much of Colour 1 is mixed with Colour2.

Swap: With this, we can exchange the two colour components.

Colour 1: With this, we c an represent the colour of the background.

Colour 2: With this, we c an represent the colour of the splats.

Maps: With this, we can assign a map to replace one of the colour components.

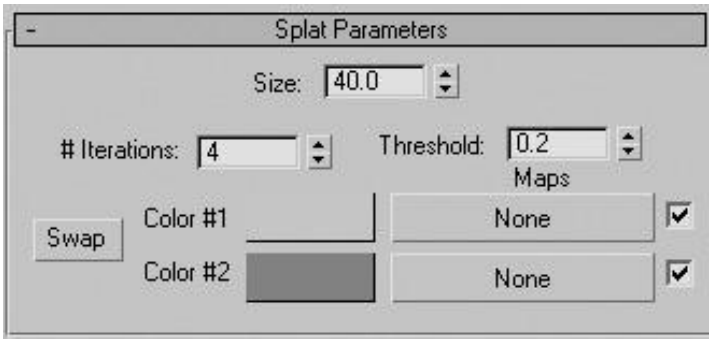


Fig. 7.10: Splat Parameters

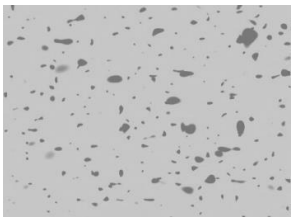


Fig. 7.11: Splat Map

7. Stucco Map

Following are the Parameters:

Size: With this, we can a djust the size of the indentations.

Thickness: With this, we can blur the border between the two colours.

Threshold: With this, we can determine how much of Colour 1 is mixe d with Colour 2.

Swap: With this, we can exchange the two colour components.

Colour 1: With this, we can represent the colour of the indentations.

Colour 2: With this, we can represent the background stucco colour.

Maps: With this, we can assign a map to replace one of the colour comp onents.

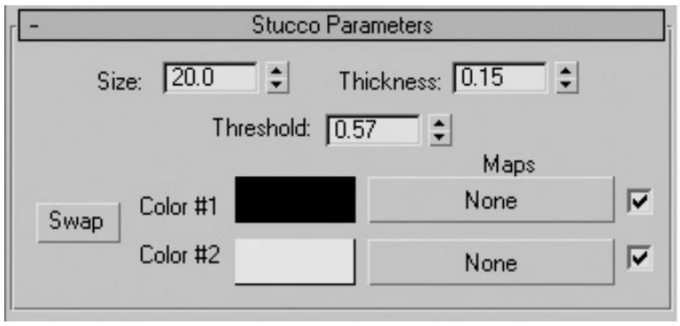


Fig. 7.12: Stucco Pa

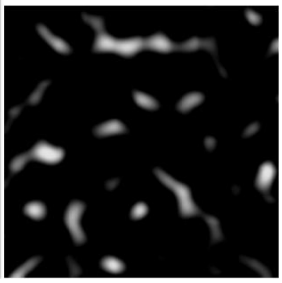


Fig. 7.13: Stucco Map

rameters 8. SwirlMap

Following are the parameters:

Base: With this, we can click the colour swatch to change the colour.

Swirl: With this, we can mix the Base colour or mapto produce the swirl effect.

Swap: With this, we can reverse the colour or map.

Colour Contrast: With this, we can control the contrast between Base and Swirl.

Swirl Intensity: With this, we can control the intensity of the swirl colour.

Swirl Amount: With this, we can control the quantity of the swirl col our that gets mixed into the base colour.

Twist: With this, we can change the number of spirals in the swirl effect.

Constant Detail: With this, we can change the level of detail within a swirl.

Swirl Location group

Center Position X and Y: With this, we can adjust the location of the s wirl's centre on the object.

Lock: With this, we can set the X and Y values so that they remain id entical as we adjust them.

Random Seed: With this, we can set a new starting point for the swirl effect.

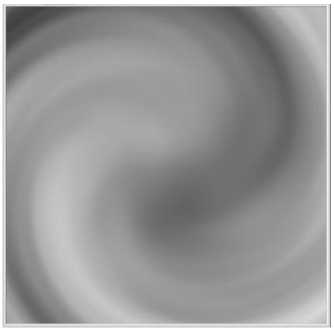


Fig. 7.14: Swirl Map

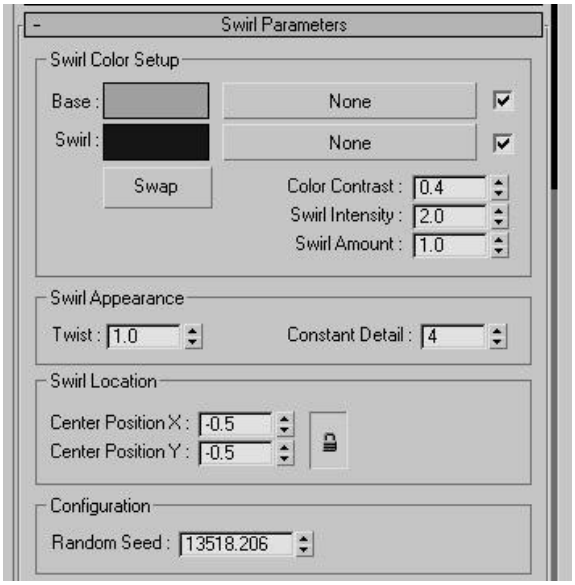


Fig. 7.15: Swirl Parameters

8. Wood Map

Following are the parameters:

Tiling: With this, we can control grain complexity or distortion.

Angle: With this, we can control grain direction.

Default Grain: Wood is rendered with the grain running along the X-axis of the object. This is illustrated by the left cube below. The default angle is 0 for X, Y and Z axes.

Rotated Grain: By rotati ng the direction of the grain around an axis, we change the rendered effect. In the right cub e, the Y-axis is set to 90. This rotates the grain direction 90 degrees around the Y-axis so tha t the grain is now running along the Z-axis.

Other Angle Effects: Varying a single angle can create distorted grain effects (cylinder at left). Varying the t hree angles by a uniform amount keeps the grain running parallel through an object (cylin der at right).

Grain Thickness: With this, we can set the relative thickness of the colour bands that make up the grain.

Radial Noise: With this, we can set the relative randomness of the pattern on a plane perpendicular to the grain, the circular ring structure.

Axial Noise:With this, w e can set the relative randomness of the pattern on a plane parallel with the grain, along the length of the grain.

Swap:With this, we can e xchange the position of the colours.

Colours:With this, we ca n select any two colours for the grain pattern.

Maps:With this, we can r eplace colours with maps.

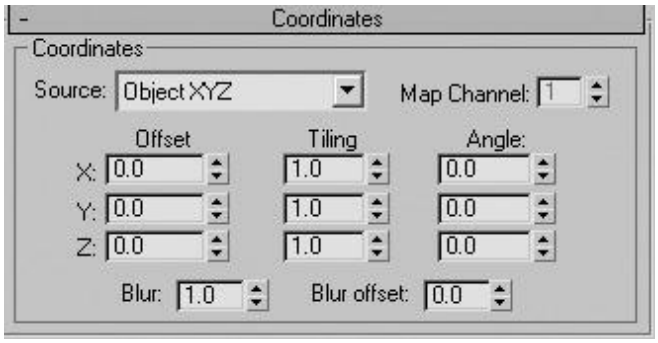


Fig. 7. 16: Wood Coordinates Parameters

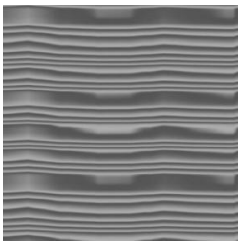


Fig. 7.17: Wood Map

	Study Notes

	Assessment

Write short notes on:

1. Planet map
2. Smoke map

	Discussion

Apply the maps listed to the obj ects created in the previous units.

1. Gradient Map

Following are the parameters:

Colour 1:3:With this, we can set the three colours that the gradient interpolates between.

Maps:With this, we can display a map instead of the colour.

Colour 2 Position:With this, we can control the centre point of the middle colour.

Gradient Type:With this, we can linear interpolates the colour based on the vertical position while radial interpolates based on the distance from the centre of the map.

Amount:With this, we can apply a noise effect.

Regular:With this, we can generate plain noise

Fractal:With this, we can generate noise using a fractal algorithm.

Turbulence:With this, we can generate fractal noise with an absolute value function applied to it to make fault lines.

Size:With this, we can Scale the noise function.

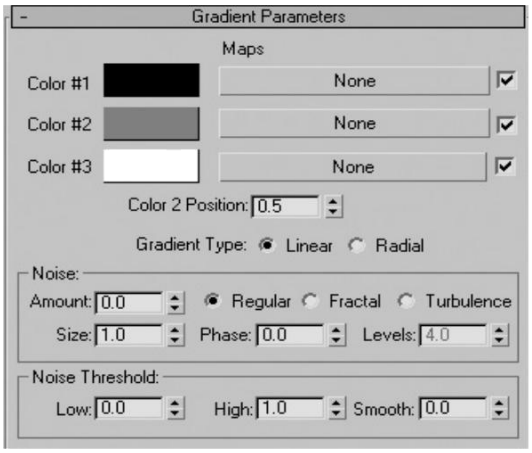
Phase: With this, we can control the speed of the animation of the noise function.

Levels:With this, we can set the number of fractal iterations or turbulence.

Low:With this, we can set the low threshold.

High:With this, we can set the high threshold.

Smooth: With this, we can make a smoother transition from the threshold value to the noise value.



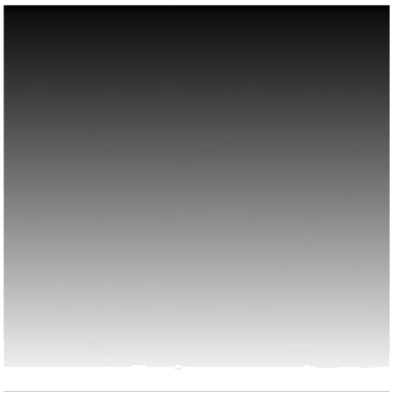


Fig. 7.18: Gradient Map Fig. 7.19. Gradient Parameters

1. Gradient Ramp Map

Following are the parameters:

Gradient bar:With this, we can present an editable representation of the gradient being created.

Reset:With this, we can return gradient bar to defaults.

Load Gradient: With this, we can load an existing gradient into the gradient bar.

Save Gradient:With this, we can load current gradient bar as a .dgr file.

Copy, Paste:With this, w e can cop a gradient and pastes it into another Gradient Ramp map.

Load UV Map:With this, we can select a UV map.

Load Bitmap: With this, we can select a bitmap.

Flag Mode:With this, we can toggle flag display.

Right: click options for flags: With this, we can display a menu with t he following options:

Copy and Paste:With th is, we can copy the current key and paste it to replace another key.

Edit Properties:With this , we can choose this option to display the Fla g Properties dialog.

Delete:With this, we can delete the flag.

Gradient Type:With this, we can choose the type of gradient. The follow ing Gradient types are available:

- 4 Corner: An asymmetrical linear transition of colours
- Box: A box
- Diagonal: A linear diagonal transition of colours
- Lighting: Based on the light intensity value No light=far left; brightest light=far right
- Linear: A smooth, linear transition of colours
- Normal: Based on the angle between the vector from the camera to the object and the surface normal vector at the sample point. The leftmost flag of the gradient is 0 degrees; the rightmost flag is 90 degrees.
- Pong: A diagonal sweep that repeats in the middle
- Radial: A radial transition of colours
- Spiral: A smooth, circular transition of colours
- Sweep: A linear sweep transition of colours
- Tartan: A plaid

Interpolation:With this, we can choose the type of interpolation.

Custom:With this, we can set an individual interpolation type for each flag.

Ease In:With this, we can weigh more toward the next flag than the current flag.

Ease In Out:With this, we can weigh more toward the current flag than the next flag.

Ease Out:With this, we can weigh more toward the previous flag than the next flag.

Linear:With this, we can constant from one flag to the next.

Solid:With this, we can give no interpolation.

Source Map:With this, we can click to assign a map to a mapped gradient.

Amount:With this, we can give a random noise effect is applied to the gradient, based on the interaction of the gradient ramp colours (and maps, if present).

Regular:With this, we can generate plain noise.

Fractal:With this, we can generate noise using a fractal algorithm.

Turbulence:With this, we can generate fractal noise with an absolute value function applied to it to make fault lines

Size:With this, we can set the scale of the noise function.

Phase:With this, we can control the speed of the animation of the noise function

Levels:With this, we can set the number of fractal iterations or turbulence Noise Threshold group

High:With this, we can se t the high threshold.

Low:With this, we can set the low threshold.

Smooth:With this, we ca n make a smoother transition from the thres hold value to the noise value.

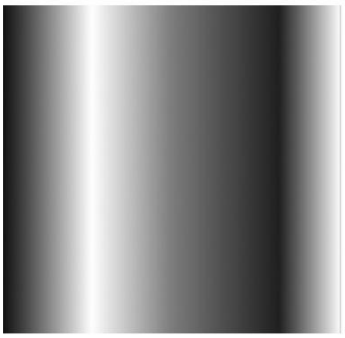


Fig. 7.20: Gradient Ramp Map

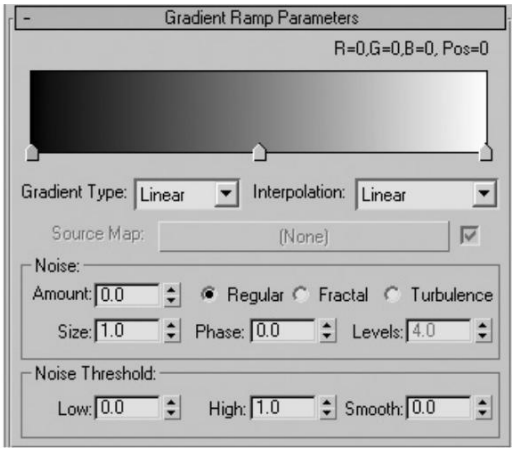


Fig. 7.21: Gradient Ramp Parameters

2. Mask Map

Following are the parameters:

Map:With this, we can se lect or create the map to be viewed through th e mask.

Mask:With this, we can select or create the map to use as a mask.

Invert Mask:With this, we can invert the effect of the mask.

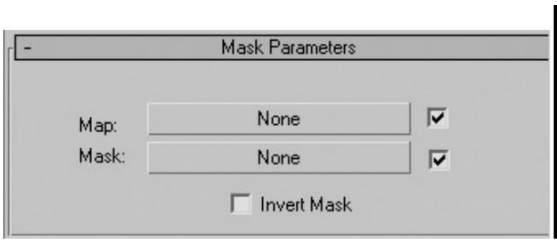


Fig. 7.22: Gradient Ramp ParametersFig. 7.23: Gradient Ramp Map

3. Mix Map

Following are the parameters:

Swap:With this, we can e xchange the two colours or maps.

Colour 1 &Colour 2:Wit h this, we can display the colour selector to s elect the two colours to be mixed.

Maps:With this, we can s elect or create the bitmaps or procedural maps to be mixed instead of each colour.

Mix Amount:With this, w e can determine the proportion of the mix.

Use Curve:With this, we can determine whether the Mixing Curve affec ts the mix.

Transition Zone: With this, we c an adjust the level of the upper and lower limits .

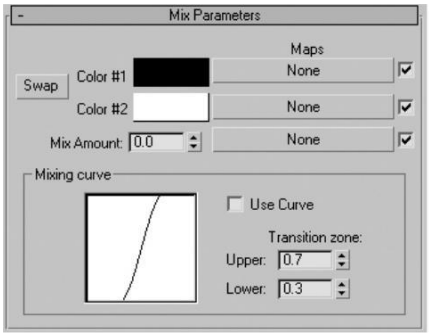


Fig. 7.24: Mix ParametersFig. 7.25: Mix Map

Use Curve:With this, we can determine whether the Mixing Curve affec ts the mix.

Transition Zone: With this, we c an adjust the level of the upper and lower limits .

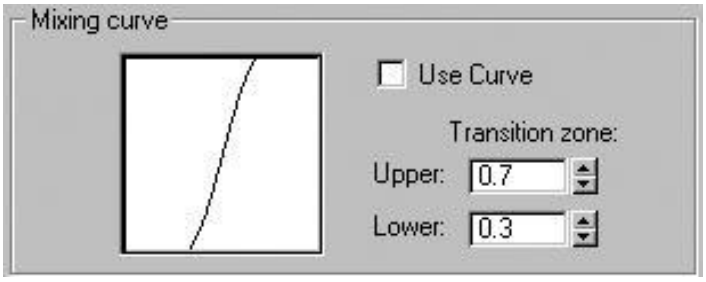


Fig. 7.26: Mixing Curve editor

4. Flat Mirror Map

Following are the parameters:

Apply Blur: With this, we can turn ON the filtering to blur the maps.

Blur: With this, we can affect the sharpness or blurriness of the generated map based on its distance from the object.

First Frame Only: With this, the renderer creates the automatic flat mirror only on the first frame.

Every Nth Frame: With this, the renderer creates the automatic flat mirror based on the frame rate set by the spinner.

Use Environment Map: When OFF, the environment maps are ignored by the mirror during rendering.

Apply to Faces with ID:With this, we can specify the material ID number where we want the mirror assigned.

None: With this, we can create any distortion.

Use Bump Map: With this, we can distort the reflection using the material's bump map.

Use Built-In Noise: With this, we can distort the reflection using the settings in the Noise group.

Distortion Amount: With this, we can adjust the amount of distortion to the reflected image.

Regular:With this, we can generate plain noise.

Fractal: With this, we can generate noise using a fractal algorithm.

Turbulence:With this, we can generate fractal noise with an absolute value functionapplied to it to make fault lines.

Phase:With this, we can control the speed of the animation of the noise function.

Size:With this, we can set the scale of the noise function.

Levels:With this, we can set the number of fractal iterations or turbulence.

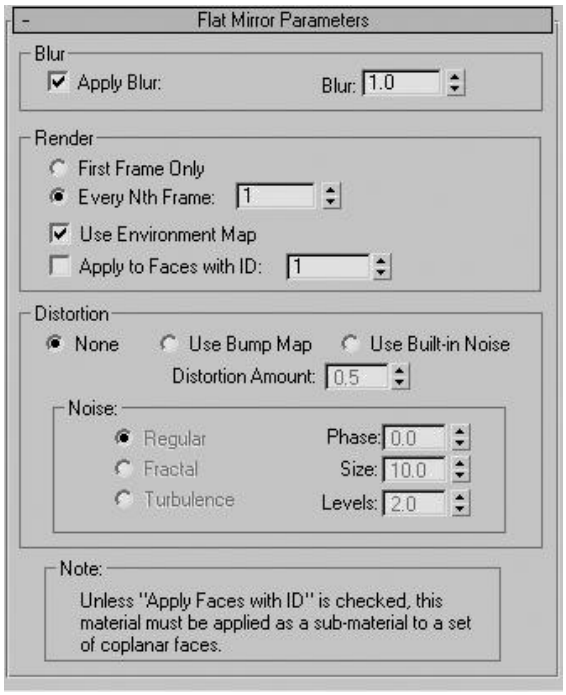


Fig . 7.27: Flat Mirror Parameters

5. RGB Tint Map

Following are the parameters:

RGB: With this, we can s et the red, green and blue colour swatches.

Map: With this, we can d isplay the material or the map browser to sele ct the map to be tinted.

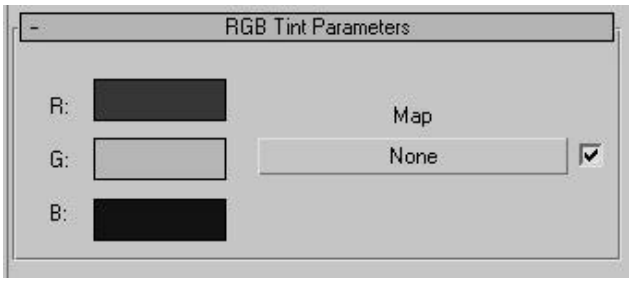


Fig. 7.28: RGB Tint Parameters

6. RGB Multiplier Map

Following are the parameters:

Map 1: With this, we can use the first map's alpha channel.

Map 2: With this, we can use the second map's alpha channel.

Multiply Alphas:With this, we can generate a new alpha channel by multiplying the alpha channels of the two maps.

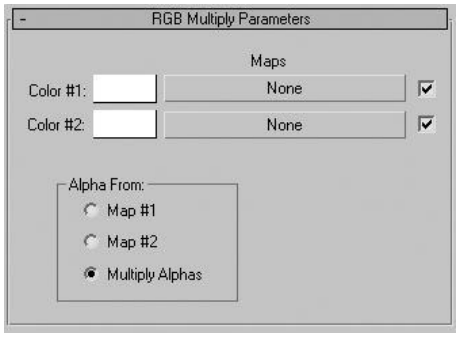


Fig. 7.29: RGB Multiply Parameters

7. Falloff Map

Following are the parameters:

Front: Side: Front: Side is the name of the group at the top of this rollout. Front: Side indicates Perpendicular/Parallel falloff.

Falloff Type:With this, we can choose the kind of falloff. The five different options:

- Colour swatches to assign colours
- Spinners to adjust the relative strength of the colours
- Buttons marked None to assign maps
- Check boxes to activate the maps
- Swap Colours or Maps to reverse

Perpendicular/Parallel:With this, we can set the angular falloff ranges between face normals that are perpendicular to the falloff direction and normals that are parallel to the falloff direction.

Towards or Away:With this, we can set the angular falloff ranges between face normals that face toward the falloff direction and normals that face away from the falloff direction.

Fresnel: With this, we can adjust the Index of Refraction (IOR).

Shadow or Light:With this, we can adjust the two sub-textures based on how much light is falling on the object.

Distance Blend:With this, we can adjust the two sub-textures based on Near

Distance and Far Distance values.

Falloff Direction:With this, we can choose the direction of falloff. The five options are:

- Viewing Direction (Camera Z-Axis):With this, we can set the falloff direction relative to the camera.
- Camera X or Y-axis: With this, we can set the using Camera X-Axis with the Toward or Away falloff type runs the gradient from left.
- Object: With this, we can pick an object whose orientation determines the falloff direction.
- Local X or Y or Z-axis: With this, we can set the falloff direction to one of the object's local axes.
- World X or Y or Z-axis: With this, we can set the falloff direction to one of the world coordinate system axes.
- Object: With this, we can pick the object from scene and puts its name on the button.

Override Material IOR: With this, we can change to the Index of Refraction set by the material.

Index of Refraction:With this, we can set a new Index of Refraction.

Near Distance:With this, we can set the distance at which the blend effect begins.

Far Distance:With this, we can set the distance at which the blend effect ends.

Extrapolate:With this, we can make the effect to continue beyond the Near and Far settings.

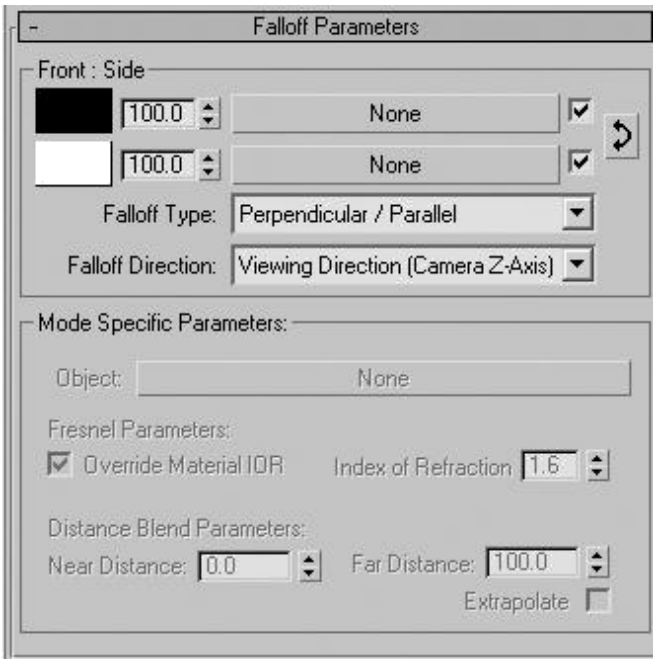


Fig. 7.30: Falloff Parameters

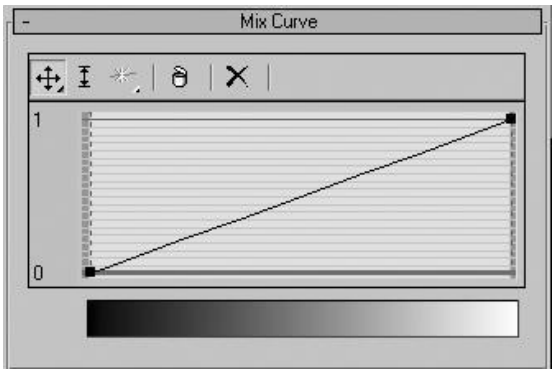


Fig. 7.31: Falloff Mix Curve

- We can move a selected p oint in any direction, limited by the unselect ed points on either side.
- We can constrain movement to the horizontal.
- We can constrain movement to the vertical.

Scale Point:With this, we can scale the selected point within the range of its gradient.

Add Point fewer

We can add a Bezier corner point anywhere on the graph line.

We can add a Bezier smooth poi nt anywhere on the graph line.

Delete Point: With this, we can remove selected points.

Reset Curves: With this, we can return graph to its default settings.

8. Reflect/Refract Map

Following are the parameters:

Source: With this, we can choose the source of the six cubic maps.

Automatic: With this, we can automatically generate by looking out in six directions from the pivot of the object with the material, then mapped onto the surface during rendering.

From File: When ON, With this, we can specify the bitmaps to use.

Size: With this, we can set the size of the Reflect/Refract maps.

Use Environment Map: When OFF, With this, we can set the environment maps are ignored by Reflect/Refract map during rendering.

Apply:With this, we can turn on filtering to blur the maps.

Blur Offset:With this, we can affect the sharpness or blurriness of the map without regard to its distance from the object.

Blur:With this, we can affect the sharpness or blurriness of the generated map based on its distance from the object.

Near:With this, we can set the near range for fog.

Far:With this, we can set the far range for fog.

Get From Camera:With this, we can uses the Near and Far atmosphere range settings of a camera in the scene.

First Frame Only:With this, we can set the renderer to create automatic maps only on the first frame.

Every Nth Frame:With this, we can set the renderer to create animated auto maps based on the frame rate set by the spinner.

Up or Down or Left or Right or Front or Back:With this, we can assign one of the six cubic maps.

Reload:With this, we can reload the assigned maps and updates the sample slot.

To File:With this, we can choose a file name for the Up map.

Pick Object and Render Maps:With this, we can click to turn ON to select the mapped object to render the six cubic maps.

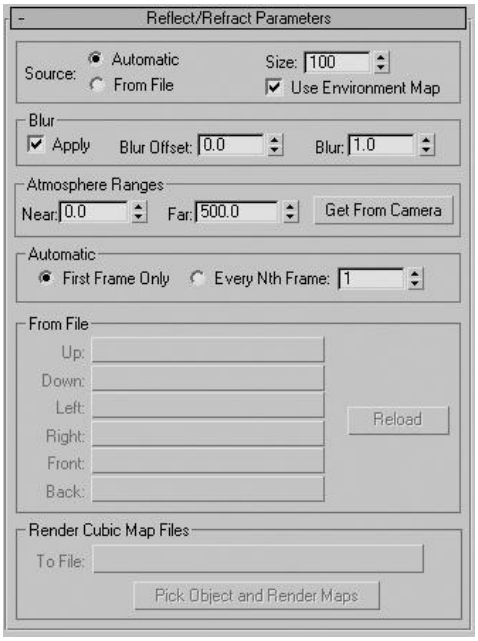


Fig. 7 .32: Reflect / Refract Parameters

9. Blend Map

Following are the parameters:

Material 1 and Material 2: With this, we can select or create the two materials to be blended.

Interactive:With this, we can select the two materials, which can be displayed on object surfaces in viewports by the interactive renderer.

Mask:With this, we can select or create a map to use as a mask.

Mix Amount:With this, w e can determine the proportion of the blend i n the form of percentage.

Use Curve:With this, we can determine whether the Mixing Curve affects the mix.

Transition Zone:With this, we can set the values adjust the level of the Upper and Lower limits.

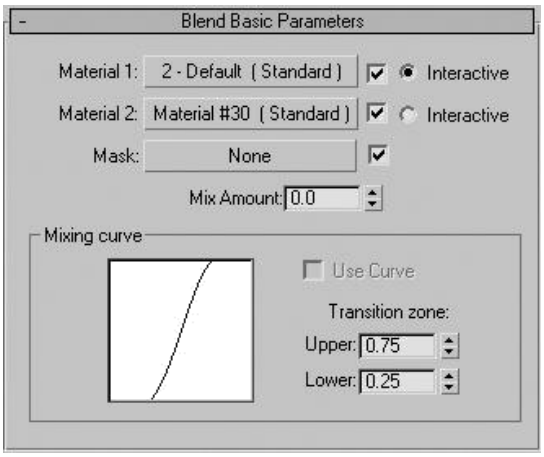


Fig. 7.33: Blend Parameters

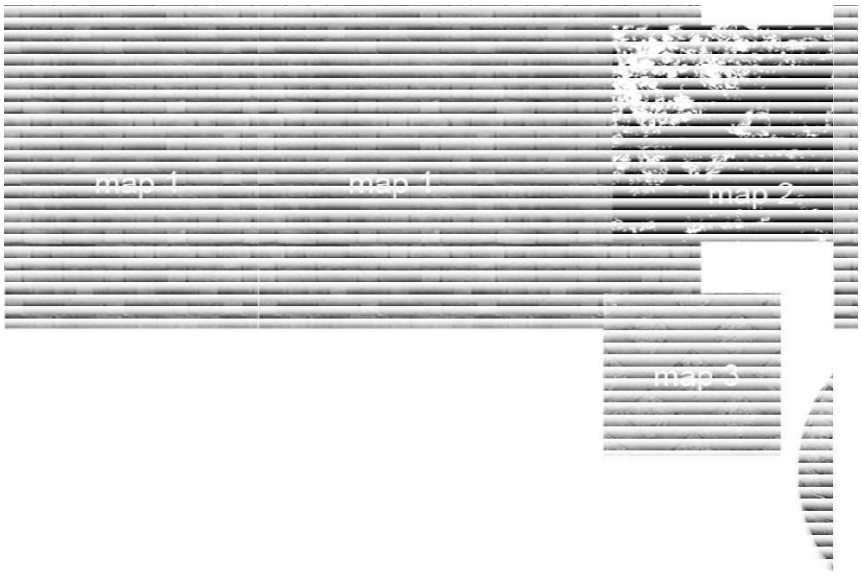


Fig. 7.34: Blend Map

	Study Notes

	Assessment

Write short notes on:

1. Gradient
2. Flat mirror

	Discussion

Use the Gradient on the terrain created using the terrain compound.

7.5 Materials

7.5.1 PART 1

1. Composite Material

The Composite map type is made up of other maps which you layer atop each other using the alpha channel and other methods. For this type of map, you can use overlay images that already contain an alpha channel or employ built-in masking tools for overlaying only certain parts of a map.

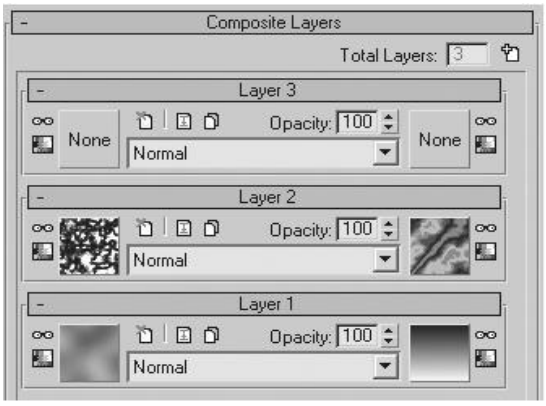


Fig. 7.35: Composite Layers Parameters

The numeric field shows the number of map layers. To add a layer at the top of the stack of layers, click on the Add layer button.

Layer rollout:

The composite map uses a separate rollout for each layer's controls, with as many rollouts as there are layers. Each layer rollout is titled with the optional name first.

Hide this layer

With this button to hide & un-hide the layer.

Colour Correct This Texture

Applies this map to the map and opens the Colour Correction map interface. You can use its controls to modify the map colours.

Map

To assign a map to the layer, click this button and then use the Map Browser.

Before assigning a map, the button reads "None." When a map is assigned, the button image is a thumbnail of the map and clicking it takes you to the parameters for the map.

Delete this layer

Deletes the lay. Available only when the map contains more than one layer.

Rename this layer

Opens a small dialog for naming or renaming the layer. By default, each layer is named "Layer #" where # is the layer number.

Duplicate this layer

Creates an exact copy of the layer and inserts it immediately adjacent to the layer.

Opacity

The relative transparency of the unmasked portions of the layer. At 100, the layer is completely opaque.

Mask map

To assign a mask map to the layer, click this button and then use the Material/Map Browser. The mask works the same as the Mask map, Black areas are transparent, white areas are opaque and gray areas allow degrees of transparency.

Hide the mask of this layer

To turn off the mask temporarily, click this button.

Colourcorrect this mask

Applies this map to the mask map and opens the Colour Correction map interface. You can use its controls to modify the map colours.

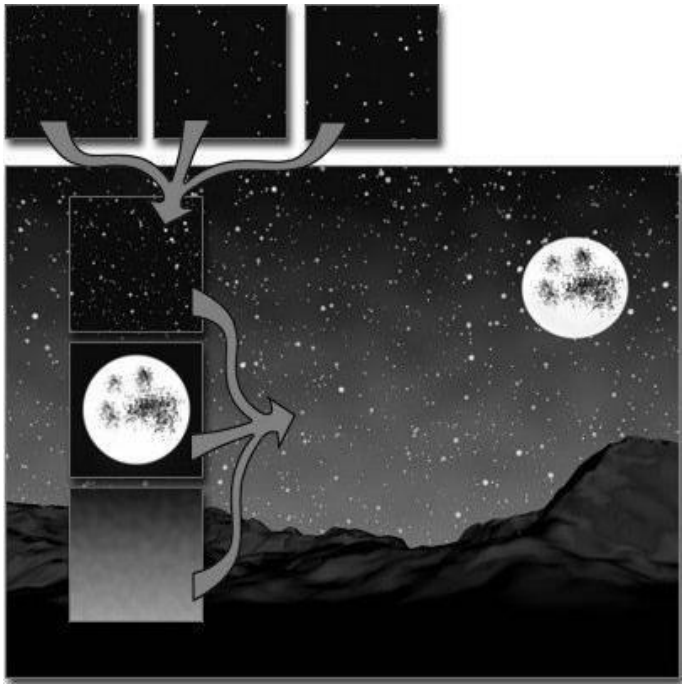


Fig. 7.36: Composite Map

Blend mode

Use the drop-down list to choose how the layer pixels interact with those in underlying layers.

2. Double Sided Material

This material lets you assign two different materials to the front and back faces of an object.

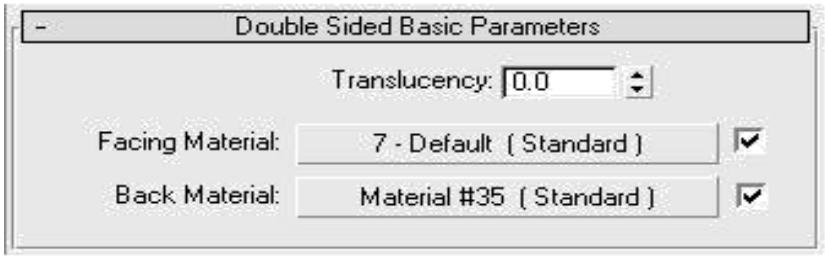


Fig. 7.3 7: Double Sided Basic Parameters

Translucency

You set the Translucenc e amount that one material shows through the other. This percentage can range from 0.0 to 100.0. At 100 percent, the outer material is visible on inner faces and the inner mat erial is visible on outer faces. At intermediat e values, the specified percentage of the inner material "bleeds through" and is visible on outer faces. Default=0.0.

Facing Material and Back Mater ial

Click to display the M aterial or Map Browser and choose a materia l for one side or the other. Use the check bo xes to turn the materials on or off.

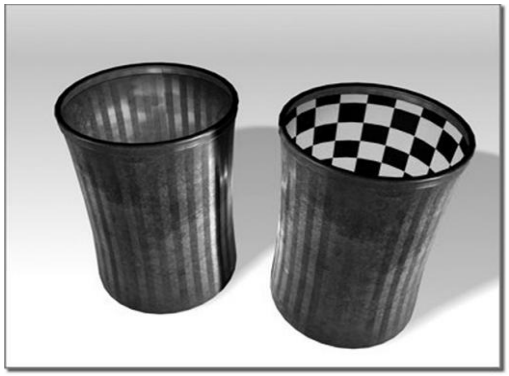


Fig. 7.38: Double Sided Map

3. Ink N Paint Material

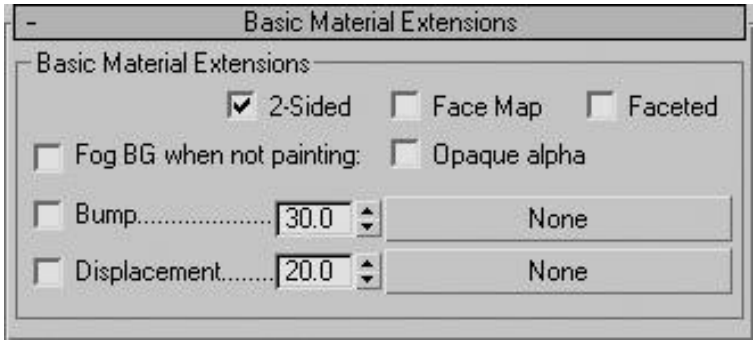


Fig. 7.39: Ink n Paint Basic Material Extensions

This material is used for creating cartoon effect than realistic 3 dimensio nal material. When this material is applied to an object, it produces a flat shading with an ink ed boarder.

Following are the parameters in the Ink and Paint parameters rollout:

Sided:With this, we can make the material 2: sided.

Face Map:With this, we c an apply the material to the faces of the geom etry.

Faceted:With this, we ca n render each face of a surface as if it were flat.

Fog BG when not paintin g: When OFF, with this, we can set the painted areas of the material colour are the same as the background.

Opaque alpha:With this, we can set the alpha channel is opaque even if ink or paint is turned off.

Bump: With this, we can add bump mapping to the material.

Displacement:With this, we can add the displacement mapping to the m aterial.

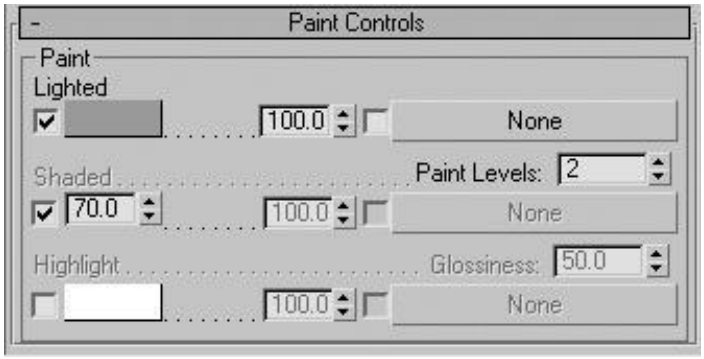


Fig. 7.40: Paint Controls

Lighted:With this, we can fill colour for the lighted side of objects.

Paint Levels: With this, we can set the number of shades of col our that are rendered.

Shaded:With this, we can set the value in the spinner at the left is the percent of the lighted colour that appears on th e unlighted side of objects.

Highlight:With this, we c an set the colour of the specular highlight.

Glossiness:With this, we can set the size of the specular highlight.

Check box: With this, we can check box at the left of the rollout enable s or disables that particular component.

Colour swatch or spinner:With this, we can set the main contr ol for each component.

Map spinner:With this, w e can set the spinner to the right of the main control is the

percentage of the map to use.

Map check box:With thi s, we can set the check box between the spi nner and the button enables or disables the m ap.

Map button:With this, we can click the button to assign a map to this co mponent.

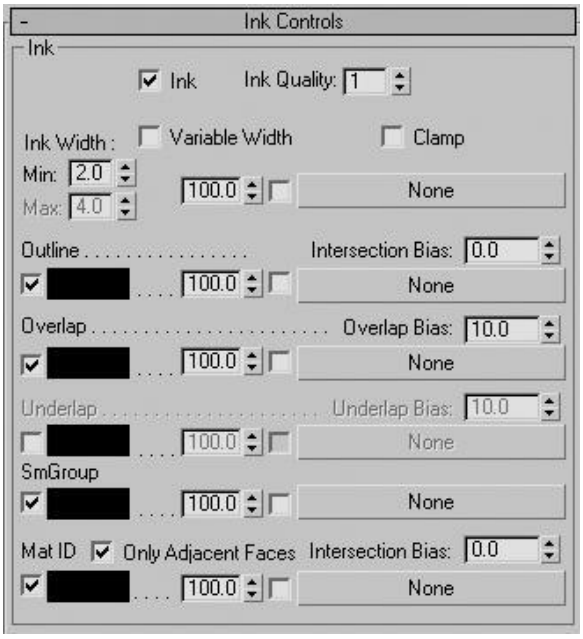


Fig. 7.41: Ink Controls

Ink: When this is on, the rendering is inked.

Ink Quality:With this, w e can affect the shape of the brush and the number of samples it uses.

Ink Width:With this, we can set the width of the ink, in pixels.

Variable Width:With thiss, we can set the ink's width can vary between the minimum and maximum Ink Width values.

Clamp:With this, we can set the scene lighting, which causes some ink lines to become so thin they nearly disa ppear.

Outline: With this, we c an decide whether the ink where the outer edges of the object appear against the backg round or in front of a different object.

Intersection Bias: With this, we can adjust artifacts that might appear when two objects intersect each other.

Overlap: With this, we can set the ink used when a portion of an object overlaps

itself.

Overlap Bias:With this, we can adjust artefacts that might appear in ink that traces the overlap.

Under lap:With this, we can apply ink to the farther surface rather than the nearer one.

Under lap Bias:With this, we can adjust artefacts that might appear in in k that traces the under lap.

SmGroup:With this, we can set the ink drawn between the boundaries of smoothing groups

Mat ID: With this, we can set the ink drawn between different material I D values.

Only Adjacent Faces: W ith this, we can set inks the material ID ed ge between adjacent faces, but not between one object and another.

Intersection Bias:With this, we can use this to adjust any artefacts that appear at the boundary between two objects with different material IDs.

Map controls:With this, we can set the map controls for each of the ink components such as width, outline, overlap, u nder lap, SmGroup and Material ID.

4. Matte Shadow Materials

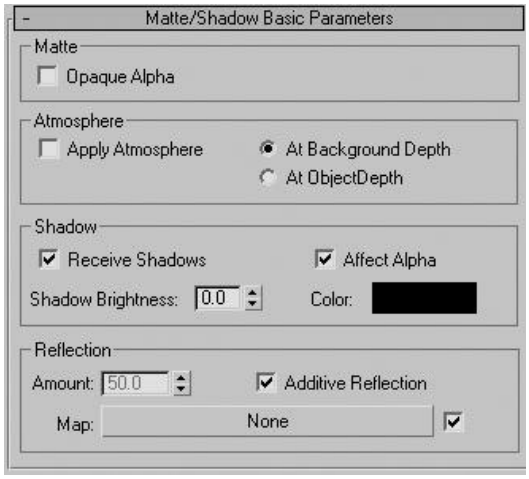


Fig. 7 .42: Matte Shadow Parameters

The Matte Shadow mat erial is used to make the object into a matte object. This material will reveal the current background or environment map.This effect is visible only when you render the scene.

To blend seamlessly into a background environment, there are three ways you can render objects:

- Assign a Matte/Shadow Material.
- A 100% self-illuminated diffuse texture assign to an object using Camera Mapping.
- A 100% self-illuminated diffuse texture assign using Environment/Screen projection.
- Press F9 for Rendering the scene.

Following are the parameters of the Matter Shadow rollout:

Opaque Alpha:With this, we can determine whether the matte material appears in the alpha channel.

Apply Atmosphere:With this, we can turn the fogging of matte objects ON and OFF.

At Background Depth: The scanline renderer fogs the scene and then renders its shadows.

At Object Depth:With this, we can set the renderer first renders the shadows and then fogs the scene.

Receive Shadows:With this, we can render shadows on the matte surfaces.

Affect Alpha:With this, we can set the shadows cast on a matte material are applied to the alpha channel.

Shadow Brightness:With this, we can set shadow brightness.

Colour:With this, we can display a colour selector to let we choose the colour of the shadow.

Amount:With this, we can control the amount of reflection to use.

Map:With this, we can display the material or map Browser so we can assign a map to use for reflections.

Fig. 7.43: Matte Shadow Map

5. Multi Sub Object Material

This type of material lets you assign multiple textures at one go. The material are assigned at the sub object level and later modified using the mesh select modifier, making it the most convenient way to add different types of textures.

The following are the parameters used to assign multi sub object:

Number:With this, we can display the number of sub: materials cont ained in the multi/sub: object material.

Set Number:With this, we can set the number of sub: materials to make up the material.

Add: With this, we can cl ick to add a new sub: material to the list.

Delete:With this, we can click to delete the currently chosen sub: material from the list.

ID: With this, we can click to sort the list so it begins with the sub: mat erial that has the lowest material ID and ends with the sub: material that has the highest material ID.

Name:With this, we can click to sort the list by the names we have e ntered in the name column.

Sub: Material: With this, we can click to sort the list by the sub: materia l names that appear on the Sub: Material butttons.

Small sample sphere: With this, we can set the small sample spheres as a mini:preview of the sub: materia l.

ID:With this, we can set the ID number assigned to this sub: ma terial. Note: Sometimes the Sub: Material bu tton shows a material number. This is not the sub: material ID.

Name:With this, we can set we enter a custom name for the material.

Sub: Material button: W ith this, we can click the sub: material button to create or edit one of the sub: materials.

Colour swatch:With this , we can click the colour swatch to the righ t of the Sub: Material button to display the colour selector and choose a diffuse colour for the sub: material.

On or Off toggle:With this, we can turn toggle the sub: material.

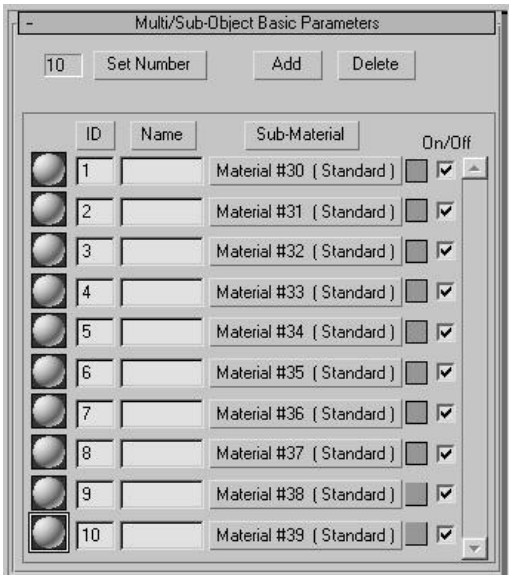


Fig. 7 .44:Multi/Sub Object Parameters

	Study Notes

	Assessment

1. Write a short note on Double Sided material.
2. Write note on Ink and Paint material.

	Discussion

Create a Caterpillar using basic primitive and apply Ink and paint to give a cartoon look.

7.5.2 PART 2

6. Shellac Material

Shellac material mixes two materials by superimposing one over the other. Colours in the superimposed material, called the "shellac" material, are added to colours in the base material. A Shellac Colour Blend parameter controls the amount of colour mixing.

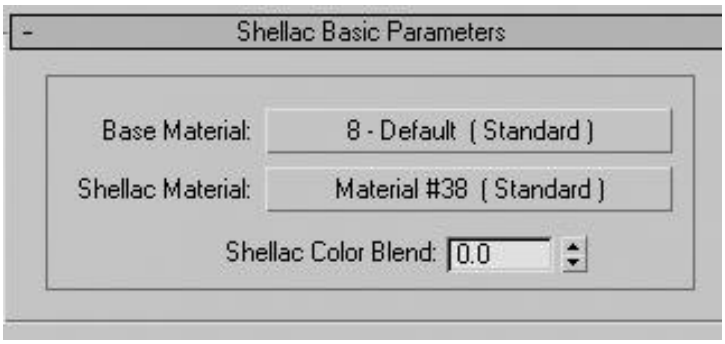


Fig. 7.45:Shellac Parameters

Base Material: With this, we can set the level of the base sub: material.

Shellac Material:With this, we can set the level of the shellac material.

Shellac Colour Blend: With this, we can control the amount of colour mixing.

7. Standard Material

The Standard material in 3d Max gives all the objects a unifor m look. The parameters are standard and pr oduce a reflective surface.

Following are the basic parameters:

Ambient colour: Ambient colour is the colour of the object in shadow.

Diffuse: Diffuse is the col our of the object in direct, "good" lighting.

Specular: Specular is the colour of shiny highlights.

Filter: Filter is the colour transmitted by light shining through the object.

Anisotropic: Anisotropic can be used for surfaces with elliptical highlights.

Blinn: Blinn can be used for softer highlights than Phong shading

Metal: Metalcan be used for metallic surfaces

Multi:Layer: Multi:Layer can be used for surfaces with more complex highlights than anisotropic.

Oren:NayarBlinn: Oren: Nayar:Blinn can be used for matte surfaces.

Phong: Phong can be use d for surfaces with strong, circular highlights.

Strauss: Strauss can be used for metallic and nonmetallic surfaces.

Translucent: Translucent can be used for specifying translucency, w here light is scattered as it passes through th e material.

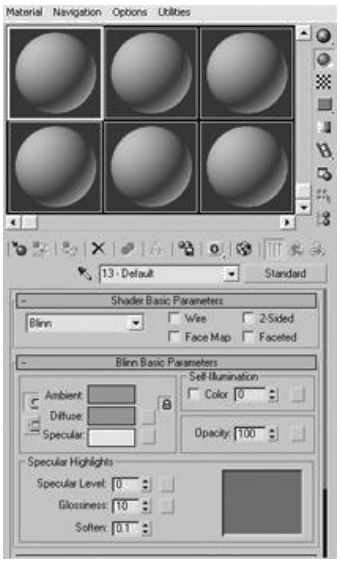


Fig. 7.46:Standard Parameters

8. Top-BottomMaterial

This material is used to apply different material on the top and diff erent on the bottom of the object. Then t he top and bottom material can be blende d using the parameters. For example a can be rusted more at the bottom and less on top, so this type of material can be created.

Following are the parameters:

Swap: With this, we can swap the position of the top and bottom materials.

World: With this, we can make the material face point up or down acc ording to the scene's world coordinates.

Local: With this, we can make the material face point up or down acc ording to the object's local coordinates. When we rotate the object, the material rotates with it.

Blend:With this, we can make the material blend the edge between the top and bottom sub: materials.

Position:With this, we can determine where the division between the two materials lies on an object.

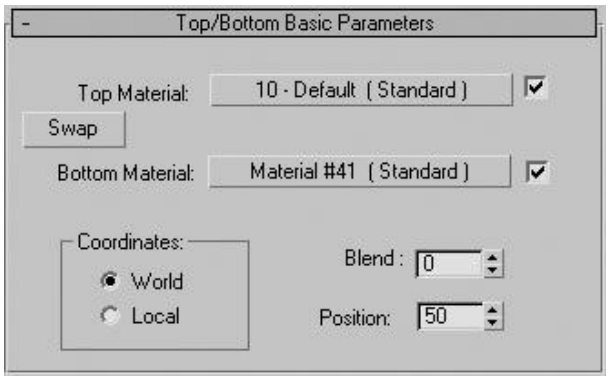


Fig. 7.47:Top-Bottom Parameters

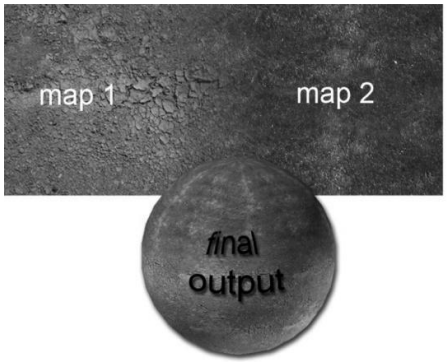


Fig. 7.48:Top-BottomMap

9. Raytracing

Raytracing accurately renders the properties like:

1. Direct Illumination
2. Shadows
3. Specular Reflections
4. Transparency Effects

Raytracing subdivides th e scene, organising it into a tree for raytrace purposes. A node in this tree is known as a "voxel". Voxel trees are dynamic and we cannot explicitly specify the structure of the tree.

Raytrace map provides fully raytraced reflections and refractions. Th e reflections and refractions it generates are more accurate than those produced by the reflect/refract map. Rendering raytraced objects is slower than using Reflect/Refract.

Raytrace material is an advanced surface shading material. It supports the same kinds of diffuse surface shadin g that a standard material does. It can also create fully

raytraced reflections and refractions. It also supports fog, colour density, translucency, fluorescence and other special effects.

Translucency

A translucent material transmits light, but unlike a transparent material, it also scatters the light so those objects behind the material cannot be seen clearly.

Fluorescence

Fluorescence is light emitted from an object when it absorbs radiation from another source. Raytrace materials have the ability to simulate fluorescence.

The reflections and refractions Raytrace material generates are more accurate than those produced by the Reflect/Refract map. Rendering raytraced objects can be slower than using Reflect/Refract. On the other hand, Raytrace is optimised for rendering scenes. We can further optimise it for were scene by excluding specific objects from raytracing.

In Raytrace material, the surface reflects its Diffuse colour component without specular reflection.

10. Architectural Material

Architectural Material is physical properties, so it provides the greatest possible realism when used with photometric Light and radiosity. With this combination of features, you can create lighting studies with a high degree of accuracy.

Fig. 7.49:Architectural Material

	Study Notes

	Assessment

Write short notes on:

1. Top bottom material
2. Raytracing material

	Discussion

Create a rusted door of an old house using the material learned.

7.6 Design Viz Concept

You can create and modify 3D solids much faster and even work conceptually instead of just with actual dimensions. The changes that have been made do not just end with creating and modifying 3D solids, but also extend to the way you navigate and visualize 3D models.

Starting with AutoCAD 2007, you can create simplistic animations that allowed you to give a virtual tour of a model and produce realistic looking renderings with less effort

when compared to earlier releases. Autodesk VIZ or 3ds Max with your DWG files. AutoCAD is primarily designed as a drafting program, which allows you to create highly accurate drawings that are used to manufacture a part or construct a building.

While AutoCAD does create renderings and simplistic animations, it is not one of its core functionalities so it does not always perform these tasks efficiently. VIZ and 3ds Max were designed with their primary focus being on visualisation. VIZ and 3ds Max are better solutions when it comes to rendering and creating animations that can help to sell a project.

The 3d Max and 3D Max Design share the same binary code, but they differ in the following ways:

- User Interface and application defaults are optimised to maximise productivity.
- 3ds Max Design features Exposure technology not present 3DMax, for simulating and analysing sun, sky and artificial lighting.
- Only 3ds Max contains a powerful SDK for developers to allow them to create their own plug-ins.
- Tutorials and sample files will be customised to optimise the learning experiences of each customer group for each product.
- For each product, documentation contains custom content.
- Online documentation content will be tailored for visualisation or entertainment customers.

Study Notes

	Assessment
1. What are the features of 3D Max Design? 2. List the difference between 3D Max and Design.	

	Discussion
Explore more about 3D Design.	

7.7 Sunlight

The Sun is modelled as a parallel light source, which makes the incident direction of sunlight constant over all surfaces in the scene. We can specify the direction and intensity of the sun directly. Alternatively, the direction and intensity of the sun can be calculated based on geographical location, time and sky condition settings.

Both the Sunlight and Daylight systems use light in a system that follows the geographically correct angle and movement of the sun over the earth at a given location. In the world, we can choose location, date, time and compass orientation. We can also animate the date and time. This system is suitable for shadow studies of proposed and existing structures. Latitude, Longitude, North Direction and Orbital Scale can be animated as well.

Sunlight and Daylight have a similar user interface. The difference is that:

- Sunlight uses a directional light.

- Daylight combines sunlight and skylight. The sunlight component can be either an IES Sun light or a standard light. The sky component can be either an IES Sky light or a Skylight.

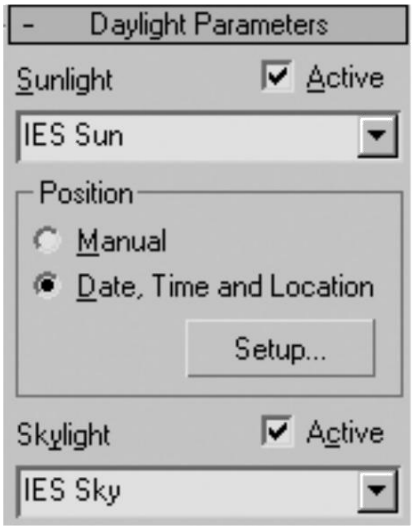


Fig. 7.50:Sunlight

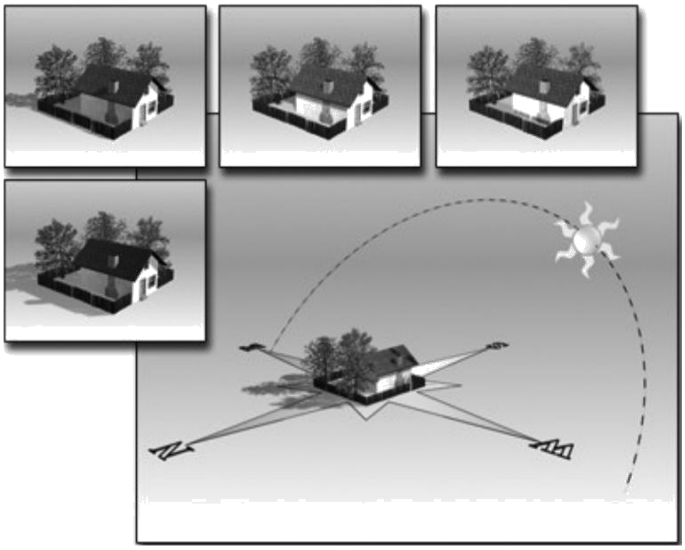


Fig. 7.51:Sunlight & Daylight Parameters

Sunlight:With this, we can select one of 3 options for sunlight in our scene:

IES Sun: This uses an IES Sun object to simulate the sun.

Standard: This uses a Target Direct light to simulate the sun.

No Sunlight: This uses no simulation of the sunlight.

Active: With this, we can turn sunlight on and off in the viewport.

Manual:With this, we can manually adjust the location of the daylight assembly head object in our scene.

Date, Time and Location:With this, we can use the geographically correct angle and movement of the sun over the earth at a given location.

Setup:With this, we canadjust the time, location and site of the daylight system.

Skylight: Select one of three options for skylight in the scene:

IES Sky: This is used as an IES Sky object to simulate skylight.

Skylight: This is used as a Skylight object to simulate skylight.

No Skylight: This is used for no simulation in the skylight.

Active:With this, we can turn skylight ON and OFF in the view port.

	Study Notes

	Assessment

1. Explain Sunlight.
2. List the parameters available for setting the Daylight parameters.

	Discussion

Model a corner of a house and apply Sunlight settings.

7.8 UVW Mapping

By applying mapping coordinates to an object, the UVW Map modifier controls how mapped and procedural materials appear on the surface of an object. Mapping coordinates specify how bitmaps are projected onto an object.

Following are the parameters:

Gizmo sub-object level: This enables gizmo transformations.

Planar: This projects the map from a single plane flat against the object, somewhat like projecting a slide.

Cylindrical: This projects the map from a cylinder, wrapping it around an object.

Cap: This applies planar mapping coordinates to the caps of the cylinder.

Spherical: This surrounds the object by projecting the map from a sphere.

Shrink Wrap: This uses spherical mapping, but truncates the corners of the map and joins them all at a single pole, creating only one singularity.

Box: This projects the map from the six sides of a box.

Face: This applies a copy of the map to every face of an object.

XYZ to UVW: The Maps 3D procedural coordinates to UVW coordinates.

Length, Width, Height: This specifies the dimensions of the UVW Map gizmo.

The dimensions are based on a bounding box of the gizmo.

U Tile, V Tile and W Tile: This lets you specify the dimensions of the UVW map for tiling the image.

Flip: This reverses the image about the given axis.

Map Channel: This sets the map channel.

Vertex Colour Channel: This defines the channel as a vertex colour channel by choosing this option.

7.8.1 MAPSCALER

1. MapScaler (OSM):

The MapScaler (OSM) modifier works in object space to maintain the scale of a map applied to an object. This lets you resize the object via its creation parameters without altering the scale of the map.

Scale: This represents the size of one repetition of the texture pattern.

U/V Offset: This specifies horizontal and vertical offset respectively.

Wrap Texture: This MapScaler attempts to wrap the texture evenly around the object.

Channel: This specifies the map channel.

2. Mapscaler (WSM):

MapScaler maintains the scale of a map applied to an object. This lets you resize the object without altering the scale of the map. Typically, you might use this to maintain the size of a map regardless of how the geometry is scaled.

Scale: This represents the size of one repetition of the texture pattern.

U/V Offset: This Specify horizontal and vertical offset respectively.

Channel: This specifies the map channel.

Wrap Texture: This MapScaler attempts to wrap the texture evenly around the object.

World Z-axis: This aligns the map with the Z-axis of the world.

Local Z-axis: This aligns the map with the local Z-axis of the object.

Study Notes

Assessment

1. Explain the types of UVW mapping available in 3d max.
2. Write a note on Mapscaler.

	Discussion
Explore the types of maps available by applying it on modelled furniture.	

7.9 Unwrap UVW Mapping

The Unwrap UVW modifier is used to assign planar maps to sub-object selections and to edit the UVW coordinates of those selections. The existing UVW coordinates on an object can be unwrapped and edited as well.

Maps can be adjusted to the proper fit on:

- Mesh
- Patch
- Polygon
- HSDS
- NURBS

The Unwrap UVW modifier can be used as a self-contained UVW mapper and UVW coordinate editor or in conjunction with the UVW Map modifier.

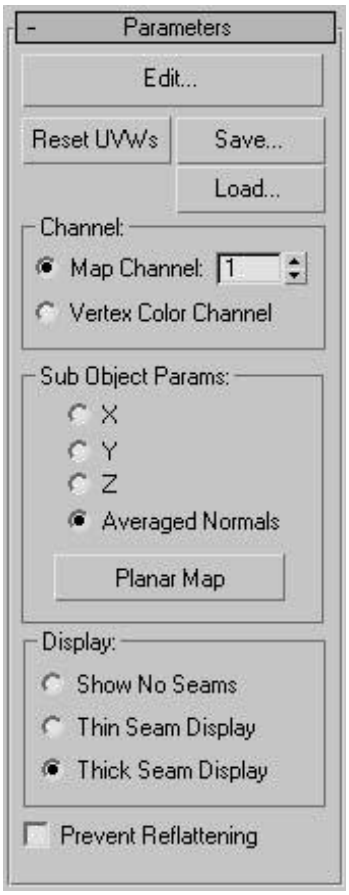


Fig. 7.52: Unwrap UVWParamet er Interface

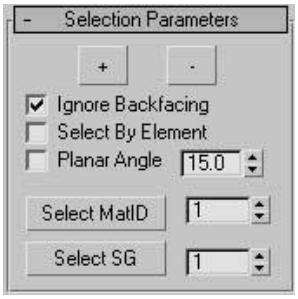


Fig. 7.53: Unwrap UVW Selection Parameter

After applying the modif ier, its panel appears, consisting of the modifier stack plus two rollouts:

Modifier Stack

The modifier stack provi des access to a Select Face sub-object level. The Select Face sub-object level is not available in the Unwrap UVW modifier. Selection Parameters

Use these settings to create a face selection for use by the modifier.

Prevent Reflattening: This option is used for texture baking.

Interface

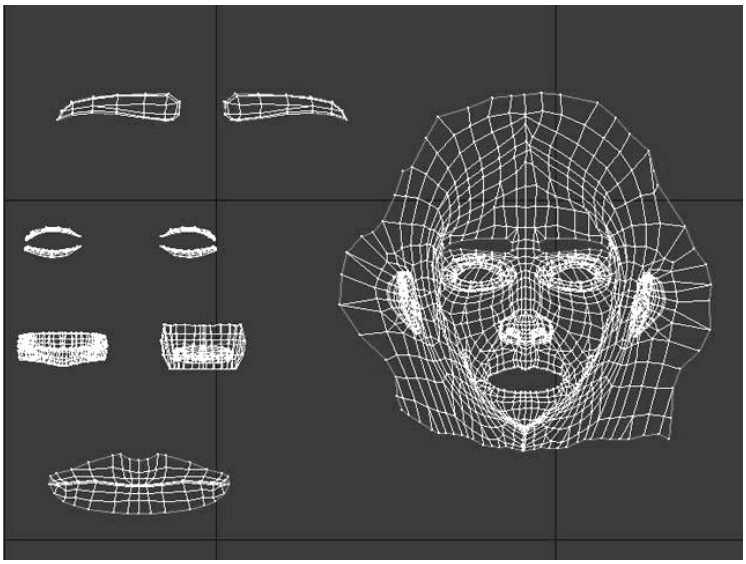


Fig. 7.54: Unwrap UVW of a face

Menu Bar

The menu bar provides access to edit UVWs.

Toolbar

Toolbar contains all the tools for manipulating the texture in the view window. The available tools are

- Move
- Rotate
- Scale
- Freeform Mode
- Move pivot
- Mirror
- Show Map
- UV / VW / UW Pick Texture

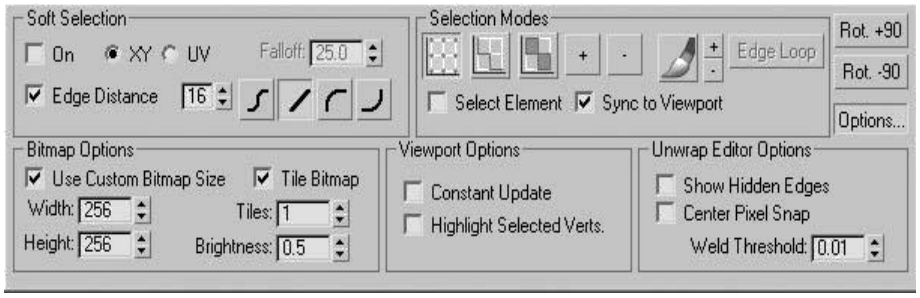


Fig. 7.55: Unwrap UVW Selection Mode

Soft Selection

The Soft Selection contro ls make a sub-object selection behave as if surrounded by a magnetic field.

The icons depict how their butto ns affect falloff. The flow options are:

-  Smooth
-  Linear
-  Slow Out
-  Fast Out

SUB-OBJECT MODE

- Vertex
- Edge
- Face

BITMAP OPTIONS

Use Custom Bitmap Size: Scales the bitmap texture to the values that are specified by Width and Height.

	Study Notes

	Assessment

1. Define UVW Mapping.
2. Explain the parameters of UVW mapping.

	Discussion

Carry out the UVW mapping of the modelled character.

7.10 Summary

INTRODUCTION TO MATERIALS AND MAPS

Materials can add much to the realism of your models. Learning to use the Material Editor, the Material/Map Browser and the Material/Map Navigator enables you to work with materials.

UNDERSTANDING MATERIALS AND MAPS

Maps: maps are just the textures. Materials: materials are the major once which not only provide a texture to the surface but also provide various surface options like shaders,

bump, opacity, shine, reflectance. . In max the procedural maps are: Cellular, Dent, Falloff, Marble, Noise, Particle Age, Particle Mblur, Perlin Marble, Planet, Smoke, Speckle, Splat, Stucco, Waves, Wood

Bitmaps And Procedural Maps

A material is data that we assign to the surface or faces of an object

Types of Maps

In 3d maps are patterns generated procedurally in three dimensions. Procedurally means the maps that we can edit according to our requirement. 2D Maps are two-dimensional images that are mapped over the surface of objects or used as environment maps

Types of Material

The Composite map- type is made up of other maps, which you layer atop each other using the alpha channel and other methods. Double Sided Material-This material lets you assign two different materials to the front and back faces of an object. Ink N Paint Material- This material is used for creating cartoon effect than realistic 3 dimensional material. Architectural Material is physical properties, so it provides the greatest possible realism when used with photometric Light and radiosity.

Design Viz Concept

You can create and modify 3D solids much faster and even work conceptually instead of just with actual dimensions. Autodesk VIZ or 3ds Max with your DWG files. AutoCAD is primarily designed as a drafting program that allows you to create highly accurate drawings that are used to manufacture a part or construct a building.

Sunlight

The Sun is modelled as a parallel light source, which makes the incident direction of sunlight constant over all surfaces in the scene.

UVWMapping

By applying mapping coordinates to an object, the UVW Map modifier controls how mapped and procedural materials appear on the surface of an object.

The Unwrap UVW modifier is used to assign planar maps to sub-object selections and to edit the UVW coordinates of those selections.

7.11 Self-Assessment Test

Broad Questions

1. What is material? How many different type of material are available in 3ds max?
2. What are maps? How many different types of maps are available in 3ds max?
3. What is Design Viz Concept? Explain sunlight.
4. What UVW and Unwrap UVW Mapping?

    a. Gradient Ramp
    b. Mask
    c. Mix
    d. Reflect/Refract
    e. Blend
    f. Ray tracing
    g. Ink and Paint
    h. Matte Shadow

7.12 Further Reading

1. Introducing 3ds Max 9: 3D for Beginners, Dariush Derakhshani, Randi L. Derakhshani and Jon McFarland.
2. 3ds Max at a Glance, George Maestri
3. Learning Autodesk 3ds Max 2008 Foundation, Autodesk
4. 3ds Max Essentials: Autodesk Media and Entertainment Courseware, Autodesk
5. Introducing 3ds Max, Dariush Derakhshani and Randi L. Derakhshani
6. Texturing and Modelling, Second Edition: A Procedural Approach (The Morgan Kaufmann Series in Computer Graphics) - Hardcover (Aug. 14, 1998), David S. Ebert
7. 3ds Max 2010 - Materials and Lighting

Assignment

Unwrap the UVWs of the character you have made in poly modelling and then create texture for the same.

Unit 2 Lights

Learning Outcome

After reading this unit, you will be able to:

- Describe Lighting basics
- Explain Max's light types
- Demonstrate Creating and positioning light objects
- Define Viewing a scene from a light
- Point out Altering light parameters
- Explain Using the Sunlight and Daylight systems
- Describe Using the Volume light effect
- Demonstrate Using projector maps and ray traced shadows

Time Required to Complete the unit

The time required to study this Unit is broken as follows:

1. 1st Reading: It will need 3 Hrs for reading
2. 2nd Reading with understanding: It will need 4 Hrs for reading and understanding
3. Self-Assessment: It will need 3 Hrs for reading and understanding
4. Assignment: It will need 2 Hrs for completing an assignment
5. Revision and Further Reading: It is a continuous process

Content Map

8.1 Introduction to Light

Lights play an important part in the visual process. Have you ever looked at a blank page and been told it was a picture of a polar bear in blizzard or looked at a completely black image and been told it was a rendering of a black spider crawling down a chimney covered in soot? The point of these two examples is that with too much or too little light, you really can't see anything.

Light in the 3D world figures into every rendering calculation and 3D artists often struggle with the same problem of too much or too little light. This chapter covers creating and controlling lights in your scene.

8.2 Concept of Light

In max, there are 2 types of options to apply texture to the object or a model.As we already know, to see anything, light is must. When the light rays hit an object, they are reflected off the surface of the object and enter into our eyes. This will let us view different objects. Lot of factors determines the behaviour of light. This includes the surface property of the object, the environment, the angle from which we look upon the object etc.

If the surface of the object is opaque, the light ray will be reflected completely. If the surface is transparent, the light rays will pass through and let us view the objects behind.

However, as the light rays will enter into a different medium, it will cause them to bend and slow down. This effect is knows as Refraction. The amount of refraction is determined by the thickness of the transparent object.

If the surface of an object is metallic, it will allow the surrounding to be reflected on its surface. This is known as Reflection.

If the light colour is white, it will allow us to see the objects with their own surface colour. However, if a light is of any other colour, it will mix with the colour of the object's surface and the resulting colour will be seen.

The colour of the surface of an object is controlled by a material component "Diffuse". As lot of light rays hit the surface of an object, there will be few rays, which enter into our eyes at exactly 90 degree.

Such rays will form a highlight on the object's surface. This is known as Specula.
When there is no light, the software will use default lights to shade and render the scene.

As soon as you put any light, the default lights are off. When you delete all the lights

in the scene, the default lights are put on again.

In the dialogue box, under Rendering Method, put on Default Lighting and click 2 Lights radio button. These two lights are known as

1. Fill Light
2. Key Light

Study Notes

Assessment

Define Light and the importance of lighting a scene in 3 d.

Discussion

Explore the types of lights available in3d max and make a list.

8.3 Types of Lights

3DS MAX provides two set of lig hts

1. Standard
2. Photometric

8.3.1 STANDARD LIGHT

1. Omni: Omni light is like a bulb, which illuminates in all directions.
2. Spot: Spotlight is a conical shape and creates a spot, rectangular or circ ular, on the object's surface.
3. Direct: Direct light cast parall el rays and form a spot on the surface of an object.
4. Skylight: Skylight, being little advanced, will be discussed later.

Fig. 8.1: Standard Light Roll-out

8.3.2PHOTOMETRY LIGHT

When we use photom etric lights, provides physically based simul ation of the propagation of light through a n environment. The results are not only highly realistic renderings, but also accurate me asurements of the distribution of light within t he scene.

The measurement of light is known as photometry

Four photometric quantitties are used in the lighting simulation system:

- Luminous flux
- Illuminance
- Luminance
- Luminous intensity

Luminous flux

Luminous flux is the quantity of light energy per unit time arriving, leaving or going through a surface.

Illuminance

Illuminance is the luminous flux incident on a surface of unit area.

Luminance

The light reflected off a surface in a particular direction is called luminance.

Luminous intensity

Luminous intensity is the light energy per unit time emitted by a point source in a particular direction.

Photometric lights

Photometric lights use photometric (light energy) values that enable us to more accurately define lights as they would be in the real world.

We can set their distribution, intensity, colour temperature and other characteristics of real world lights. We can also import specific photometric files available from lighting manufacturers to design lighting based on commercially available lights. When you create lights from the Create panel, photometric lights appear as the default.

Following are the types of photometric light objects:

- Target Light: This light is used to aim at object and follow them as they are animated.
- Free Light: This light has no target sub-object but can use transformation to aim at object.

	Study Notes

	Assessment

1. Write a short note on Standard Light.
2. Explain Photometric light.

	Discussion

Discuss where the Standard lights can be used.

8.4 Atmosphere and Effects

This rollout is available for all light types and comprises two options, viz. Lens Effects and Volume Light.

Fig. 8.2: Atmospheres & Effect roll-out

Lens effects

Lens effect is composed of several components, listed in the left hand side box.

Volume light

Likewise, when you select a spot or direct light and add Volume Light from the effects category. Click setup to access volume light options. It creates a light beam effect initiating from the source of the light. Depending upon the light, spot or direct, the shape of the beam will be either conical or parallel.

Checking Exponential will ensure the constant intensity of the light, which when off, will intensify the light near to its target.

To add an effect of dust particles, put on Noise, located at the bottom of the dialogue box and manipulate the options to achieve variety of dust particles.

	Study Notes

	Assessment
1. What is Atmosphere light? 2. Explain the parameters for Atmosphere light.	

	Discussion
Study the rollout parameters of Volume light.	

8.5 Radiosity

This technique is called Radiosityin the computer graphics world; it differs fundamentally from raytracing.Types of the daylight depend upon the colour temperature. Colourtemperature describes a colour in terms of degrees Kelvin (K).

LIGHT SOURCE	COLOUR TEMP	HUE
Overcast daylight	6000 K	130
Noontime sunlight	5000 K	58
White fluorescent	4000 K	27
Tungsten/halogen lamp	3300 K	20
Incandescent (glowing) lamp (100 to 200 W)	2900 K	16
	2500 K	12
Incandescent (glowing) lamp (25 W)	2000 K	7
Sunlight at sunset or sunrise	1750 K	5
Candle flame		

Skylight

The Skylight light models daylight. It is meant for use with the Light Tracer. We can set the colour of the sky or assign it a map. The sky is modelled as a dome above the scene.

Light tracer

The Light Tracer provides soft edged shadows and colour bleeding for brightly lit scenes such as outdoor scenes. Unlike radiosity, the Light Tracer does not attempt to create a physically accurate model and can be easier to set up.

8.5.1 CONCEPT OF PHOTONS

A light ray is made up of photons. They are the particles which make up a light. The photons are radiant energy capable of producing visuals for human eye.

Now there are two major sections of lighting

1. Interior
2. Exterior

In the exterior lighting, in the real world there is normally only light source i.e. Sun. The sky also takes part into illuminating the surrounding.

On the other hand, interior lighting is based on the accurate physical properties of the objects and measurement of lights. In an interior scene, when a light ray, composed of photons, hits the surface, it takes some colour of the surface and is reflected back to another surface. This process is known as diffuse reflections and only one light is capable of illuminating the entire scene.

However, it is not possible to simulate using the standard light, as they do not provide physically accurate calculations. Photometric lights are designed to serve this purpose. As they can accurately measure light using standard light parameters like luminance flux, luminance and luminous intensity, they allow highly realistic light renderings.

There are two plug-ins to work with these advanced lighting

- Light Tracer
- Radiosity

Light Tracer works with Skylight and Radiosity works with Photometric lights.

8.5.2 PHOTONS

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There are two plug-ins to work with these advanced lighting

- Light Tracer
- Radiosity

Light Tracer works with Skylight and Radiosity works with Photometric lights.

	Study Notes

	Assessment
1. Write a short note on concept of photon. 2. Explain Photons.	

	Discussion
Explore more about the plug-in used in for lighting effects to be created in 3D.	

8.6 Render to Texture

"Render to Texture" or "Texture Baking" allows us to create texture maps. This is completely based on an object's appearance in the rendered scene.

Render: This renders either the scene or the elements.

Unwrap Only: Applies the Automatic Flatten UVs modifier.

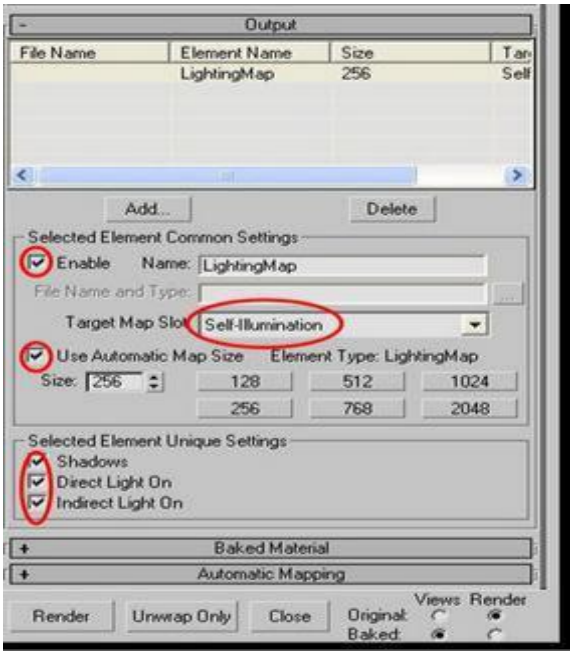

Fig. 8.3: Atmospheres & Effect Roll-out

This is applied to all selected objects.

Close: Closes the dialog.

Original / Baked: The original or baked material is displayed in the view ports.

Text field: The folder where the rendered texture will be saved can be specified.

Skip Existing Files: Allows us to render only those maps that do not already exist.

Drop menu: We can choose the options from the Load Preset.

Setup: Displays the Render Scene dialog.

Network Render: Rendering task to Server systems can be assigned.

List of objects: Shows all selected objects. The options in here are

- Name column
- Map Channel column
- Edge Padding column

Output List: Shows the following

- Maps names
- Element names
- Map sizes
- Designated map slots

Add: Adds the texture elements one or more element types so as to add to the list.

Delete: Click to remove the currently highlighted element.

Name: Enters the element component of the file name.

File Name and Type Enter the file name of the rendered texture.

This is saved in the TGA format.

Use Automatic Map Size: Sets the texture size automatically depending upon General Settings rollout.

Width: Specifies a custom resolution for the texture.

Output Into Source: Replaces any target map slot in the object's existing material.

Create Shell: Makes a new Shell material and assigns it to the object.

Duplicate Source To Baked: Makes a copy of the existing material.

Create New Baked: Creates a new material in the Baked Material slot.

Shader list: Specifies a shader to be used for the baked texture.

Update Baked Materials: Builds a Shell material for all selected objects.

Clear Shell Materials: Removes the Shell material applied to the texture-baked object.

Render to Files Only: When turned on, the baked texture files are rendered to the specified folder.

Rotate Clusters: Clusters are rotated to minimise the size of their bounding box.

Threshold Angle: The angle that determines the face clusters to be mapped.

Study Notes

Assessment

1. Write down the fundamentals of texturing.
2. What are the parameters required to bake a texture?

Discussion

Crate an aeroplane and apply texture, apply the bake texture option in the Render to texture window.

8.7 Mental Ray

Mental ray is a production quality rendering application developed by mental images (Berlin, Germany). As the name implies, it supports ray tracing to generate images. Its feature set is comparable to that of PhotoRealistic (PRman) RenderMan, the RenderMan compliant renderer by Pixar, over which it holds certain advantages and disadvantages.

Mental ray has been used in several feature films, including Hulk, The Matrix Reloaded & Revolutions, Star Wars Episode II: Attack of the Clones, The Day After Tomorrow and lately in Poseidon.

8.7.1 INDIRECT ILLUMINATION

Indirect Illumination roll out provides controls for the behavior of light with the MR renderer.

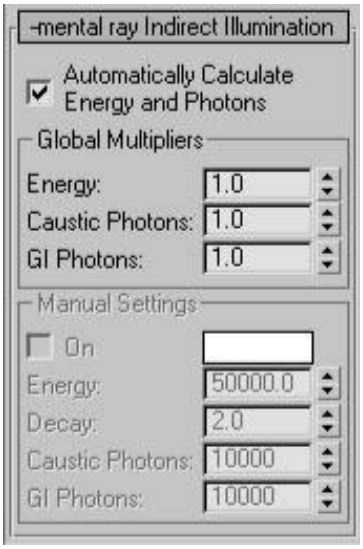

Fig. 8.4: Indirect Illumination rollout

8. 7.2 CAUSTICS

Caustics are the effects of light cast onto an object via reflection off or refraction through another object.

To render with caustics:

1. Select each object you wan t to generate caustics, Right-click and choose mental ray <panel Properties turn on Ge nerate Caustics.
2. Objects receive caustics by default. On the Render Setup dialog, go to the Caustics And Global Illumination rollout a nd turn on Caustics.
3. Adjust the caustics paramete rs to get the effect you want.
4. Render the scene.

8.7.3 GLOBAL ILLUMINATION

Global illumination imp roves the realism of a scene. This is done b y simulating radiosity or the inter-reflection of light in a scene.

To render with global illuminatio n:

1. Select each object you want to generate caustics, Right-click and choose mental ray <panel Properties turn on Generate Global Illumination and/or Receive Global Illumination
2. Render Setup < Indirect Illumination panel < Caustics And Global Illumination rollout < Global Illumination (GI) group and turn on Enable.
3. Adjust the global illumination parameters to get the effect you want.
4. Turn on Final Gather as well as Global Illumination, for the final rendering.
5. Render the scene.

8.7.4 Final Gather

Final gathering improves the quality of global illumination. It uses the photon map to calculate illumination.

8.7.5 Trace Depth

The Trace Depth controls calculate reflections and refractions. They refer to the photons used by FG.

Mental ray Shadow Map: Generates the shadows using the mental ray shadow-map algorithm.

No shadows appear in the rendering if we render with the default scan line renderer instead.

Transparent Shadows: Here, the shadow maps are saved with multiple Z-layers so as to have transparency.

Study Notes

	Assessment
1. Write a short note on Mental Ray. 2. Explain the process of rendering Caustics.	

	Discussion
Study the importance of Global illumination.	

8.8 Summary

INTRODUCTION TO LIGHT

Lights play an important part in the visual process. Have you ever looked at a blank page and been told it was a picture of a polar bear in blizzard or looked at a completely black image and been told it was a rendering of a black spider crawling down a chimney covered in soot? The point of these two examples is that with too much or too little light, you really can't see anything.

CONCEPT OF LIGHT

As we already know, to see anything, light is must. When the light rays hit an object, they are reflected off the surface of the object and enter into our eyes. This will let us view different objects. If the surface of the object is opaque, the light ray will be reflected completely. If the surface is transparent, the light rays will pass through and let us view the objects behind.

TYPES OF LIGHT

3DS MAX provides two set of lights: Standard and Photometric. Standard light include: omni light, Spot, Directional light etc.

CONCEPT OF PHOTONS

A light ray is made up of photons. They are the particles, which make up a light. The photons are radiant energy capable of producing visuals for human eye. However, this is not possible to simulate using the standard light, as they do not provide physically accurate

calculations.

ATMOSPHERE AND EFFECTS

This rollout is available for all light types and comprises two options, viz. Lens Effects and Volume Lightwhen you select a spot or direct light and add Volume Light from the effects category.

PHOTOMETRIC LIGHTS

Are designed to serve this purpose. As they can accurately measure light using standard light parameters like luminance flux, luminance and luminous intensity, they allow highly realistic light renderings.

RADIOSITY

As this technique is called in the computer graphics world, differs fundamentally from ray tracing. Types of the daylight depend upon the colour temperature. Colour temperature describes a colour in terms of degrees Kelvin (K).

RENDER TO TEXTURE

“Render To Texture” or "Texture Baking” allows us to create texture maps. This is completely based on an object's appearance in the rendered scene.

MENTAL RAY

Mental ray is a production quality rendering application developed by mental images (Berlin, Germany). As the name implies, it supports ray tracing to generate images. Its feature set is comparable to that of PhotoRealistic (PRman) RenderMan, the RenderMan compliant renderer by Pixar, over which it holds certain advantages and disadvantages.

8.9 Self-Assessment Test

Broad Questions

1. Which are the various standard lights available with 3ds max?
2. What are photometric lights? Define a photon.
3. What is Mantel ray? Give various features of mental ray.

Short Notes

a. Omni
b. Spot light
c. Photon
d. Sky light
e. Render to texture

8.10 Further Reading

1. Introducing 3ds Max 9: 3D for Beginners, Dariush Derakhshani, Randi L. Derakhshani and Jon McFarland.
2. 3ds Max at a Glance, George Maestri
3. Learning Autodesk 3ds Max 2008 Foundation, Autodesk.
4. 3ds Max Essentials: Autodesk Media and Entertainment Courseware, Autodesk
5. Introducing 3ds Max, Dariush Derakhshani and Randi L. Derakhshani
6. 3DS Max Lighting, Nicholas Boughen
7. Essential CG Lighting Techniques with 3ds Max, Second Edition, Darren Brooker CG artist Cosgrove Hall Digital
8. Environment Lighting for Production: 3ds Max Rendering Techniques with Tim Jones, Tim Jones
9. Essential CG Lighting Techniques with 3ds Max, Third Edition (Autodesk Media and Entertainment Techniques), Darren Brooker

Assignment

Create an interior as well as the exterior of the same and do lighting for it.

Unit 3 Environment and Effects

Learning Outcome

After reading this unit, you will be able to:

- Illustrate Using the Fire effect
- Explain Working with fog
- Define Adding render effects
- Demonstrate Using the Lens Effects to add glows, rays and streaks
- Discuss the other types of render effects

Time Required to Complete the unit

The time required to study this Unit is broken as follows:

1. 1st Reading: It will need 3 Hrs for reading
2. 2nd Reading with understanding: It will need 4 Hrs for reading and understanding
3. Self-Assessment: It will need 3 Hrs for reading and understanding
4. Assignment: It will need 2 Hrs for completing an assignment
5. Revision and Further Reading: It is a continuous process

Content Map

9.1 Introduction to Environment

In the real world, an environment of some kind surrounds all objects. The environment does much to set the ambiance of the scene. For example, an animation set at night in the woods has a very different environment than one set at the horse races during the middle of the day. Max includes dialog boxes for setting the colour, background images and lighting environment; these features can help define your scene.

This chapter covers atmospheric effects, including the likes of clouds, fog, fire and volume lights. These effects can be seen only when the scene is rendered.

Max also has a class of effects that you can interactively render to the Rendered Frame window without using any post-production features such as the Video Post dialog box. These effects are called render effects. Render effects can save you lots of time that you would normally spend rendering an image, touching it up and repeating the process again and again.

9.2 Environment & Effects

Environment is used for setting up atmospheric and background effects. Environment is the surrounding of your scene. You can use either a plain solid colour background or an image as an environment. It also allows assigning an animated background as well as numerous maps to choose from, as an environment. When you are using Advanced Lighting, in conjunction with exposure controls, the environment affects the way the objects in the scene are rendered.

Some of the other uses of the environment panel are as stated below

- Set and animate the background colour.
- Use an image in the background of the rendered scene (screen environment) or use texture maps as spherical, cylindrical or shrink-wrap environments.
- Set and animate the ambient light.
- Use atmospheric plug-in, such as volumetric light, in the scene.
- Apply exposure controls to renderings.

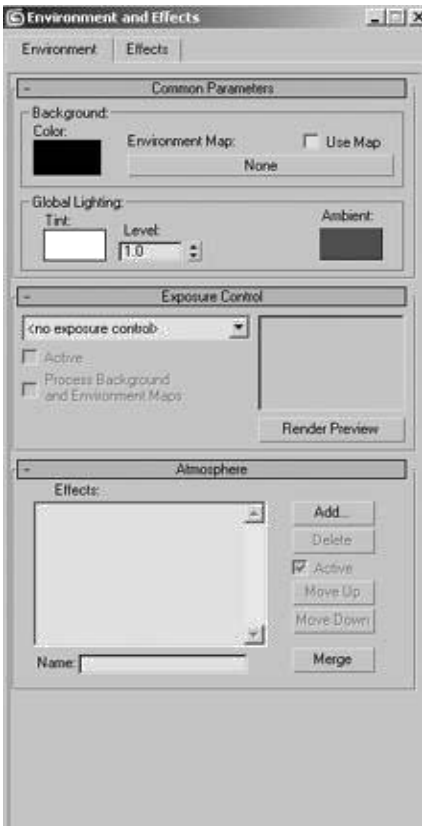

Fig. 9.1: Environment & Effect panel

Following are the parameters:

Colour: Sets the colour f or the scene background.

Environment Map: The b utton for Environment Map displays the name of the map.

The map must use Environmental mapping coordinates i.e. spherica l, cylindrical, shrink wrap and screen.

Use Map: Uses a map fo r the background.

Tint: Used to tint all lights in the scene.

Level: Multiplies all light s in the scene.

Ambient: Sets the colour for the ambient light.

Effects: Shows the queue of effects that were added.

Name: Customises the n ame to effects in the list.

Add: Adds Atmospheric Effect dialog.

Delete: Deletes a selected atmospheric effect from the list.

Active: Activates or de-activates the state for the individual effects in the list.

Move Up / Move Down: Moves the selected item in the list up or down to change the order in which the atmospheric effects are applied.

Merge: Merges effects from other max scene files.

9.2.1 Exposure Controls

Exposure Controls are plug in components that adjust the output levels and colour range of a rendering, as if we were adjusting film exposure. Exposure Controls are especially useful for renderings that use radiosity. Exposure control adjusts colours so they better simulate the eye's great dynamic range, while still fitting within the colour range that can be rendered.

9.2.2 Ambient

Ambient is the general light with no identifiable source or direction.

9.2.3 Tint

Used to apply a shade of the colour on the rendered scene. It is like using a colour filter in front of the camera.

9.2.4 Environment Map

Environment maps to create a background for the scene. The simplest 2D maps are bitmaps. Other kinds of 2D maps are developed procedurally.

Study Notes

	Assessment
1. Explain more about Ambient. 2. Write a note on Exposure control.	

	Discussion
Study the setting required for exposure control.	

9.3 View Port Background

The Viewport Background dialog controls display of an image or animation as the background for one or all viewports. You can use this for modelling, for example, by placing front, top or side view sketches in the corresponding viewports. Or use Viewport background to match 3D elements with digitised camera footage.

To assign an image to one or all viewports:

1. To display the background image, activate the viewport.
2. Choose Views menu > Viewport Background > Viewport Background or press Alt+B. This opens the Viewport Background dialog.
3. In the Background Source group, click the Files button.

   This opens the Select Background Image dialog.
4. Use the dialog to open the image or animation to use.
5. To display the image in all viewports, choose All Views in the Apply Source And Display To group.
6. Click OK.

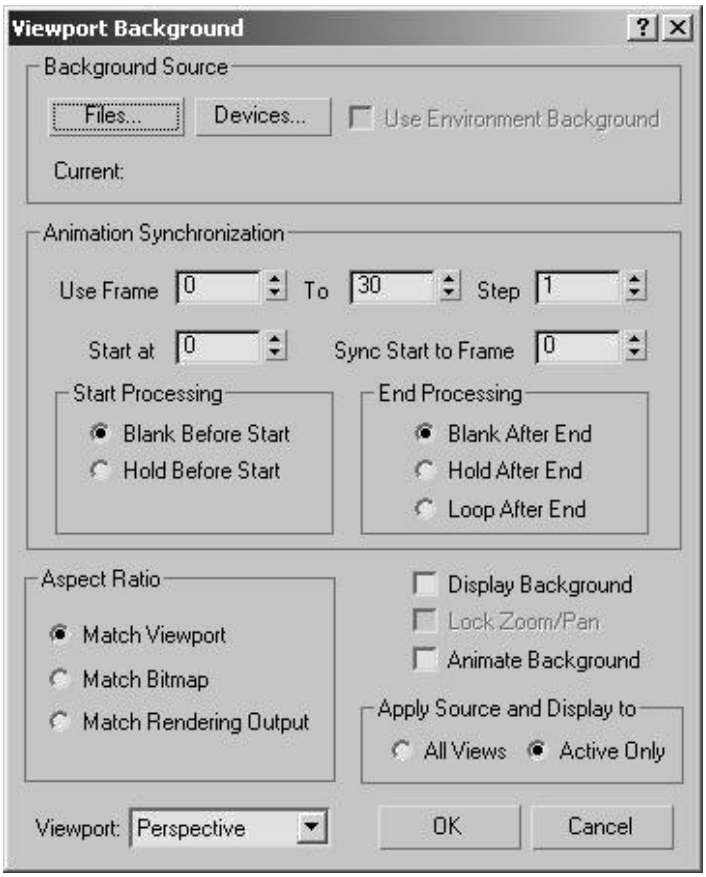

Fig. 9.2: Viewport Background Controls

	Study Notes

	Assessment
1. What is the use of View port Background image? 2. Write down the procedure to add View port Background image.	

	Discussion
Make a House model and add a viewport background image for the scene.	

9.4 Effects

In 3DS MAX the Effects panel is used to assign Render Effects plug in, apply image processing without using Video Post, adjust and view effects interactively and animate parameters and references to scene objects.

- Effects: Displays a list of selected effects.
- Name: Displays the name of the selected effect. Edit this field to rename the effect.
- Add: Displays a dialog listing all available rendering effects.
- Delete: Removes a highlighted effect from the window and from the scene.
- Active: Specifies whether the selected effect is active in the scene.
- Move Up: Moves the highlighted effect up in the window list.
- Move Down: Moves the highlighted effect down in the window list.
- Merge: Merges rendering effects from scene files.

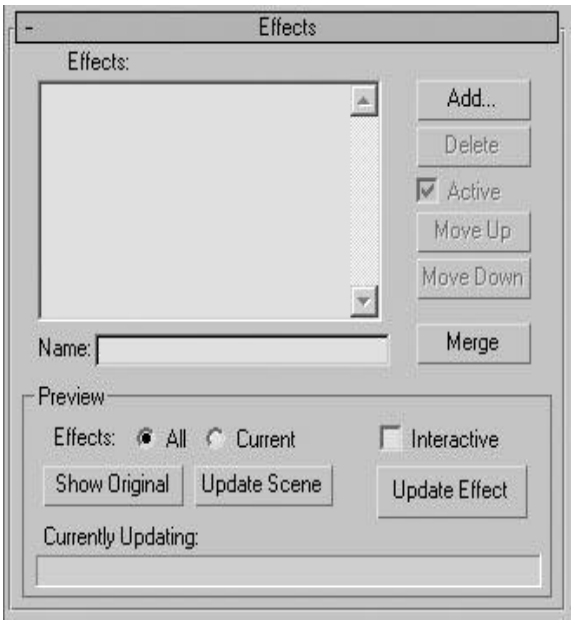

Fig. 9.3: Effect Panel

Interactive: These changes occur interactively in the rendered frame window as we adjust the parameters of an effect.

Show Original/Show Eff ects toggle: Show Original to display the original rendered image without any of the effects applied.

Update Scene: Updates the rendered frame window with all chan ges made in Rendering Effects as well as any changes made to the scene itself.

Update Effect: Manually updates the preview rendered frame wi ndow when Interactive is not on.

9.4.1 LENS EFFECTS

Lens effect is composed of several components, listed in the left hand side box.

9.4.2 B LUR EFFECTS

The Blur effect allows us to blur our image in three different methods: Uniform, Directional and Radial.

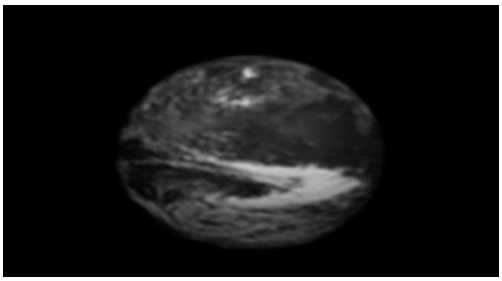

Fig. 9.4: Blur Effect

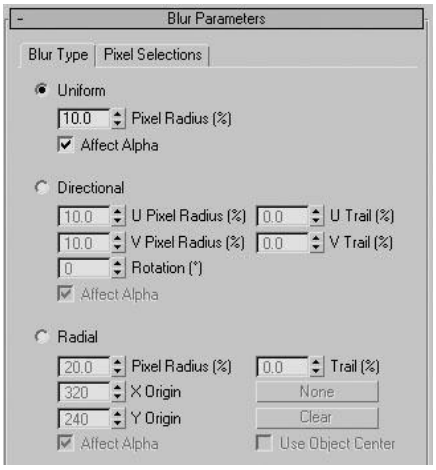

Fig. 9.5: Blur Parameters

9.4.3 Brightness a nd Contrast

Allows adjusting the brightness and contrast values of the scene

Contrast: Adjusts the con trast value of the file.

Brightness: Adjusts the b rightness value of the file.

Absolute/Derived: Deter mines the calculation of the gray value for con trast.

9.4.4 Col our Balance

The Colour Balance Eff ect allows you to manipulate additive/subtr active colour tinting through independent con trol of RGB channels.

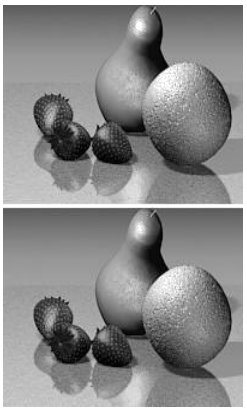

Fig. 9.6:Colour Balance Object

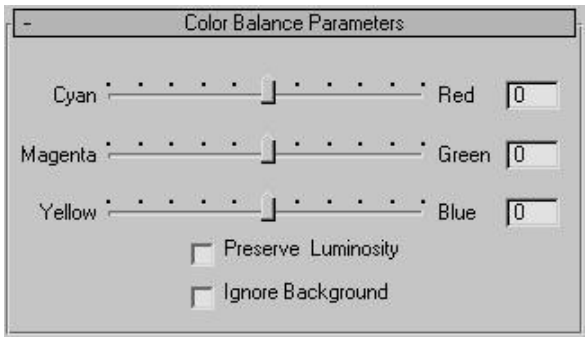

Fig. 9.7:Colour Balance Parameters

Cyan/Red:Adjusts the re d channel.

Magenta/Green: Adjusts the green channel.

Yellow/Blue: Adjusts the blue channel.

Preserve Luminosity: Wh en on, retains the luminosity of the image while correcting the colour.

Ignore Background:Whe n on, allows you to image correct a model without affecting the background.

9.4.5 Depth Of Field

Depth of Field choice h as been added to the Multi-Pass Effect drop- down list to support the mental ray renderer's depth-of-field effects.

9.4.6 File Output

File Output allows we to take a “snapshot” of a rendering before some or all of the other Render Effects are applied , depending on the placement of File Output in the Render

Effects stack.

Fi g. 9.8: File Output Parameters

Files: Opens a dialog so we can save the rendered image or animation t o disk.

The rendered output can be a still image or an animation, in one of the following file formats: Autodesk Flic Image F ile (FLC, FLI, CEL), AVI File (AVI), BMP Image file (BMP) , Encapsulated PostScript format (EPS, PS), JPEG File (JPG), Kodak Cineon (CIN), MOV QuickTime file (MOV), PNG Ima ge File (PNG), RLA Image File (RLA), RPF Image File (RPF), SGI's Image File Format (RGB), TargaImage File (TGA, VDA, ICB, UST), TIF Image File (TIF)

9.4. 7 FILM GRAIN

Film Grain is used to recreate the look of film grain in our rendered scen e. Film Grain also allows we to match film grain from source material used as a background, such as an AVI, to the rendered scene creat ed in the software.

Fig. 9.9: Film Grain Parameters

Grain: Sets the amount o f grain added to our image. Range=0 to 1.0.

Ignore Background: Masks the background so that grain is applied only to geometry and effects in the scene.

9.4.8 Motion Blur

Motion Blur applies an image motion blur to our rendered scene by blurring moving objects or the entire scene. Motion blur can enhance the realism of a rendered animation by simulating the way a real-world camera works.

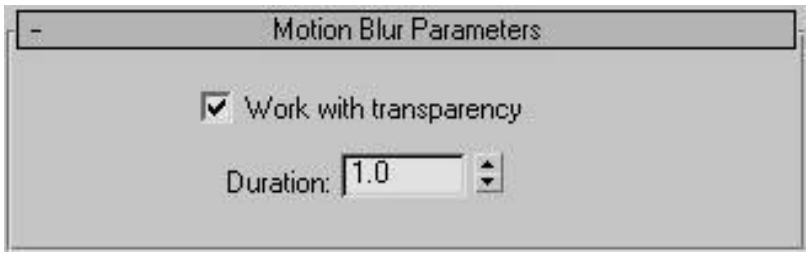

Fig. 9.10: Motion Blur Parameters

Work with transparency: When on, motion blur is applied to objects behind transparent objects.

Duration: Specifies how long the "virtual shutter" is open.

9.4.9 Gizmos

Gizmo is geometry that appears in viewports, but not in the scene. You manipulate a gizmo to modify the scene geometry or other effects. There are gizmos for transforms, modifiers, atmospheric apparatus and some directly modifiable geometry suc as spotlight cones.

9.4.1 Fire Effect

Use Fire to produce animated fire, smoke and explosion effects.

We can create a fire apparatus or "gizmo", to position the effect in our scene and to define the maximum boundaries of the effect.

The apparatus is a Helper object found in the Atmospheric Apparatus subcategory.

There are three kinds of apparatus: Box Gizmo, Sphere Gizmo andCyl Gizmo.

Box Gizmo:Box Gizmo lets we create a box shaped gizmo in our scene.

Sphere Gizmo:Sphere Gizmo lets we create a sphere or hemisphere shaped gizmo in our scene.

Cylinder Gizmo: Cylinder Gizmo lets us create a cylinder shaped gizmo in our scene.

Pick Gizmo: Enters an atmospheric apparatus in the scene.

Remove Gizmo: Removes the gizmo selected in the gizmo list.

Gizmo List: Lists apparatus objects assigned to the fire effect.

Inner Colour: Sets the colour of the densest part of the effect.

Outer Colour: Sets the colour of the sparsest part of the effect.

Smoke Colour: Sets the colour of smoke for use with the Explosion option.

Two options set the direction and general shape of flames.

Tendril: Creates directional pointed flames with veins along their centre.

Fireball: Creates round puffy flames.

Stretch: Scales flames along the Z-axis of the apparatus.

Regularity: Modifies how the flames fill the apparatus.

Flame Size: Sets the size of individual flames inside the apparatus.

Flame Detail: Controls the amount of colour change and edge sharpness seen within each flame.

Density: Sets the opacity and brightness of the fire effect.

Samples: Sets the rate at which the effect is sampled.

Phase: Controls the rate of change for the fire effect. FIG 10

Drift: Sets how flames are rendered along the Z-axis of the fire apparatus.

Explosion: Animates size, density andcolour automatically based on the animation of the Phase value.

Smoke: Controls whether or not the explosion creates smoke.

Fury: Varies the churning effect of the Phase parameter.

Set Up Explosion: Displays the Set Up Explosion Phase Curve dialog.

9.4.11 FOG

This command provides fog and smoke atmospheric effects. The extent of the fog layeris done in world units.

9.4.12 VOLUME FOG

Volume Fog provides a fog effect in which the fog density is not constant through 3D space.

	Study Notes

	Assessment

1. Write note on Blur Effect give an example where this effect can be used.
2. Explain Colour Balance.

	Discussion

Make a model of a street and use the fog effect to create a dramatic effect.

9.5 File Output

File Output allows we to take a “snapshot” of a rendering before some or all of the other Render Effects are applied, depending on the placement of File Output in the Render Effects stack.

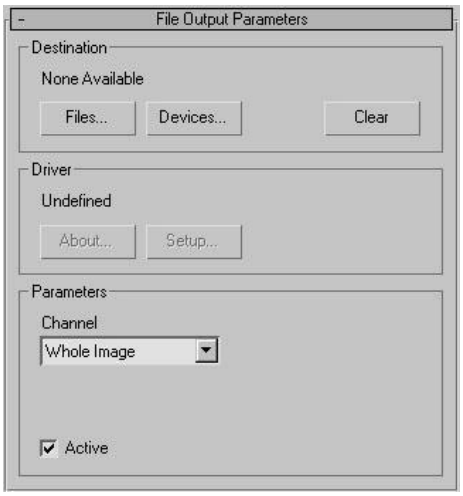

Fig. 9.11: File Output Parameters

Files: Opens a dialog so we can save the rendered image or animation t o disk.

The rendered output can be a still image or an animation, in one of the following file formats:

- Autodesk Flic Image File (FLC , FLI, CEL)
- AVI File (AVI)
- BMP Image file (BMP)
- Encapsulated PostScript for mat (EPS, PS)
- JPEG File (JPG)
- Kodak Cineon (CIN)
- MOV QuickTime file (MOV)
- PNG Image File (PNG)
- RLA Image File (RLA)
- RPF Image File (RPF)
- SGI's Image File Format (RGB)
- Targa Image File (TGA, VDA, ICB, UST)
- TIF Image File (TIF)

Devices: Opens a dialog so we can send the rendered output to a device such as a video recorder.

Clear: Clears any file or device selected in the Destination group box.

About: Provides information on the source of the image:handler software used to bring the image into the software.

Setup: Displays a setup dialog specific to the plug:in. Some plug:ins may not use this button.

Channel: Let us us choose which channel we wish to save or send back in to the Render Effects stack.

Affect Source Bitmap: This will take in an image with any effects previously applied, convert it to the channel selected and send it back into the stack for the rest of the effects to be applied.

Active: Turns the File Output feature on and off.

Copy: Click Copy to use the camera's clipping planes to determine which part of the scene should be rendered into the Depth channel image file.

None: Enables we to select a camera to use for copying clipping planes.

Near Z: Specifies the beginning distance from the camera that should be used in determining where to start rendering the scene's geometry in the depth channel image file.

Far Z: Specifies the ending distance from the camera that should be used in determining where to stop rendering the scene's geometry in the depth channel image file.

Fit Entire Scene: Makes all other Depth parameters unavailable and will render the entire view port's scene geometry in the Depth channel image file, automatically calculating the near and far Z required.

Study Notes

	Assessment
1. Explain the purpose of outputting a file. 2. List down the formats for outputting on 3D Max.	

	Discussion
Make a model of a street, use the fog effect to create a dramatic effect.	

9.6 Summary

INTRODUCTION TO ENVIRONMENT AND EFFECTS

Creating the right environment can add lots of realism to any rendered scene. Using the Environment and Effects dialog box, you can work with atmospheric effects. Atmospheric effects include Fire, Fog, Volume Fog and Volume Light.Environment is the surrounding of your scene. The environment affects the way the objects in the scene are rendered.

VIEWPORT BACKGROUND

The Viewport Background dialog controls display of an image or animation as the background for one or all viewports. You can use this for modelling, for example, by placing front, top or side view sketches in the corresponding viewports.

EFFECTS

In 3DS MAX the Effects panel Is used to assign Render Effects plug in, apply image processing without using Video Post, adjust and view effects interactively and animate parameters and references to scene objects with effects like Blur, brightness and contrast etc

FILE OUTPUT

File Output allows we to take a “snapshot” of a rendering before some or all of the other Render Effects are applied, depending on the placement of File Output in the Render

Effects stack.

9.7 Self-Assessment Test

Broad Questions

1. What are Environment features? Give brief description of available options.
2. What are effects? Give brief description of the available effects.

    a. Environment map

    b. Tint

    c. Exposure control

    d. Fire effect

    e. Lens effects

9.8 Further Reading

1. Introducing 3ds Max 9: 3D for Beginners, Dariush Derakhshani, Randi L. Derakhshani and Jon McFarland.
2. 3ds Max at a Glance, George Maestri
3. Learning Autodesk 3ds Max 2008 Foundation, Autodesk
4. 3ds Max Essentials: Autodesk Media and Entertainment Courseware, Autodesk
5. Introducing 3ds Max, Dariush Derakhshani and Randi L. Derakhshani
6. Foundation 3ds Max 8 Architectural Visualization, Brian L. Smith
7. Environment Creation for Production: 3ds Max Modelling and Texturing with Tim Jones, Tim Jones

Assignment

Create a space scene with Earth, Moon, Mars, star field and Sun.

Unit 4 Cameras and Rendering Techniques

Learning Outcome

After reading this unit, you will be able to:

- Interpret camera basics
- Explain Creating a camera object
- Define Viewing a camera in a viewport
- Explain Controlling cameras with the viewport camera controls
- Discuss Aiming a camera at objects
- Describe Altering camera parameters
- Explain Using the Camera Correction modifier
- Demonstrate Using camera effects

Time Required to Complete the unit

The time required to study this Unit is broken as follows:

1. 1st Reading: It will need 3 Hrs for reading
2. 2nd Reading with understanding: It will need 4 Hrs for reading and understanding
3. Self-Assessment: It will need 3 Hrs for reading and understanding
4. Assignment: It will need 2 Hrs for completing an assignment
5. Revision and Further Reading: It is a continuous process

Content Map

10.1 Introductionto Camera in 3D

Cameras in Max can also offer all kinds of amusing views of your scene from the real camera. The benefit of cameras is that you can position them anywhere within a scene to offer a custom view. You can open camera views in a viewport and you can also use them to render images or animated sequences. Cameras in Max can also be animated (without damaging the camera, even if your mischievous older brother turns on the dryer).

In the Camera Parameters, rollout is a section for enabling Multi-Pass Camera Effects. These effects include Motion Blur and Depth of Field. Essentially, these effects are accomplished by taking several rendered images of a scene and combining them with some processing.

10.2 More about Cameras

Whatever you make and animate in 3d world may not seem real or original unless and until you place a “Camera” in our scene.

Mostly seen in the hollywood movies like “ the fast and the furious”, “Constantine”, “The Mask”, “Mission Impossible”, “Men In Black”,”Vanilla Sky”, ……. now a days these effects are even seen in the bollywood movies like “Koi Mil Gaya”, “Dhoom”, “Dus”, “Khel”, “JaaniDushman”, ……

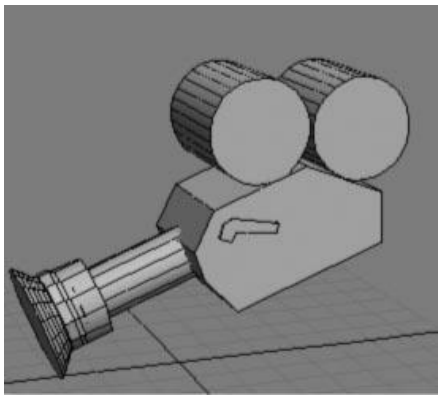

Fig. 10.1: Camera

The cameras in short, play a very vital role in animations as they add special effects like motion blur, jerks, DOF etc.The main aim of the camera is to “FOCUS”. The vieyour sees what the camera focuses. The motion is seen where the camera moves. You feel as if you are seeing the real world in the computer.

The reason behind the excellent originality in the 3d animated movies like “ FindingNemo”, “Monsters Inc”, “Shrek” etc. are due to cameras.

10.2.1 Explain Lens

Sets the camera's focal length in millimeters.

FOV Direction fly out: Lets you choose how to apply the field of view (FOV) value:

This Horizontal / vertical / diagonal: This applies the FOV horizontally / vertically / diagonally.

FOV: This determines how wide an area the camera views.

Orthographic Projection: The camera view looks just like a User view.

10.2.2 Focus

Specifies the distance from the camera's position to the plane that is in perfect focus.

10.2.3 Focal Length

Specifies the distance from the film plane to the camera lens.

10.2.4 Apertures

Specifies the size of the lens opening

10.2.5 Motion Blur

Motion Blur applies an image motion blur to our rendered scene by blurring moving objects or the entire scene. Motion blur can enhance the realism of a rendered animation by simulating the way a real-world camera works.

10.2.6 Depth of Field

The Depth of Field effect simulates the natural blurring of foreground and background scene elements when viewed through a camera lens.

10.2.7 Field Of View

Field-of-View adjusts the amount of the scene that is visible in a view port and the amount of perspective flare.

10.2.8 Pass Blending

The multiple depth-of-field passes are blended by dithering, which you can control by the parameters in this group.

These controls apply only to renderings of the depth-of-field effect, not to previews in viewports.

10.2.9 Normalize Weights

Passes are blended with random weighting to avoid artifacts such as streaking. When Normalise Weights is on, the weights are normalised, giving a smoother result. When off, the effect is a bit sharper but usually grainier. Default=on.

Dither Strength

Controls how much dithering is applied to the rendered passes. Increasing this value increases the amount of dithering and can make the effect grainier, especially at the edges of objects. Default=0.4.

Tile Size

Sets the size of the pattern used in dithering. This value is a percentage, where 0 is the smallest tile and 100 is the largest. Default=32.

10.2.10 Camera Map Modifier

Pick Camera: This is used to apply the UVW coordinates.

Map Channel: This is used to choose a map channel to use

Vertex Colour Channel: This sets the Vertex Colour channel.

Label: Names the current camera used for mapping.

Pick Camera: Used to select the camera for mapping

Map Channel: Specifies the use of a map channel.

Vertex Colour Channel: Specifies use of the Vertex Colour Channel.

10.2.11 Camera Correction Modifier

The Camera Correction modifier applies two-point perspective to a camera view.

Amount: This set the amount of correction for 2-point perspective.

Direction: This biases the correction.

Guess: Use this to have the Camera Correction modifier set a first-guess Amount value.

There are 2 types of cameras present in 3ds max i.e. Free & Target Camera.

Use them to move the camera or its target along the camera's main axis to and fro.

Dolly Camera: moves the camera to and fro.

Dolly Target: moves the target to and fro.

Dolly Camera + Target: moves both the target and the camera to and fro.

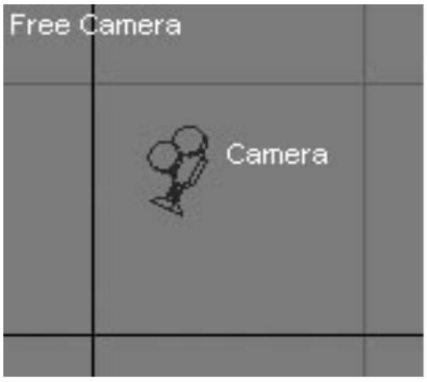

Fig. 10.2: Free Camera

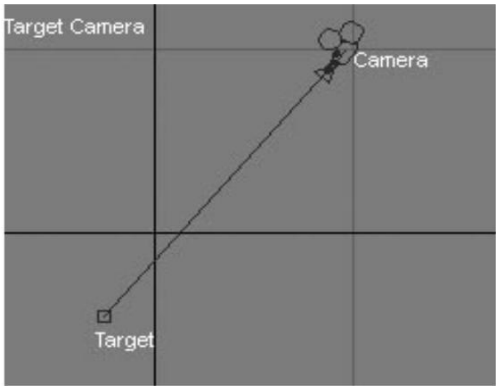

Fig. 10.3: Target Camera

Fig. 10.4: Camera Object Type

Fig. 10.5: Camera Parameters

Study Notes

	Assessment
1. Explain Pass Blending. 2. Explain Camera Map Modifiers.	

	Discussion
Explore and study the Camera parameters and try adding the same to the scene.	

10.3 Rendering

Rendering is used to shade the scene's geometry as per the

- Lighting
- Materials
- Environment

Three renderers are provided with 3ds max. Additional renderers might be available as third-party plug-in components. The renderers provided with 3ds max are:

Default scan line renderer

It is the default renderer is active by default. It renders the scene in a series of scale lines.

Mental ray renderer

This is an advanced renderer and it renders the scene in a series of square “buckets.” VUE file renderer

The VUE file renderer generates the data in ASCII form.

Important values that enhance the scene while rendering with the mental ray renderer are

Physically based indirect illumination

- Exposure control
- BSP
- Grid ray-trace acceleration
- Final gathering
- Photon map
- Back face culling
- Shadow maps
- Motion blur

10.3.1 RAM PLAYER

The RAM Player loads a frame sequence into RAM (Random Access Memory). It plays back the loaded frames as per the frame rates we specify. It consists of 2 channels: channel A and channel B.

Two different sequences can be loaded into the channels to play back together, giving you the ability to compare them.

The options that allow us to focus when we compare 2 channels:

- Channel A
- Channel B
- Split Screen
- Transport Panel
- Frame Rate Control
- Colour Selector
- Double Buffer

10.3.2 RENDERING TECHNIQUES

Angular Dashpot

Dashpots typically serve to cushion impact. It constraints the relative orientation of two rigid bodies.

Linear Dashpot

Dashpots typically serve to cushion impact. The Linear Dashpot constraint lets you constrain two rigid bodies together in the simulation or to constrain one body to a position in world space. It behaves like a heavily damped spring with zero rest length.

Rag Doll Constraint

The Rag Doll constraint lets you realistically simulate the behaviour of body joints, such as hips, shoulders and ankles. Once you decide the degree of movement a joint should have, you can model it by specifying limiting values for the Rag Doll constraint.

Car-Wheel Constraint

You can use this constraint to attach a wheel to another object; for instance, a car chassis. You can also constrain a wheel to a position in world space.

Point-Point Constraint

The Point-Point (point-to-point) constraint lets you attach two objects together or an object to a point in world space.

Point-Path Constraint

The Point-Path constraint allows you to constrain two bodies so that the child is free to move along a specified path relative to the parent.

10.3.3 Pixel Based Camera Mapping

It projects the map from the direction of a particular camera.

Uses

- For 2D matte painting
- To render the scene
- Adjust the rendering

Using the image as a matte that is projected

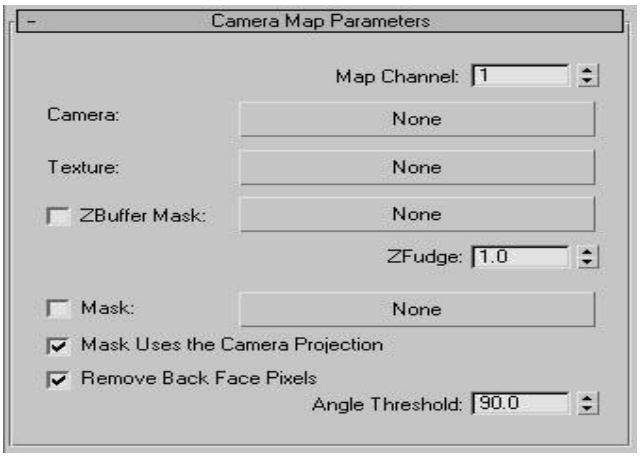

Fig. 10.6: Camera Map Parameters

Map Channel: Chooses t he map channel.

Camera: Selects a camer a in the scene.

Texture: Applies the texture to project.

ZBuffer Mask: Used to mask the projection from unwanted surfaces.

Mask: Used to view one map through another.

Remove Back Face Pixels : Exclude surfaces that face away from the cam era.

Angle Threshold: Specifies the angle to use as a cutoff when removing back face pixels.

	Study Notes

	Assessment
Write a note on: 1. RAM player 2. Pixel based mapping	

	Discussion
Explore the renderers available them market.	

10.4 Path Constraint for Camera

Path constraint positions the service platform along the side of the bridge. A path constraint restricts an object's movement along a spline or at an averaged distance between multiple splines. A path target can be any type of spline. The spline curve defines a path of motion for the constrained object.

Fig. 10.7: Path Parameters

Following are the parameters:

Adds path: This adds a n ew spline path that influences the constrained object.

Delete path: This remo ves a path from the target list. Once removing the path target, it will no longer influence the constrained object

Weight: This assigns and animates weight values for each target.

%Along Path: This set the percent that the object is positioned along the path.

Follow: This aligns the ob ject to the trajectory as it follows the contour.

Bank: This allows the object to bank (roll) as it negotiates the curves of the spline.

Bank Amount: This adju sts the amount of the banking to one side or the other, depending on whether the value is positive or negative.

Smoothness: This contro ls how rapidly the roll angle changes as the o bject moves

through bends in the trajectory.

Allow Upside Down: This turns ON to avoid the situation in which an object flips when going around a vertically oriented path.

Constant Velocity: This provides a constant velocity along the path.

Loop: This by default, when the constrained object reaches the end of a path it can no longer move past the end point.

Relative: This turn ON to maintain the original position of the constrained object.

Axis: This defines which axis of the object is aligned to the trajectory of the path.

Flip: This turn ON to flip the direction of the axis.

Active: This activates an axis (X/Y/Z) and allows the selected object to animate along the activated path.

Limited: This limits the range of motion allowed on an active path.

Ease: This causes a joint to resist motion as it approaches its From and To limits.

From and To Spinners: This determine for path limits. Use in conjunction with the Limited function.

Damping: This applies resistance over a joint's motion along the path and simulates the natural effect of joint friction or inertia.

Study Notes

	Assessment
1. Define Path Constrain used for camera. 2. List the parameters for adding path constrain to cameras.	

	Discussion
Create a model of a bee and path constrain camera to follow the bee.	

10.5 Summary

INTRODUCTION TO CAMERAS

Cameras can offer a unique look at your scene. You can position and move them anywhere. In this unit, you discovered how cameras work and how to control and aim them at objects. With Multi-Pass camera effects, you can add Depth of Field and Motion Blur effects.

MORE ABOUT CAMERA

The main aim of the camera is to “FOCUS”. The viewer sees what the camera focuses. The motion is seen where the camera moves. You feel as if you are seeing the real world in the computer. In camera, FOV: This determines how wide an area the camera views, The Depth of Field effect simulates the natural blurring of foreground and background scene, aperture Specifies the size of the lens opening etc. similarly there are other parameters.

RENDERING

Rendering is used to shade the scene's geometry. The renderers provided with 3ds max are:

Default scan line renderer, Mental ray renderer, VUE file renderer

The RAM Player loads a frame sequence into RAM (Random Access Memory). It plays back the loaded frames as per the frame rates we specify.

Path constraint positions the service platform along the side of the bridge. A path constraint restricts an object's movement along a spline or at an averaged distance between multiple splines

10.6 Self-Assessment Test

Broad Questions

1. What is camera? Discuss its features.
2. Define Rendering. Prepare a list of available renderers for 3ds max.

Short Notes

a. Focal length
b. Depth of field
c. Motion blur
d. Path constraint
e. Pixel based camera mapping

10.7 Further Reading

1. Introducing 3ds Max 9: 3D for Beginners, Dariush Derakhshani, Randi L. Derakhshani and Jon McFarland.
2. 3ds Max at a Glance, George Maestri
3. Learning Autodesk 3ds Max 2008 Foundation, Autodesk
4. 3ds Max Essentials: Autodesk Media and Entertainment Courseware, Autodesk
5. Introducing 3ds Max, Dariush Derakhshani and Randi L. Derakhshani
6. Foundation 3ds Max 8 Architectural Visualisation, Brian L. Smith
7. Environment Creation for Production: 3ds Max Modelling and Texturing with Tim Jones, Tim Jones
8. Architectural Rendering with 3ds Max and V-Ray: Photorealistic Visualisation

Assignment

Create a walkthrough for the interior and exterior you have created earlier.

Glossary

2 Dimensions	A dimension can be defined as number of parameters or coordinates required to define points for a shape or an object.
Persistence of vision	Avisual illusion of the objects. Persistence of vision is a phenomenon of eye in which an image continues to appear in one's vision after the exposure to the original image has ceased.
3 Dimensions	3D comprises an extra dimension known as z coordinate which stands for rotation and depth.
Perspective view	This view shows the objects with the vanishing point which belong to the horizon. This views show the depth in the scene, resembling the human vision.
Orthographic view	This view represents the objects in 2D.
Wireframe	It displays the object as if it is made of wires.
Edged faces	This highlights the edges of the object.
Show safe frames	This shows the proportion of the width and height of the output size of the rendering output.
Time controls	The complete animation in the file can be controlled with these tools. Time controls contain set of playback buttons like play, stop, step backward, step forward etc.
Transformation tools	These tools are used for applying the movement or changing the orientation of the object.
Standard primitives	These are collection of basic object such as spheres, cubes, cone etc.
Extended Primitives	These are collection of complex primitives such as Hedra, Torus etc.
Clone Option	The options given here are normally used to create the duplicate of the selected object.
Grouping	This option is used to create a group of the selected objects.
Boolean	This combines two other objects by performing a Boolean operation on them.

Hierarchy	It is an arrangement of items from top to bottom, which allows us to differentiate between parent and child in the PARENT-CHILD relationship
Pivot point	Pivot point is the center point or a local point of the local coordinate. The pivot point is defined for transformation
Object-space modifiers	Object-space modifiers straight transform an object's geometry in local object space. it shows directly above the object with other object-space modifiers in the modifier stack.
World-space modifiers	They act as object-specific space warps. They are carried with the object.
Shapes	Shapes are the objects which are made up of 2 or more than 2 splines. Spline is a collection of segments or vertices.
Text	Text is the name suggests this tools is used write the text.
Lathe modifier	With this modifier, we can spin the spline around on a particular axis in 360 degree to create a 3D object.
Extrude modifier	This modifier is used to give the height to the drawn spline or to add the depth to the drawn spline.
FFD Modifier	The full form of FFD is Free Form Deformation. This can be called as a modelling tool. This modifier is commonly used for making animation related to soft bodies.
Poly Modelling	The “Poly Modelling” is also a kind of the modelling tool with which we can easily modify the objects and convert it into desirable objects and shapes.
Conform	Conform is a compound object with which we can wrap the selected object to the base object. It projects the vertices of the wrapper on to other surface which is called as wrap-to object.
Loft	With this, we can extrude 2 splines on the third dimensional axis
Surface Modelling	With this kind of modeling, we can easily create a patch surface depending upon the splines that we select. This

	modelling can be said done after we apply the surface modifier to the contours that connects each other
NURBS	NURBS stands for Non-Uniform Rational B-Splines. NURBS are popular because they are easy to manipulate interactively.
Material	A material is data that we assign to the surface or faces of an object so that it appears a certain way when rendered
Raytracing	Raytrace material is an advanced surface shading material. It supports the same kinds of diffuse surface shading that a standard material does.
Mapscaler	The MapScaler (OSM) modifier works in object space to maintain the scale of a map applied to an object.
Photons	A light ray is made up of photons. They are the particles which make up a light.
Radiosity	As this technique is called in the computer graphics world, differs fundamentally from ray tracing.
Mental ray	Mental ray is a production quality rendering application developed by mental images (Berlin, Germany). As the name implies, it supports ray tracing to generate images.
Motion Blur Effect	Motion Blur applies an image motion blur to our rendered scene by blurring moving objects or the entire scene.