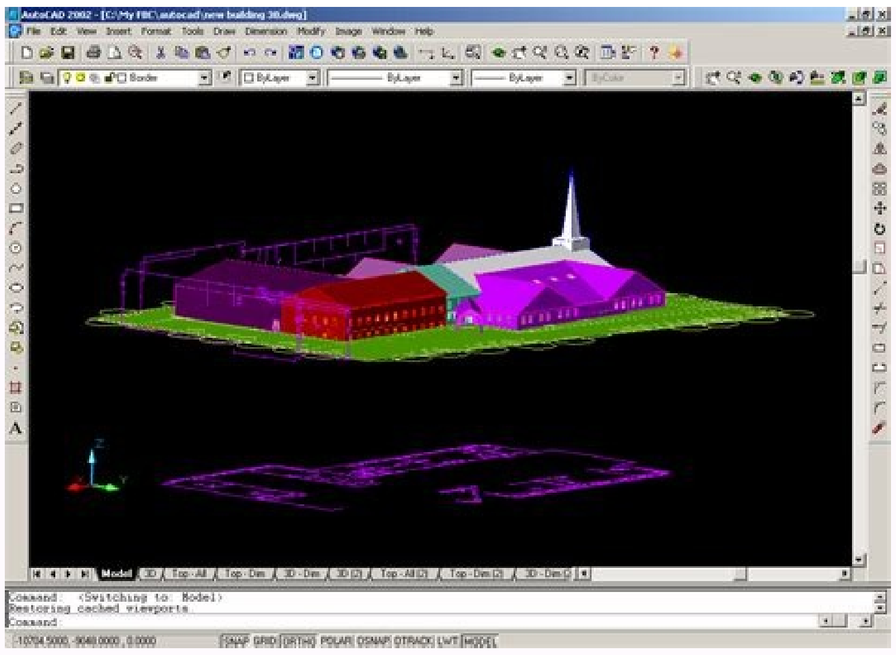
Autocad 3d modeling notes pdf



TUTORIAL 1

AutoCAD 3D Modeling

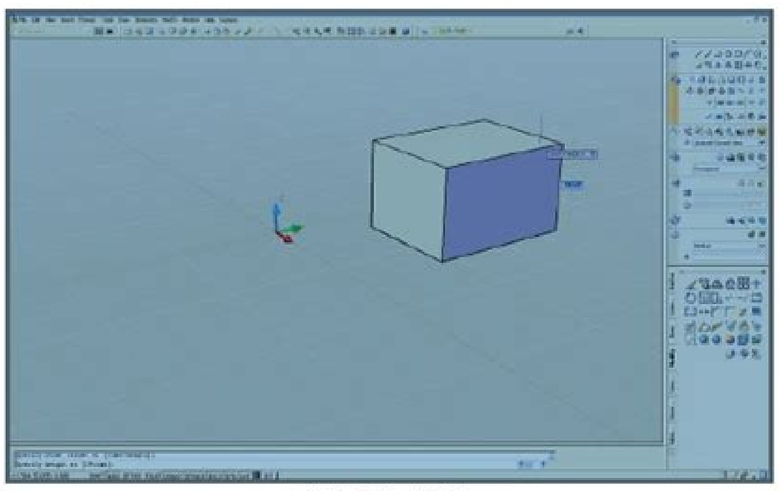
3D Modeling Workspace

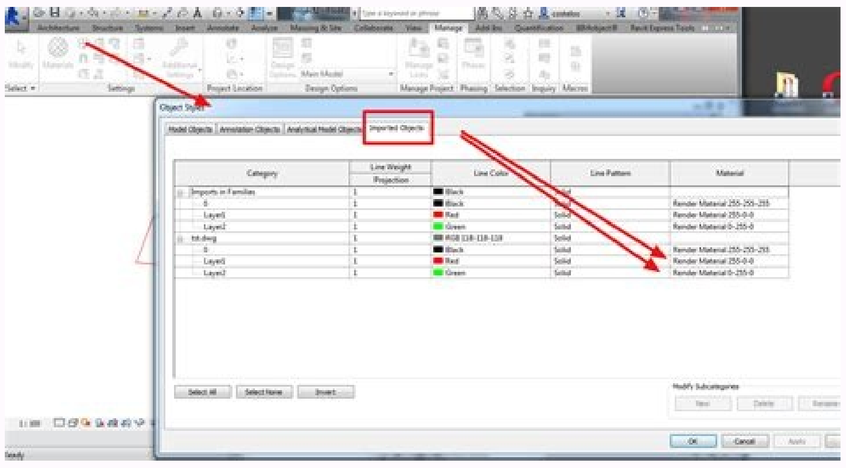
Required Competencies

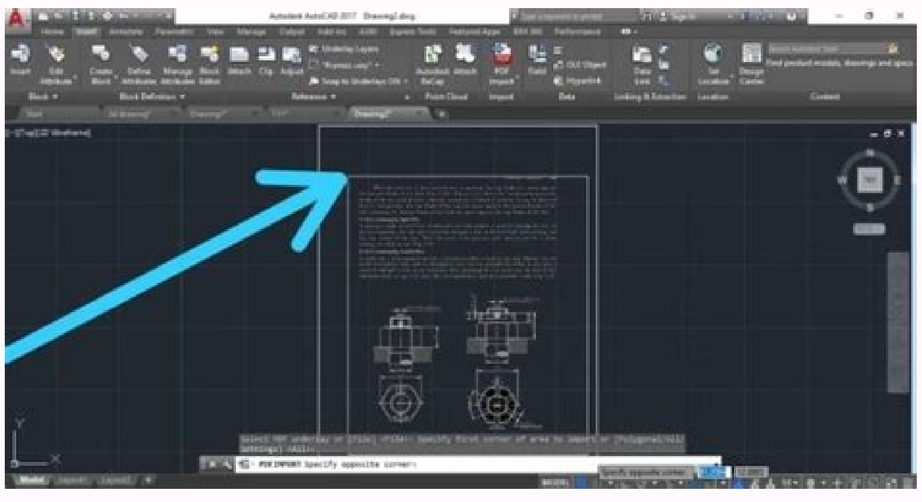
Before starting this tutorial, you should have been able to:

- Use the 3D Modeling tools available in previous releases of AutoCAD
- Use AutoCAD at an intermediate to advanced level
- Manipulate the UCS

The new 3D modeling tools in AutoCAD 2007 allow you to model complex freeform shapes that previously were not possible to model in AutoCAD. This tutorial assumes that the user is completely familiar with creating precise 2D sketches of arcs, lines, polylines, and splines in any location as well as the 3D tools from previous releases.







Autocad 3d modelling.

Introduction to AutoCAD 3D Commands AutoCAD is three-dimensional CAD software that is used commercially across the world. Developed by Autodesk in the year 1982. AutoCAD is also available as a mobile and web app, which is marketed as AutoCAD 360. AutoCAD offers an exclusive range of commands and functions both for 3D and 2D modeling and drawing with an amazing set of tools. 3D is all about the third Z coordinate. While working in 2D, the user only cares for the X and Y axis, and most of the time, coordinates are not used. Whereas, while working with 3D, the user uses all the coordinates, which can even make their work quite easier. Why do I need a 3D? Today, technology has made it possible to link our imagination a bit closer to the reality, and it can be done by 3D modeling, printing, rendering and more. A huge number of software is available in the market that offers the users to bring their imagination into reality. Some of the software is freeware, while some are priced. With every update and with continuous new discoveries, people are more attracted to the technology offering them to make and create vivid designs. The need for 3D is a necessary part of the designing world. Without it, the design almost looks like a sketch. Moreover, 3D is a boost for all the interior designers, architects who can design life-like models of any building, office or any exterior with some interiors as well like furniture, walls, show pieces and more. 3D modeling The process of creating a mathematical representation of any surface of an object in three dimensions by using special software is called 3D modeling. A 3D model can even be represented as a two-dimensional image by using the 3D rendering process. The user can also create 3D models physically using 3D printers. There is a lot of software that is used to create 3D models like AutoCAD, MAX, MAYA, and many more. 3D models are high in demand with the game developers as well. Some computer games use already rendered images of 3D models, which are known as sprites. This helps the designer to view the model in all directions, and they can make sure that the object created is like the original one. Presently, 3D models are also used by the movie industry; they use them as objects for animated and real-life pictures. Also, since a lot of VFX is used in movies and the gaming industry, 3D models, renders and effects are most commonly used. The medical industry also uses 3D models of organs. Some of the benefits of 3D modeling are: – Using 3D models, users can get a more evocative design, and they can even see the virtual images of their projects. An architectural 3D model is much more interesting and realistic than a 2D model. The experience that a 3D model gives is much more compelling and satisfying to the user than viewing a 2D drawing. The user can see the impact of all the minor and major changes made in a 3D model. This also aids in the better finishing of the designs without wasting time and money. 3D models are an amazing advantage to interior designers as they get to create and then modify 3D interior as well as exterior as per their need and choice. In a 3D design, the user gets to know the physical dimensions of the objects and their distance in relation to other objects in the total layout. This feature helps enormously to see and modify arrangements of objects based on their sizes. Some artists use a mixture of 3D modeling for best results by editing the 2D computer-rendered images from the 3D model. Top AutoCAD 3D Commands Let us look at the top commands, which are as follows: Revolve Location: Draw > Modeling > Revolve This AutoCAD 3D command creates a 3D solid by revolving a 2D object around an axis. Extrude Location: Draw > Modeling > Extrude This AutoCAD 3D Extrude command allows the user to create a 3D object by extruding a 2D face along a line or path. For example, A cylinder can be created by selecting a 2D circle and extruding it along with a path. Sweep Location: Draw > Modeling > Sweep This command helps the user to extrude the 2D objects without the 2D face being orthogonal to the beginning of the path. Union Location: Modify > Solids Editing > Union This AutoCAD 3D command allows the user to combine two objects converting them into one single object. Subtract Location: Modify > Solids Editing > Subtract This command is opposite to the union command; this command works when there is a common area in both the objects. Then this command subtracts the object A from the object B. Intersect Location: Modify > Solid Editing > Intersect With this AutoCAD 3D command, the user is left with the area that is common to both the objects. 3D Drawing Tools AutoCAD is primarily used for generating 2D sketches. While it is possible to create 3D objects, AutoCAD is built around a flat, sketch-based interface. There is a wide range of pre-defined 3D objects in AutoCAD. These objects are cylinders, spheres and wedges and many more. But then users use 2D objects and modify them using the 3D commands accordingly. So, AutoCAD 3D commands like Extrude, Sweep, Revolve, Union are used by the users. Also, the user must know the importance of the Viewport feature if they are working on 3D Models. The viewport command allows the user to split the drawing area into different windows to project multiple views of the model. These include the top, front, left/right views of the object. This feature works great for the user and helps them to observe the model from different aspects. Conclusion – AutoCAD 3D Commands AutoCAD 3D Commands is a lengthy and challenging software for the beginners. Yet it is extremely useful and has a lot of benefits. It is a powerful CAD software, which is used for architectural design and mechanical engineering. It has one of the best toolboxes and functions to support 2D drawings. However, it is impressive when it comes to 3D design, with its 3D rendering feature that gives stunning and vivid outputs. Recommended Articles This has been a guide to AutoCAD 3D Commands. Here we have discussed different AutoCAD 3D commands like Extrude, Sweep, Revolve, Union, Subtract, Intersect. You may also look at the following article to learn more – AutoCAD Commands Uses Of AutoCAD 3D Software Design AutoCAD For Students Full PDF PackageDownload Full PDF PackageThis PaperA short summary of this paper13 Full PDFs related to this paperDownloadPDF Pack 1. AutoCAD 3D Tutorials - 1 - AutoCAD® 2013 3D Tutorials By Kristen S. Kurland C o p y r i g h t © 2 0 1 2 AutoCAD is a registered trademark of Autodesk, Inc. 2. AutoCAD 3D Tutorials - 2 - AutoCAD 3D – Chapter 1 3D Interface 3. AutoCAD 3D Tutorials - 3 - 1.1 Launch AutoCAD 1. Choose Start, Programs, Autodesk , AutoCAD from the Windows program manager. OR 2. Double-click the AutoCAD icon from your desktop. Workspaces AutoCAD workspaces are sets of menus, toolbars and dockable windows (such as the Properties palette, DesignCenter, and the Tool palettes window) that are grouped and organized so that you can work in a custom, task-oriented drawing environment. 1. Click the Workspace Switching icon. 2. Click 3D Basics and OK. 4. AutoCAD 3D Tutorials - 4 - 1.2 3D Basics Interface The following is AutoCAD's 3D Basic interface. The 3D Basic ribbons are as follows: Create Edit Draw Modify Selection Coordinates Layers and Views The 3D Basic pulldown menus are as follows: Home Render Insert Manage Output Plug-ins Online Express Tools 5. AutoCAD 3D Tutorials - 5 - 1.3 3D Modeling Interface The 3D Modeling panels are as follows: Modeling Mesh Solid Editing Draw Modify Section Coordinates View Selection Layers and Groups The 3D Modeling pulldown menus are as follows: Home Solid Surfaces Mesh Render Parametric Insert, Annotate, View, Manage, Output, Plug-ins, Online, and Express Tools 6. AutoCAD 3D Tutorials - 6 - 1.4 Viewports 1. Open a drawing or create simple objects as shown below. 2. Click the dropdown menu in the shortcut tools and choose Show Menu Bar. 3. Choose View, Viewports, 4 Viewports. OR 4. Type -VPORTS at the command prompt. Command: -VPORTS Enteranoption [Save/Restore/Delete/Join/SIngle/?/2/3/4] 4: enter Enteraconfiguration option[Horizontal/Vertical/Above/ Below/Left/Right] : enter Your screen will look something like the figure below with four views in one AutoCAD drawing. 7. AutoCAD 3D Tutorials - 7 - 1.5 Preset 3D Viewports 1. Choose View, Viewports, New Viewports 2. Click the dropdown option for Setup and click 3D. 3. Choose Four: Right as the viewport option. 8. AutoCAD 3D Tutorials - 8 - 1.6 Named Views 1. Choose View, Named Views... 2. Click the plus (+) sign beside Preset Views. 3. Click NE Isometric, Set Current, Apply,and OK. Tip: You can also choose View, 3D Views, and any of the preset 3D views. 9. AutoCAD 3D Tutorials - 9 - 1.7 Steering Wheel SteeringWheels are menus that track the cursor over the drawing window, and provide access to 2D and 3D navigation tools from a single interface. SteeringWheels, or "wheels," are divided into wedges; each wedge contains a single navigation tool. You can start a navigation tool by clicking a wedge or by clicking and dragging the cursor over a wedge. Full Navigation Wheel 1. Click the Full Navigation Wheel icon. 10. AutoCAD 3D Tutorials - 10 - 2D Navigation Wheel (Zoom/Pan) View Object Wheel – Center a model and define the pivot point to use with the Orbit tool. Zoom and orbit a model. Center 11. AutoCAD 3D Tutorials - 11 - Orbit Look 12. AutoCAD 3D Tutorials - 12 - Walk/Up/ Down Rewind Shortcuts 1. Right-click on the wheel to view shortcuts. 13. AutoCAD 3D Tutorials - 13 - Steering Wheel Settings 1. Right-click on the steering wheel and choose SteeringWheel Settings... 14. AutoCAD 3D Tutorials - 14 - 1.8 VPOINT Command (Tripod) Displays a compass and tripod for defining a view rotation. The compass represents a two dimensional globe. 1. Choose View, 3D Views, Viewpoint or 2. Type VPOINT at the command prompt. Command: VPOINT Rotate/: PRESS ENTER 3. Click a point on the compass to define the viewing angle. Point in the center of the compass is the " north pole", looking straight down at the drawing Middle ring of the compass is the "equator", looking straight on at the drawing. Entire outer ring isthe "south pole", looking straight up at the drawing. Tripod 15. AutoCAD 3D Tutorials - 15 - 1.9 VPOINT Command (Rotate) Enters a rotation angle at the viewpoint prompt. 1. Type VPOINT at the command prompt. Command: VPOINT Rotate/ : R (enter) Enter angle in XY plane from X axis : 225 (enter) Enter angle from XY plane : 15 (enter) 16. AutoCAD 3D Tutorials - 16 - 1.10 DDVPOINT 1. Choose View, 3D Views, Viewpoint Preset. or 2. Type DDVPOINT at the command prompt. Command: DDVPOINT 3. Set a viewing angle by typing the From X axis and XY Plane angle. or 4. Pick a viewing angle in the 2 graphics Left graphic = From X Axis Right graphic = In XY Plane 5. Click OK. 17.

AutoCAD 3D Tutorials - 17 - 1.11 Plan View 1. Choose View, 3D Views, Plan View , World UCS. or 2. Type PLAN at the command prompt. Command: PLAN Enter an option [Current Ucs/Ucs/World] : World 18. AutoCAD 3D Tutorials - 18 - AutoCAD 3D – Chapter 2 Thickness and Elevation 19. AutoCAD 3D Tutorials - 19 - 2.1 Thickness Command 1. Begin a new drawing using a 3D Modeling workspace. 2. Choose View, Viewports, 2 Viewports. 3. Press ENTER for the default of two vertical viewports. 4. Type PLAN and World in the left viewport. 5. Choose SE Isometric for the right viewport. 6. Type THICKNESS at the command prompt. Command: THICKNESS Enter new value for THICKNESS : 3 7. Draw a 5",2" rectangle using in the LINE command in the left view. The lines will have a 3D "thickness" that can be seen in the 3D view. 20. AutoCAD 3D Tutorials - 20 - 2.2 Change Existing Thickness 1. Select the object whose thickness you would like to change (e.g. one line of the rectangle you drew in 2.1. 2. Choose Modify, Properties...or right click and choose Properties... 3. Type a new line thickness. The result is a new line thickness for the selected object. 21. AutoCAD 3D Tutorials - 21 - 2.3 Elevation Stores the elevation for new objects relative to the current UCS for the current space. 1. Type ELEVATION at the command prompt. Command: ELEVATION Enter new value for ELEVATION : 1.00 2. Draw two circles in the left view at the new elevation. Note that they appear to be "floating" 1 unit above the ground. 22. AutoCAD 3D Tutorials - 22 - 2.4 Elevation Shortcut 1. Type ELEV at the command prompt. Command: ELEV Specify new default elevation: : 2 Specify new default thickness: : .5 2. Draw a new line in the left view to see the elevation and thickness settings. 23. AutoCAD 3D Tutorials - 23 - AutoCAD 3D – Chapter 3 Visualizing Your Model 24. AutoCAD 3D Tutorials - 24 - 3.1 HIDE Command Regenerates a three-dimensional model with hidden lines 1. Open a drawing with 3D objects and display in a 3D view. 2. Choose View, Hide. or 3. Type HIDE at the command prompt. Command: HIDE 25. AutoCAD 3D Tutorials - 25 - 3.2 Visual Styles A visual style is a collection of settings that control the display of edges and shading in the viewport. Open a drawing with 3D objects and display in a 3D view. Choose View, Visual Styles and one of the following style options. 26. AutoCAD 3D Tutorials - 26 - Visual Styles 2D Wireframe 3D Wireframe 3D Hidden Realistic Shaded Shaded with Edges Shades of Gray Sketchy XRay 27. AutoCAD 3D Tutorials - 27 - 3.3 Visual Style Manager The Visual Styles Manager displays sample images of the visual styles available in the drawing. The selected visual style is indicated by a yellow border, and its settings are displayed in the panel below the sample images. 1. Choose View, Visual Styles, Visual Styles Manager... or 2. Type VISUALSTYLES at the command prompt. Command: VISUALSTYLES 3. Choose the desired option from one of those available in the drawing for 2D Wireframe, 3D Wireframe, 3D Hidden, Realistic, or Conceptual options. 28. AutoCAD 3D Tutorials - 28 - 3.4 Visual Styles Panel 29. AutoCAD 3D Tutorials - 29 - 3.5 Adaptive 3D Grid When you choose a shaded or 3D wireframe visual style, the grid changes from a dotted grid to a rectangular grid. The new grid provides a better sense of a model's orientation in 3D. The rectangular grid supports perspective, can display major and minor grid lines, provides color options, and can automatically control the grid density when zooming in or out (adaptive grid.) You can change the grid settings using the drafting settings dialog box. 1. Choose Tools, Drafting Settings, and the Snap and Grid TAB. 2. Type DSETTINGS at the command prompt. Command: DSETTINGS TIP: You can turn the adaptive grid on/off from the status bar. 30. AutoCAD 3D Tutorials - 30 - AutoCAD 3D – Chapter 4 Z Coordinates 31. AutoCAD 3D Tutorials - 31 - 4.1 3D Coordinates Entering 3D Cartesian coordinates (X,Y,Z) is similar to entering 2D coordinates (X,Y). In addition to specifying X and Y values, you specify a Z value. 1. Open a drawing with 3D objects and display in a 3D view. 2. Type 3DPoly at the command prompt. Command: 3DPOLY Specify start point of polyline: 1,1,0 Specify endpoint of line or [Undo]: 1,2,1 Specify endpoint of line or [Undo]: 2,2,1 Specify endpoint of line or [Close/Undo]: 2,1,0 Specify endpoint of line or [Close/Undo]: 1,1,0 The result will be the following lines that are drawn in 3D: 32. AutoCAD 3D Tutorials - 32 - 4.2 Track in Z Direction With AutoTrack (polar tracking and object snap tracking), you can track in the Z direction as well as in the XY plane. Similarly, when Ortho mode is turned on, you can lock the cursor to the Z direction. 1. Press F11 or click OSnap Tracking on the status bar if it is not already on. 2. Press F10 or click Polar Tracking on the status bar if it is not already on. 3. Draw a line in the 3D view in the Z direction using tracking. 33. AutoCAD 3D Tutorials - 33 - 4.3 Move in Z Direction 1. Open a drawing with 3D objects in it. 2. Type MOVE at the command prompt. Command: move Select objects: pick object in 3D view Select objects: press enter Specify base point or displacement: Specify second point of displacement or : 0,0,1 or use polar tracking to move the object. before move after move 34. AutoCAD 3D Tutorials - 34 - 4.4 3D Point Filters Draws in 3D Z direction by filtering X and Y coordinates. 1. Open a drawing with 3D objects in it. Use the CIRCLE command and place it using 3D point filters (.xy) Command: CIRCLE Specify center point for circle or [3P/2P/Ttr (tan tan radius)]: .XY of pick endpoint to filter (need Z): 1 Specify radius of circle or [Diameter] : press enter endpoint to filter 35. AutoCAD 3D Tutorials - 35 - 4.5 Helix Creates a 2D or 3D spiral. 1. Begin a new drawing. 2. Choose Draw, Helix. or 3. Type HELIX at the command prompt. Command: helix Number of turns = 3.0000 Twist=CCW Specify center point of base: pick point Specify base radius or [Diameter] : enter or drag and pick Specify top radius or [Diameter] : enter or drag and pick Specify helix height or [Axis endpoint/Turns/turn Height/tWist] : enter or drag and pick 36. AutoCAD 3D Tutorials - 36 - AutoCAD 3D – Chapter 5 User Coordinate System 37. AutoCAD 3D Tutorials - 37 - 5.1 UCS Icon The UCS icon represents the orientation of the user coordinate system (UCS) axes and the location of the current UCS origin. It also represents the current viewing direction relative to the XY plane. AutoCAD displays the UCS icon differently for 2D, 3D and Paper Space environments. 1. Choose View, Display, UCS Icon. or 2. Type UCSICON at the command prompt. Command: ucsicon Enter an option [ON/OFF/All/Noorigin/ORigin/Properties] : ON Displays the UCS icon. OFF Turns off the display of the UCSICON. All Affects the display of the UCSICON in all viewports. Noorigin Always displays the UCS at the lower left corner. Origin Shows the UCS at the 0,0,0 origin of the current UCS. Properties Changes the display properties of the UCS icons(s). 3D UCS icons 2D UCSIcon Pspace UCSICON 38. AutoCAD 3D Tutorials - 38 - UCS Icon Properties 1. Choose View, Display, UCS Icon, Properties. or 1. Type UCSICON at the command prompt. Command: ucsicon Enter an option [ON/OFF/All/Noorigin/ORigin/Properties] : P 39. AutoCAD 3D Tutorials - 39 - 5.2 UCS Overview The user coordinate system provides an alternate movable coordinate system for coordinate entry, planes of operation, and viewing. Most AutoCAD geometric editing commands are dependent on the location and orientation of the UCS. There are a variety of ways to set the User Coordinate System using the UCS command. 1. Type UCS at the command prompt. Command: UCS Specify origin of UCS or [Face/NAmed/OBject/Previous/View/World/X/Y/Z/ ZAxis] : Face Aligns the UCS to the selected face of a solid object. Named Saves or restores a UCS. Object Lets you define a new UCS by pointing at an object. Previous Restores the previos UCS. New Defines a new coordinate system by one of six methods: Origin, Z Axis, 3 Point, Object, Face, View X, Y, Z View Establishes a new UCS whose XY plane is perpendicular to your viewing direction (e.g. parallel to your screen). World Restores the world UCS X/Y/Z Rotates the ucs around a specified axis UCS Toolbars Found under the AutoCAD Classic Toolbars 40. AutoCAD 3D Tutorials - 40 - 5.3 New (3 Point) UCS The 3 Point option is one of the easiest ways to define a new UCS on a given 3D object. 1. Open a drawing with a simple 3D object (e.g. 3D box) 2. Type UCS at the command prompt. Command: UCS Specify origin of UCS or [Face/NAmed/OBject/Previous/View/World/X/Y /Z /ZAxis] :N Specify origin of new UCS or [ZAxis/3point/OBject/ Face/View/X/Y/Z] : 3 Specify new origin point : pick origin Specify point on positive portion of X-axis : pick point for X direction Specify point on positive-Y portion of the UCS XY plane : pick point for Y direction Positive Y New 0,0,0 origin Positive X 41. AutoCAD 3D Tutorials - 41 - New UCS TIP: You can also click the dropdown beside WCS and click New UCS. 42. AutoCAD 3D Tutorials - 42 - 5.4 Plan UCS To work in the plan view of your new UCS, use the PLAN command with the current UCS option. New entities that you draw will be in relation to this current UCS. 1. Type PLAN at the command prompt. Command: PLAN Enter an option [Current ucs/Ucs/World] : PRESS ENTER 43. AutoCAD 3D Tutorials - 43 - 5.5 World UCS The World UCS is the only UCS guaranteed to be the same in all AutoCAD drawings and can be used to set the UCS back to its original state. This is the UCS you should use when creating Wblocks and inserting Wblocks. 1. Type UCS at the command prompt. Command: UCS Specify origin of UCS or [Face/NAmed/OBject/Previous/View/World/X/Y /Z /ZAxis] :W 44. AutoCAD 3D Tutorials - 44 - 5.6 View UCS Establishes a new coordinate system whose XY plane is perpendicular to your viewing direction (i.e. parallel to your screen) 1. Type UCS at the command prompt. Command: UCS Specify origin of UCS or [Face/NAmed/OBject/Previous/View/World/X/Y /Z/ZAxis] :V 45. AutoCAD 3D Tutorials - 45 - 5.7 Dynamic UCS You can use the dynamic UCS to create objects on a planar face of a 3D solid without manually changing the UCS orientation. During a command, the dynamic UCS temporarily aligns the XY plane of the UCS with a planar face of a 3D solid when you move the cursor over the face. When the dynamic UCS is active, specified points, and drawing tools, such as polar tracking and the grid, are all relative to the temporary UCS established by the dynamic UCS. 1. 1. Click the DUCS icon on the status bar or 2. Press CTRL +D. 3. Type any draw command. Command: CIRCLE 4. Move the cursor to the face of the 3D object on which you Would like to draw. 5. Click to begin drawing your new object. 46. AutoCAD 3D Tutorials - 46 - 5.8 Naming a UCS User coordinate systems can sometimes be complicated and it is often useful to name and save them so you can quickly recall them. 1. Type UCS at the command prompt. Command: UCS Specify origin of UCS or [Face/NAmed/OBject/Previous/View/World/X/Y/Z /ZAxis] NA Enter an option [Restore/Save/Delete/?]: S Enter name to save current UCS or [?]: LeftSide 47. AutoCAD 3D Tutorials - 47 - 5.9 Restoring a UCS A named and saved UCS can be restored at any time. 1. Type UCS at the command prompt. Command: UCS Specify origin of UCS or [Face/NAmed/OBject/Previous/View/World/X/Y/Z /ZAxis] NA Enter an option [Restore/Save/Delete/?]: R Enter name to save current UCS or [?]: LeftSide 48. AutoCAD 3D Tutorials - 48 - 5.10 UCS Dialog Box Displays and modifies defined and unnamed user coordinate systems, restores named and orthographic UCSs, and specifies UCS icon and UCS settings for viewports via a dialog box. 1. Chose Tools, Named UCS. or 2. Type UCSMAN at the command prompt. Command: UCSMAN 49. AutoCAD 3D Tutorials - 49 - 5.10 Viewcube The ViewCube provides visual feedback about the current orientation of a model. The ViewCube can help you adjust the viewpoint of a model. The orientation shown by the ViewCube is based on the North direction of the WCS for the model. The ViewCube also shows the current UCS and allows you to restore a named UCS. 50. AutoCAD 3D Tutorials - 50 - AutoCAD 3D – Chapter 6 3D Orbit 51. AutoCAD 3D Tutorials - 51 - 6.1 Constrained 3D Orbit 3DORBIT activates a 3D Orbit view in the current viewport. You can view your entire drawing or select one or more objects before starting the command. When 3DORBIT is active, the target of the view stays stationary and the camera location, or point of view, moves around the target. However, from the user's point of view, it appears as if the 3D model is turning as the mouse cursor is dragged. In this way, you can specify any view of the model. 1. Open a drawing with 3D objects. 2. Choose View, Orbit, Constrained Orbit. or 3. Type 3D Orbit at the command prompt. Command: 3DOrbit 4. Click and drag to move your object in 3D. 52. AutoCAD 3D Tutorials - 52 - 6.2 Zoom and Pan in 3D Orbit Zoom 1. Click the right mouse button while in the 3D Orbit command. 2. Choose Zoom Window from the pop-up menu. 3. Zoom to a new area of the 3D drawing. 4. Click the right mouse button while in the 3D Orbit command. 5. Choose Zoom Previous or Zoom Extents. Pan 1. Click the right mouse button while in the 3D Orbit command. 2. Choose Other Navigation Modes from the pop-up menu. 3. Choose Pan. 4. Pan to a new area of the drawing. 5. Click the right mouse button while in the 3D Orbit command. 6. Choose Other Navigation Modes from the pop-up menu. 7. Choose Constrained Orbit to set the mode back to orbit. 53. AutoCAD 3D Tutorials - 53 - 6.3 Projection Mode 1. Click the right mouse button while in the 3D Orbit command. 2. Choose Perspective. Perspective view displays objects in perspective so that all parallel lines converge at one point. Objects appear to recede into the distance, and parts of the objects appear larger and closer to you. The shapes are somewhat distorted when the object is very close. This view correlates more closely to what your eye sees. Parallel view displays objects so that two parallel lines in a drawing never con verge at a single point. The shapes in your drawing always remain the same and do not appear distorted when they are closer. Perspective View Parallel View 54. AutoCAD 3D Tutorials - 54 - 6.4 Visual Styles Displays your objects in one of the following selected styles: 1. Click the right mouse button while in the 3D Orbit command. 2. Choose Visual Styles from the pop-up menu. 3. Choose one of the Visual Styles. Visual Style Examples 3D Hidden 3D Wireframe Conceptual Realistic 55. AutoCAD 3D Tutorials - 55 - 6.5 Visual Aids 1. Click the right mouse button while in the 3D Orbit command. 2. Choose Visual Aids from the pop-up menu. 3. Choose Compass, Grid, or UCS Icon. Compass Grid UCS Icon 56. AutoCAD 3D Tutorials - 56 - 6.6 Preset Views Sets the 3D view while in the orbit command 1. Click the right mouse button while in the 3D Orbit command. 2. Choose Preset Views from the pop-up menu. 3. Choose one of the following standard 3D views. 57. AutoCAD 3D Tutorials - 57 - 6.7 Free Orbit 1. Choose View, Orbit, Free Orbit. The 3D Orbit Arcball appears. 2. Click one of the 3D Orbit Arcball locations to move the display of your object(s). Inside the Arcball - Allows movement in any direction Outside the Arcball - Moves View about an axis that extends through the center (acts like twist) Inside one of the small circles to the left/right - Rotates around the "Y" axis through the center. Inside one of the small circles to the top/bottom - Rotates around the "X" axis through the center. 58. AutoCAD 3D Tutorials - 58 - 6.8 Continuous Orbit 1. Choose View, Orbit, Continuous Orbit. 2. Click and drag to define the direction and speed of a continuous orbit for your object(s). 3. Press ESC on the keyboard to stop the orbit. 59. AutoCAD 3D Tutorials - 59 - 6.9 Other Navigational Modes 1. Click the right mouse button while in the 3D Orbit command. 2. Choose Other Navigational Modes from the pop-up menu. 3. Choose one of the following modes. Adjust Distance (4) Simulates moving the camera closer to the object or farther away. Swivel (5) Changes the cursor to an arched arrow and simulates the effect of swiveling the camera. Walk (6) Changes the cursor to a plus sign and enables you to "walk through" a model at a fixed height above the XY plane, by dynamically controlling the location and target of the camera. Fly (7) Changes the cursor to a plus sign and enables you to "fly through" a model without being restricted to a fixed height above the XY plane. Zoom (8) Changes the cursor to a magnifying glass with plus (+) and minus (-) sign and simulates moving the camera closer to an object or farther away. Works like the Adjust Distance option. Pan (9) Pans the drawing while in the 3D Oribit. 60. AutoCAD 3D Tutorials - 60 - AutoCAD 3D – Chapter 7 3D Navigation 61. AutoCAD 3D Tutorials - 61 - 7.1 Creating a Camera Sets a camera and target location to create and save a 3D perspective view of objects. 1. Open a drawing with 3D objects. 2. Choose View, Create Camera. or 3. Type CAMERA at the command prompt. Command: CAMERA Current camera settings: Height=0.0000 Lens Length=50.0000 mm Specify camera location: .XY of (need Z): 7 Specify target location: endp Enter an option [?/Name/LOcation/Height/Target/LEns/Clipping/View/eXit]: X Camera location using .XY filter and Z height of 7 Camera target 62. AutoCAD 3D Tutorials - 62 - 7.2 Viewing a Camera Once a camera is created, it becomes a named view in the drawing and can be viewed using the Named View Manager. You can also view the camera using the view option when creating the camera. 1. Choose View, 3D Views, Southwest Isometric to be sure you are not in an existing camera view. 2. Choose View, Named Views. 3. Click the plus (+) sign beside Model Views. 4. Click Camera1, Set Current, Apply, and OK. View from Camera 63. AutoCAD 3D Tutorials - 63 - 7.3 Camera Preview Camera preview is a quick and easy way to see the properties of a camera before viewing from the camera. 1. Choose View, 3D Views, Southwest Isometric to be sure you are not in an existing camera view. 2. Zoom out until you see the camera in your 3D view. 3. Click once on a camera in your view. The Camera Preview dialog box will show the view from the chosen camera. You can change the Visual style of this preview by clicking the Visual Style dropdown. 64. AutoCAD 3D Tutorials - 64 - 7.4 Camera Properties 1. Double click a camera in a 3D isometric view, 2. Choose one of the following properties to change. 65. AutoCAD 3D Tutorials - 65 - 7.5 Displaying and Plotting a Camera Displaying a Camera 1. Choose View, Display, Cameras. Plotting a Camera 1. Click View, Display, Cameras. 2. Double-click a camera. 3. Click Yes under the Plot option. 66. AutoCAD 3D Tutorials - 66 - 7.6 Adjusting Camera Distances and Swiveling a Camera Adjust Camera Distance 1. Choose View, Named Views. 2. Click the plus (+) sign beside Model Views. 3. Click Camera1, Set Current, Apply, and OK. 4. Choose View,Camera, Adjust Distance. 5. Click and drag to zoom in or out about the camera, Swivel a Camera 1. Choose View, Camera, Swivel. 2. Click and drag to swivel the camera, 67. AutoCAD 3D Tutorials - 67 - 7.7 DView Command Defines parallel projection or perspective views by using a camera and target. 1. Choose View, 3D Views, SW Isometric. 2. Type DVIEW at the command prompt. Command: DVIEW Select objects or : pick objects and press ENTER Enter option [CAmera/TArget/Distance/POints/PAn/Zoom/TWist/C Lip/Hide/Off/Undo]: PO Specify target point : pick target (see below) Specify camera point : .XY of (need Z): 7 Enter option [CAmera/TArget/Distance/POints/PAn/Zoom/TWist/C Lip/Hide/Off/Undo]: D Specify new camera-target distance : click and drag new zoom Enter option [CAmera/TArget/Distance/POints/PAn/Zoom/TWist/ CLip/Hide/Off/Undo]: Regenerating model. Camera location using .XY filter and Z height of 7 Camera target 68. AutoCAD 3D Tutorials - 68 - New perspective view 69. AutoCAD 3D Tutorials - 69 - 7.8 Walk and Fly You can simulate walking and flying through a 3D drawing. When you walk through a model, you travel along the XY plane. When you fly through a model, you are not constrained by the XY plane, so you appear to "fly" over an area in a model. The following shortcuts are available for walking: Up arrow / W key Move forward Down arrow / S key Move backward Left arrow / A key Move left Right arrow / D key Move right Drag mouse Look around & turn 1. Open a drawing with 3D objects and display in a 3D view. 2. Create a camera anywhere in the drawing and set the view to that camera. 3. Choose View, Walk and Fly, and Walk. or 4. Type 3DWalk or 3DFky at the command prompt. Command: 3DWALK The following Position Locator dialog box will appear that you can use to navigate your drawing. 70. AutoCAD 3D Tutorials - 70 - 5. Press the Up, Down, Left, and Right keys on the keyboard to see how the camera location moves in the drawing and Position Locator dialog box. 6. Move the camera and target in the Position Locator dialog box. 7. Click and drag your mouse to "fly" through the drawing. 8. Close the Position Locator dialog box and try walking and flying using only the keys on the keyboard and mouse. 71. AutoCAD 3D Tutorials - 71 - 7.9 Walk and Fly Settings 1. Choose View, Walk and Hide, Walk and Hide Settings. or 2. Type WALKFLYSETTINGS at the command prompt. Command: WALKFLYSETTINGS 3. Choose one of the following settings from the Walk and Fly dialog box. If you are working in a drawing with a large architectural scale, be sure to set your drawing units to a large number, similar to the scale of the drawing. 72. AutoCAD 3D Tutorials - 72 - 7.10 Animation Paths 1. Open a drawing with 3D objects and display in a 3D view. 2. Draw a line or polyline representing a path for an animation 3. Choose View, Motion Path Animations. or 4. Type ANIPATH at the command prompt. Command: ANIPATH 5. Select Path under the Link camera to: option 6. Click the line or polyline path. 7. Type Path1 as the default path name. 8. Select Path under the Link target to: option 9. Click on the line or polyline path. 10. Type Path2 as the default path name. 11. Change other animation settings such as the frames per second, duration, resolution, etc. 73. AutoCAD 3D Tutorials - 73 - 12. Choose the Preview...button to preview your animation. 13. Close the animation preview and click OK to create an animation file. 14. Play your animation in a PC or MacIntosh video review application such as Media Player or Quicktime. 74. AutoCAD 3D Tutorials - 74 - AutoCAD 3D – Chapter 8 3D Model Objects 75. AutoCAD 3D Tutorials - 75 - 8.1 Wireframes A wireframe model is a skeletal description of a 3D object. There are no surfaces in a wireframe model; it consists only of points, lines, and curves that describe the edges of the object. With AutoCAD you can create wireframe models by positioning 2D objects anywhere in 3D space. AutoCAD also provides some 3D wireframe objects, such as 3D polylines (that can only have a CONTINUOUS linetype) and splines. Because each object that makes up a wireframe model must be independently drawn and positioned, this type of modeling can be the most time-consuming. Wireframe lines in 3D 76. AutoCAD 3D Tutorials - 76 - 8.2 Surfaces Surface modeling is more sophisticated than wireframe modeling in that it defines not only the edges of a 3D object, but also its surfaces. The AutoCAD surface modeler defines faceted surfaces using a polygonal mesh. Because the faces of the mesh are planar, the mesh can only approximate curved surfaces. 77. AutoCAD 3D Tutorials - 77 - 8.3 Solids Solid modeling is the easiest type of 3D modeling to use. With the AutoCAD solid modeler, you can make 3D objects by creating basic 3D shapes: boxes, cones, cylinders, spheres, wedges, and tori (do- nuts). You can then combine these shapes to create more complex solids by joining or subtracting them or finding their intersecting (over- lapping) volume. You can also create solids by sweeping a 2D object along a path or revolving it about an axis. 78. AutoCAD 3D Tutorials - 78 - AutoCAD 3D – Chapter 9 2D Solids and 3D Faces 79. AutoCAD 3D Tutorials - 79 - 9.1 2D Solid Creates solid-filled triangles and quadrilaterals. 1. Type SOLID at the command prompt. Command: SOLID First point: P1 Second point: P2 Third point: P3 Fourth point: P4 Third point: enter 80. AutoCAD 3D Tutorials - 80 - 9.2 3D Faces 3DFACE creates a three or four sided surface anywhere in 3D space. You can specify different Z coordinates for each corner point of a 3D face. 3DFACE differs from SOLID, which creates a three- or four-sided surface that is parallel to the current UCS and can be extruded. 1. Begin a new drawing. 2. Set the visual style to Conceptual. 3. Type 3DFACE at the command prompt. Command: 3DFACE First point: pick Second point: pick Third point: pick Fourth point: pick Third point: enter 3D Wireframe Lines 3D Face 81. AutoCAD 3D Tutorials - 81 - 9.3 3D Face Invisible Edge With 3DFACE, you control which edges of a 3D face are visible, allowing accurate modeling of objects with holes. Entering i or invisible before the first point of an edge makes the edge invisible.Type 3DFACE at the command prompt. 1. Draw an irregular shaped object similar to the one shown below. 2. Set the visual style to Conceptual. 3. Type 3DFACE at the command prompt. Command: 3DFACE First point: P1 Second point: P2 Third point: i P3 Fourth point: P4 Third point: i P5 Fourth point: P6 Third point: P7 Fourth point: P8 Third point: enter NOTE: You must enter an "i" for invisible before the face is chosen. 82. AutoCAD 3D Tutorials - 82 - 9.4 Edge Command 1. Type EDGE at the command prompt. Command: EDGE Specify edge of 3dface to toggle visibility or [Display]: pick edge Specify edge of 3dface to toggle visibility or [Display]: D Enter selection method for display of hidden edges [Select/All] : A ** Regenerating 3DFACE objects...done. Specify edge of 3dface to toggle visibility or [Display]: press enter Pick edge 83. AutoCAD 3D Tutorials - 83 - 9.5 PFace Creates a three-dimensional polyface mesh vertex by vertex 1. Type PFACE at the command prompt. Command: PFACE Specify location for vertex 1: pick point 1 Specify location for vertex 2 or : pick point 2 Specify location for vertex 3 or : pick point 3 Specify location for vertex 4 or : pick point 4 Specify location for vertex 5 or : pick point 5 Specify location for vertex 6 or : pick point 6 Specify location for vertex 7 or : pick point 7 Specify location for vertex 8 or : enter Face 1, vertex 1: Enter a vertex number or [Color/Layer]: 1 (enter) Face 1, vertex 2: Enter a vertex number or [Color/Layer] : 2 (enter) Face 1, vertex 3: Enter a vertex number or [Color/Layer] : 6 (enter) Face 1, vertex 4: Enter a vertex number or [Color/Layer] : 7 (enter) Face 1, vertex 5: enter Enter a vertex number or [Color/Layer] : Face 2, vertex 1: Enter a vertex number or [Color/Layer]: 2 (enter) Face 2, vertex 2: Enter a vertex number or [Color/Layer] : 3 (enter) Face 2, vertex 3: Enter a vertex number or [Color/Layer] : 4 (enter) Face 2, vertex 4: 84. AutoCAD 3D Tutorials - 84 - Enter a vertex number or [Color/Layer] : 6 (enter) Face 2, vertex 5: Enter a vertex number or [Color/Layer] : Face 3, vertex 1: Enter a vertex number or [Color/Layer]: 4 (enter) Face 3, vertex 2: Enter a vertex number or [Color/Layer] : 5 (enter) Face 3, vertex 3: Enter a vertex number or [Color/Layer] : 6 (enter) Face 3, vertex 4: Enter a vertex number or [Color/Layer] : Face 4, vertex 1: enter Enter a vertex number or [Color/Layer]: 85. AutoCAD 3D Tutorials - 85 - AutoCAD 3D – Chapter 10 Basic 3D Surfaces 86. AutoCAD 3D Tutorials - 86 - 10.1 Basic Mesh Commands 1. Click the 3D Modeling dropdown option from the Solids panel. 2. Click the Mesh tab. 3. Click the Primitives panel. 4. Click the Primitive drop-down. Mesh Primitive Options The following settings can be adjusted for mesh primitives. 87. AutoCAD 3D Tutorials - 87 - Mesh Box 1. Choose Mesh box from the Primitives panel. Command: MESH Current smoothness level is set to : 0 Enter an option [Box/Cone/CYlinder/Pyramid/Sphere/Wedge/Torus/ SEttings] : _BOX Specify first corner or [Center]: pick point Specify other corner or [Cube/Length]: @4,2 Specify height or [2Point] : 2 88. AutoCAD 3D Tutorials - 88 - Mesh Cone 1. Choose Mesh cone from the Primitives panel. Command: MESH Current smoothness level is set to : 0 Enter an option [Box/Cone/CYlinder/Pyramid/Sphere/Wedge/Torus/S Ettings] : CONE Specify center point of base or [3P/2P/Ttr/Elliptical]: Specify base radius or [Diameter] : 2 Specify height or [2Point/Axis endpoint/Top radius] : 5 89. AutoCAD 3D Tutorials - 89 - Mesh Cylinder 1. Choose Mesh cylinder from the Primitives panel. Command: MESH Current smoothness level is set to : 0 Enter an option [Box/Cone/CYlinder/Pyramid/Sphere/Wedge/Torus/ SEttings] : CYLINDER Specify center point of base or [3P/2P/Ttr/Elliptical]: Specify base radius or [Diameter] : 2 Specify height or [2Point/Axis endpoint] : 8 90. AutoCAD 3D Tutorials - 90 - Mesh Pyramid 1. Choose Mesh pyramid from the Primitives panel. Command: MESH Current smoothness level is set to : 0 Enter an option [Box/Cone/CYlinder/Pyramid/Sphere/Wedge/Torus/S Ettings] : PYRAMID 4 sides Circumscribed Specify center point of base or [Edge/Sides]: Specify base radius or [Inscribed] : Specify height or [2Point/Axis endpoint/Top radius] : 4 91. AutoCAD 3D Tutorials - 91 - Mesh Sphere 1. Choose Mesh sphere from the Primitives panel. Command: MESH Current smoothness level is set to : 0 Enter an option [Box/Cone/CYlinder/Pyramid/Sphere/Wedge/Torus/S Ettings] : SPHERE Specify center point or [3P/2P/Ttr]: Specify radius or [Diameter] : 92. AutoCAD 3D Tutorials - 92 - Mesh Wedge 1. Choose Mesh wedge from the Primitives panel. Command: MESH Current smoothness level is set to : 0 Enter an option [Box/Cone/CYlinder/Pyramid/Sphere/Wedge/Torus/S Ettings] : WEDGE Specify first corner or [Center]: Specify other corner or [Cube/Length]: @4,2 Specify height or [2Point] : 2 93. AutoCAD 3D Tutorials - 93 - Mesh Torus 1. Choose Mesh torus from the Primitives panel. Command: MESH Current smoothness level is set to : 0 Enter an option [Box/Cone/CYlinder/Pyramid/Sphere/Wedge/Torus/S Ettings] : TORUS Specify center point or [3P/2P/Ttr]: Specify radius or [Diameter] : 6 Specify tube radius or [2Point/Diameter]: 1 94. AutoCAD 3D Tutorials - 94 - 10.2 Mesh Tesselations By default, new mesh primitives are created with no smoothness. To change the default smoothness, enter mesh at the Command prompt. Specify the Settings option before you specify the type of mesh primitive you want to create. 1. Type MESH at the command prompt. Command: MESH Enter an option [Box/Cone/CYlinder/Pyramid/Sphere/Wedge /Torus/SEttings] : SE Specify level of smoothness or [Tessellation] : 3 Enter an option [Box/Cone/CYlinder/Pyramid/Sphere/Wedge/ Torus/SEttings] : BOX Specify first corner or [Center]: pick point Specify other corner or [Cube/Length]: @5,5 Specify height or [2Point] : 95. AutoCAD 3D Tutorials - 95 - 10.3 Mesh Smooth Converts 3D faces (3DFACE) and legacy polygonal and polyface meshes (from AutoCAD 2009 and earlier). You can also convert 2D objects such as regions and closed polylines. The default mesh settings are defined in the Mesh Tessellation Options dialog box. The level of smoothness upon conversion depends on the mesh type setting in this dialog box. If the mesh type is not set to be optimized, the converted object is not smoothed 1. Type MESHSMOOTH at the command prompt. Command: MESHSMOOTH Select objects to convert: pick object Select objects to convert: press enter 2. Click Create mesh. 2D Polyline before MESHSMOOTH 2D Polyline after MESHSMOOTH 96. AutoCAD 3D Tutorials - 96 - 10.4 Smooth and Refine Meshes The following commands control the smoothness of mesh objects. Meshsmoothmore Increases the level of smoothness for mesh objects by one level. 1. Type MESHSMOOTHMORE at the command prompt. Command: MESHSMOOTHMORE Select mesh objects to increase the smoothness level: pick object. Mesh before smooth increase Mesh after smooth increase 97. AutoCAD 3D Tutorials - 97 - Meshsmoothless Decreases the level of smoothness for mesh objects by one level. 1. Type MESHSMOOTHLESS at the command prompt. Command: MESHSMOOTHLESS Select mesh objects to increase the smoothness level: pick object. Mesh before smooth decrease Mesh after smooth decrease 98. AutoCAD 3D Tutorials - 98 - Meshsmoothrefine Multiplies the number of faces in selected mesh objects or faces. . 1. Type MESHREFINE at the command prompt. Command: '_MESHREFINE Select mesh object or face subobjects to refine: pick object Select mesh object or face subobjects to refine: 1 object(s) found. Mesh refine before Mesh refine after 99. AutoCAD 3D Tutorials - 99 - 10.5 Add and Remove Mesh Creases Meshcrease Sharpens the edges of selected mesh subobjects. 1. Type MESHCREASE at the command prompt. Command: MESHCREASE Select mesh subobjects to crease: select objects Specify crease value [Always] : enter Before crease Selected objects After crease TIPS: Crease value Sets highest smoothing level at which the crease is retained. If the smoothing level exceeds this value, the crease is also smoothed. Enter a value of 0 to remove an existing crease. Always Specifies that the crease is always retained, even if the object or subobject is smoothed or refined. A crease value of -1 is the same as Always. 100. AutoCAD 3D Tutorials - 100 - Meshuncrease Removes the crease from selected mesh faces, edges, or vertices. . 1. Type MESHUNCREASE at the command prompt. Command: MESHUNCREASE Select crease to remove: pick object Select crease to remove: press enter Before uncrease Selected objects After uncrease 101. AutoCAD 3D Tutorials - 101 - 10.6 Editing Meshes Meshextrude Extends a mesh face into 3D space. 1. Type MESHEXTRUDE at the command prompt. Command: _MESHEXTRUDE Adjacent extruded faces set to: Join Select mesh face(s) to extrude or [Setting]: pick object(s) Select mesh face(s) to extrude or [Setting]: Specify height of extrusion or [Direction/Path/ Taper angle] : 1 Selected mesh face Extruded mesh face 102. AutoCAD 3D Tutorials - 102 - Meshsplit Splits a mesh face into 2 faces. 1. Type MESHSPLIT at the command prompt. Command: _MESHSPLIT Select a mesh face to split: (pick object) Specify first split point on face edge or [Vertex]:MID of Specify second split point on face edge or [Vertex]: MID of MIDpoint MIDpoint 103. AutoCAD 3D Tutorials - 103 - Mergeface Merges adjacent faces into a single face. 1. Type MESHMERGE at the command prompt. Command: _MESHMERGE Select adjacent mesh faces to merge: (pick object) Select adjacent mesh faces to merge: (pick object) Select adjacent mesh faces to merge: press enter Selected mesh faces Resultant merge 104. AutoCAD 3D Tutorials - 104 - Meshcap (Close Hole) Creates a mesh face that connects open edges.. 1. Type MESHCAP at the command prompt. Command: _MESHCAP Select connecting mesh edges to create a new mesh face: (pick objects) Select connecting mesh edges to create a new mesh face: press enter Mesh object before Selected mesh edges Closed "hole" 105. AutoCAD 3D Tutorials - 105 - Converting Meshes Converts objects to surfaces. Objects that can be converted to surfaces include the following: 2D solids, 3D solids, Regions, open, zero-width polylines with thickness, lines with thickness, arcs with thickness, mesh objects, planar 3D faces 1. Type CONVTOSURFACE at the command prompt. Command: CONVTOSURFACE Mesh conversion set to: Smooth and optimized. Select objects: pick object Select objects: press enter PLine with thickness New converted mesh Smooth options 106. AutoCAD 3D Tutorials - 106 - AutoCAD 3D – Chapter 11 Complex Surfaces 107. AutoCAD 3D Tutorials - 107 - 11.1 Revolved Surfaces Regenerates a three-dimensional model with hidden lines 1. Type REVSURF at the command prompt. Command: REVSURF Current wire frame density: SURFTAB1=6 SURFTAB2=6 Select object to revolve: pick path curve Select object that defines the axis of revolution: pick line Specify start angle : enter Specify included angle (+=ccw, -=cw) : enter 108. AutoCAD 3D Tutorials - 108 - 11.2 Surftab Variables Sets the number of tabulations for both directions to be generated for RULESURF and TABSURF. Also sets the mesh density in ROTATE3D the M direction for REVSURF and EDGESURF commands. 1. Type Surftab1 at the command prompt. Command: SURFTAB1 Enter new value for SURFTAB1 : 30 2. Type Surftab2 at the command prompt. Command: SURFTAB2 Enter new value for SURFTAB2 : 30 3. Type Revsurf at the command prompt. Command: REVSURF Current wire frame density: SURFTAB1=30 SURFTAB2=30 Select object to revolve: pick path curve Select object that defines the axis of revolution: pick line Specify start angle : enter Specify included angle (+=ccw, -=cw) : press enter 109. AutoCAD 3D Tutorials - 109 - 11.3 Tabulated Surfaces 1. Type TABSURF at the command prompt. Command: TABSURF Select object for path curve: Select object for direction vector: 110. AutoCAD 3D Tutorials - 110 - 11.4 Ruled Surfaces 1. Type RULESURF at the command prompt. Command: rulesurf Current wire frame density: SURFTAB1=6 Select first defining curve: P1 Select second defining curve: P2 111. AutoCAD 3D Tutorials - 111 - 11.5 Edge Surfaces Regenerates a three-dimensional model with hidden lines 1. Type EDGESURF at the command prompt. Command: EDGESURF Current wire frame density: SURFTAB1=20 SURFTAB2=10 Select object 1 for surface edge: P1 Select object 2 for surface edge: P2 Select object 3 for surface edge: P3 Select object 4 for surface edge: P4 112. AutoCAD 3D Tutorials - 112 - 11.6 Planesurf Creates a planar surface by selecting a closed object or by creating a rectangular plane. 1. Type PLANESURF at the command prompt. Command: PLANESURF Specify first corner or [Object] : press enter Select objects: pick object Select objects: press enter Planar surface 113. AutoCAD 3D Tutorials - 113 - 11.7 Extrude Surfaces Creates a 3D solid or surface by extending the dimensions of an object. 1. Type EXTRUDE at the command prompt. Command: EXTRUDE Current wire frame density: ISOLINES=4, Closed profiles creation mode = Surface Select objects to extrude or [MOde]: pick object creation mode [SOlid/SUrface] : _su Select objects to extrude or [MOde]:enter Specify height of extrusion or [Direction/Path/Taper angle/Expression] : 10 114. AutoCAD 3D Tutorials - 114 - 11.8 Loft Command Creates a 3D solid or surface in the space between several cross sections.. 1. Type LOFT at the command prompt. Command: LOFT Current wire frame density: ISOLINES=4, Closed profiles creation mode = Surface Select cross sections in lofting order or [POint/Join multiple edges/MOde]: select object Select cross sections in lofting order or [POint/Join multiple edges/MOde]: select object Select cross sections in lofting order or [POint/Join multiple edges/MOde]: select o bject Select cross sections in lofting order or [POint/Join multiple edges/MOde]: 3 cross sections selected Enter an option [Guides/Path/Cross sections only/Settings] : press enter Objects before Surfaces using loft 115. AutoCAD 3D Tutorials - 115 - 11.9 Sweep Command Creates a 3D surface by sweeping a 2D or 3D curve along a path. 1. Type SWEEP at the command prompt. Command: SWEEP Current wire frame density: ISOLINES=4, Closed profiles creation mode = Surface Select objects to sweep or [MOde]: select object Select objects to sweep or [MOde]: select path (line) Select sweep path or [Alignment/Base point/Scale/Twist]: 116. AutoCAD 3D Tutorials - 116 - 11.10 Surface Network One way to create surfaces is with a network of curves. The SURFNETWORK command creates a surface similar to a lofted surface from a network of curves in the U and V directions. A network surface also can be created from curves that are not all connected. The resulting surface can be either a procedural surface or a NURBS surface. 1. Type SURFNETWORK at the command prompt. Command: SURFNETWORK 117. AutoCAD 3D Tutorials - 117 - 11.11 Revolve Surface One way to create surfaces is with a network of curves. The SURFNETWORK command creates a surface similar to a lofted surface from a network of curves in the U and V directions. A network surface also can be created from curves that are not all connected. The resulting surface can be either a procedural surface or a NURBS surface. 1. Type REVOLVE at the command prompt. Command: REVOLVE Current wire frame density: ISOLINES=4, Closed profiles creation mode = Surface Select objects to revolve or [MOde]: select object Select objects to revolve or [MOde]: press enter Specify axis start point or define axis by [Object/X/Y/Z] : select endpoints of sxis Specify axis endpoint: Specify angle of revolution or [STart angle/Reverse/EXpression] : press enter 118. AutoCAD 3D Tutorials - 118 - 11.12 Surface Blend Creates a blend surface between two existing surfaces. 1. Type SURFBLEND at the command prompt. Command: SURFBLEND 119. AutoCAD 3D Tutorials - 119 - 11.13 Surface Patch Creates a new surface or cap to close an open edge of an existing surface. 1. Type SURFPATCH at the command prompt. Command: SURFPATCH 120. AutoCAD 3D Tutorials - 120 - 11.14 Offsetting Surfaces Creates a parallel surface at a specified distance from the original surface. 1. Type SURFOFFSET at the command prompt. Command: SURFOFFSET 121. AutoCAD 3D Tutorials - 121 - 11.15 Editing Surfaces Surface Fillet 1. Type SURFFILLET at the command prompt. Command: SURFFILLET Surface Trim 1. Type SURFTRIM at the command prompt. Command: SURFTRIM 122. AutoCAD 3D Tutorials - 122 - Surface UnTrim 1. Type SURFUNTRIM at the command prompt. Command: SURFUNTRIM Surface Extend 1. Type SURFEXTEND at the command prompt. Command: SURFEXTEND Surface Suplt 1. Type SURFSCULPT at the command prompt. Command: SURFSCULPT 123. AutoCAD 3D Tutorials - 123 - Surface CV Edit Bar Adds and edits control vertices on a NURBS surface or spline 1. Type SURFSCULPT at the command prompt. Command: SURFSCULPT Convert to NURBS 1. Type CONVTONURBS at the command prompt. Command: CONVTONURBS 124. AutoCAD 3D Tutorials - 124 - 11.16 NURB Vertex Controls Surface CV - Show Shows NURB vertices. 1. Type CVSHOW at the command prompt. Command: CVSHOW Surface CV - Hide Hides NURB vertices. 1. Type CVHIDE at the command prompt. Command: CVHIDE 125. AutoCAD 3D Tutorials - 125 - Surface CV Rebuild Rebuilds control vertices of NURBS surfaces or spline 1. Type CVREBUILD at the command prompt. Command: CVREBUILD Surface CV Add Adds control vertices of NURBS surfaces or spline 1. Type CVADD at the command prompt. Command: CVADD 126. AutoCAD 3D Tutorials - 126 - Surface Remove Removes control vertices of NURBS surfaces or spline 1. Type CVREMOVE at the command prompt. Command: CVREMOVE 127. AutoCAD 3D Tutorials - 127 - 11.17 Surface Analysis Analysis Zebra Projects parallel lines onto a model to help you analyze surface continuity. The way the stripes line up where two surfaces meet helps analyze the tangency and curvature of the intersection. 1. Type ANALYSISZEBRA at the command prompt. Command: ANALYSISZEBRA Analysis Curvature Displays a color gradient onto a surface so you can evaluate the high and low areas of curvature.. 1. Type ANALYSISCURVATURE at the command prompt. Command: ANALYSISCURVATURE 128. AutoCAD 3D Tutorials - 128 - Analysis Draft Displays a color gradient onto a surface so you can evaluate if a model has adequate draft between a part and its mold 1. Type ANALYSISDRAFT at the command prompt. Command: ANALYSISDRAFT 129. AutoCAD 3D Tutorials - 129 - 11.18 Work with Associative Surfaces and Constraints SURFACEASSOCIATIVITY Like hatch and dimensions, surfaces can also be associative. When a surface is moved or modified, any associated surface is adjusted automatically. In this illustration, the boat is made up of four surfaces. When one of the sides is stretched and reshaped, all associated surfaces adjust accordingly. Use the SURFACEASSOCIATIVITY system variable to turn associativity on and off. Associativity also allows you to apply mathematical expressions and parametric constraints to surfaces. Mathematical expressions can be applied to surface properties such as radius and height. For example, you can specify that the height of a surface is always one half of the length of a solid box. Parametric constraints restrict the relative position of one object to another. In this example, the arc that was extruded to create the surface is locked in a fixed position. When you edit the associated surface, the arc surface stays in place. 130. AutoCAD 3D Tutorials - 130 - AutoCAD 3D – Chapter 12 Creating Solids 131. AutoCAD 3D Tutorials - 131 - 12.1 Solid Primitives Solid primitives can easily be drawn from from the 3D Modeling panel, Solid Panel . 132. AutoCAD 3D Tutorials - 132 - 12.2 Polysolid Command With the POLYSOLID command, you can convert an existing line, 2D polyline, arc, or circle to a solid with a rectangular profile. A polysolid can have curved segments, but the profile is always rectangular by default. 1. Open a drawing with a closed 2D polyline and display in a 3D view. 2. Type POLYSOLID at the command prompt. Command: polysolid Specify start point or [Object/Height/Width/Justify] : h Specify height

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