EXERCISE 3: MODELING WITH SPLINES

ASSIGNMENT:
In this exercise you will create basic architectural elements using splines. For this exercise you will use the overall shape of the House at Riva San Vitale by Mario Botta as a model. You will model the exterior walls and subtract two of the major architectural openings using the Boolean command.

LEARNING OBJECTIVES:
- Creating shapes using lines and rectangles
- Applying extrude modifiers
- Introduction to editing at the sub-object level
- Creating compound objects using the Boolean command
- Navigating multiple viewports to construct geometry
- Manipulating geometry using the transform type-in
PROCEDURE:
1. Open Autodesk VIZ 2006
2. From the main menu bar select Customize, Units Setup
3. For this exercise, set your units to metric, meters. *(We will use metric units for this exercise to give you some exposure to the different units systems available in VIZ)*
4. Activate and maximize the top viewport.
5. In the command panel, select Create, Shapes, Splines and select the Line tool.

6. The plan of this residence is approximately 22 meters square, and we will use the line tool to create the plan shape.
7. With the top viewport active, Use the Keyboard Entry Rollout to enter the following coordinates:
   a. X = 0.0m  Y = 0.0m  Z = 0.0m  Click Add Point
   b. X = 22m  Y = 0.0m  Z = 0.0m  Click Add Point
   c. X = 22m  Y = 22m  Z = 0.0m  Click Add Point
   d. X = 0.0m  Y = 22m  Z = 0.0m  Click Add Point
   e. Click Close to complete the shape
8. Your shape should look like figure 3.01
EDITING AT THE SUB-OBJECT LEVEL

9. With the current shape still selected, select the modify tab on the control panel, expand the line object to view the sub-object components, and select the Spline Sub-Object.

10. With the Spline Sub-Object selected, scroll down until you see the `outline` button.

11. Enter an outline of **1.0m** and click the `outline` button. (the house has a very thick exterior masonry wall)

12. Your spline has now added an outline as shown in figure 3.02

13. Click on the **spline sub-object** option to deactivate it. When deactivated it will no longer be highlighted yellow.

14. Apply an **extrude modifier** to the line object, and enter an amount of 28m.
15. Click the **Maximize Viewport Toggle** button to see all four views.
16. Click the **Zoom Extents All** button.
17. Your model should look like figure 3.03.

![Figure 3.03](image)

**Note:** VIZ sees objects in a hierarchical order.
- **Sub object** (vertex, segment, and spline)
- **Object** (the original line itself)
- **Modifiers** (extrude)

In this case, the line is the original object. Adding the outline was a modification to the properties of the spline subobject level. At the very top of the stack, the extrude modifier tells it affects everything below it. It is important while working in VIZ to be aware of this hierarchy as it can affect the final outcome of the object you are creating.

**CREATING THE ROOF**

18. In the command panel, select **Create, Shapes, Splines** and select the **Rectangle** tool.
19. Use the Keyboard Entry Rollout and enter the following:
   \[
   X = 11.0m \quad Y = 11.0m \quad Z = 0.0m \quad \text{Length and Width} = 22.0m
   \]
   \(X\) and \(Y\) coordinates are 11m because the rectangle tool inserts from the center of the object.
20. Click **Create**.
21. Right click the **Select and Move Tool** to activate the **Move Transform Type-In**.
22. In the **Absolute World** settings, change \(Z = 27.0m\)
23. In the command panel, select **modify** and apply an **extrude modifier** to the rectangle shape. Enter an amount of **1.0m**

24. Your shape will now have a solid roof element as shown in figure 3.04.

![Figure 3.04](image)

**CREATING THE FIRST OPENING**

25. Make the front viewport active. You will create the cutout shape in this viewport.

26. Use the **line tool**, along with the **keyboard entry rollout** to create the shape indicated in figure 3.05. The coordinates for each point you will create are shown below. Be sure to close the shape when you are finished.

1. X=5m, Y=0m, Z=0m, add point
2. X=9m, Y=0m, Z=0m, add point
3. X=9m, Y=16m, Z=0m, add point
4. X=17m, Y=16m, Z=0m, add point
5. X=17m, Y=20m, Z=0m, add point
6. X=5m, Y=20m, Z=0m. Add point

![Figure 3.05](image)
27. With the line object you just created still selected, right click the select and move tool to activate the move transform type in.
28. Verify that the front viewport is still active.
29. Using the Offset Screen coordinates, enter Y = 5m and press enter.
30. Note the Offset Screen coordinates reset to 0 after completing your transform.
31. Using the Offset Screen coordinates again enter Z = .5m
   Note: Using the Offset Screen mode in the front viewport, the Y coordinate moves the object vertically on the screen and the Z coordinate moves the object towards the screen. The move gizmo indicates the axis direction in the viewport to assist you.
32. With the line object still selected, select the modify tab in the command panel and apply an extrude modifier.
33. Enter an amount of \(-2.0m\)
34. At the top of the modify tab, click in the window next to the name line02. Change the color to a contrasting color to view the two object better on the screen.
35. You model will now look similar to figure 3.06.

![Figure 3.06](image)

**CREATING COMPOUND OBJECTS WITH THE BOOLEAN TOOL**
36. Switch to the perspective view and select the outside walls of the building, line01. (hint, you can use select by name tool.)
37. In the command panel, select Create, Geometry, Compound Objects and select the Boolean tool.
38. Click on the **Pick Operand B** button.
39. Move the mouse over the line02 object that we are trying to subtract. Your cursor will change to a cross when it finds an acceptable object.
40. Click on the Line 02 object.
41. Verify that the **Subtraction (A-B)** radio button is selected.
42. Your object should now appear with the first opening subtracted as shown in figure 3.07.

![Figure 3.07](image)

**CREATING THE SECOND OPENING**

43. Create the second opening using the same procedure used to create the first opening.
44. Use the following directions and the diagrams on page 8 to assist you:

- Work in the left viewport for this portion of the exercise
- Create the shape indicated in figure 3.08 using the line tool and the keyboard entry rollout.
- Use the Transform Type In with the Offset-Screen coordinates to move the object 5m in the Y direction and .5m in the Z direction.
- Add an extrude modifier with the amount of –2m to the line object.
- Use the compound object, Boolean tool to subtract the shape from the main volume.
- Your completed shape should look like figure 3.09.
1. X=-5m, Y=0m, Z=0m, add point
2. X=-5m, Y=20m, Z=0m, add point
3. X=-17m, Y=20m, Z=0m, add point
4. X=-17m, Y=12m, Z=0m, add point
5. X=-9m, Y=12m, Z=0m, add point
6. X=-9m, Y=0m, Z=0m, add point

Close shape when complete.
45. Save your file as `yourname-sanvitale.max`

We will stop this exercise here, however you can see how we could use this method of lines and Booleans to continue constructing the remaining portions of the building.

![Figure 3.10 Completed Exercise](image-url)