Chapter 2   **The Geometry Window**

Chapter Overview

This chapter reviews the Geometry window. This is the working window of NCSA UIFlow. The tools and features available in the Geometry window are used to create the datasets.

Introduction

When a new dataset is opened, the Geometry window appears after the dimensions for the geometry are choosen. The window is divided into two parts. The upper part contains the visual rendering of the dataset and the tools used to manipulate it. The bottom section displays information about the dataset.

Tool Bar

The Tool Bar (Figure 2.1) contains the following eight tools: the Selection tool, the Segment tool, the Grid Divisions tool, the Baffle tool, the Obstacle tool, the Data tool, the Fine Grid tool, and the Magnification tool. Each of these tools is used to manipulate the geometry of the dataset. Tools are enabled by clicking the appropriate icon on the Tool Bar.

Figure 2.1   **Tool Bar**

Selection Tool

Figure 2.2   **Selection Tool**

The *Selection tool*, shown in Figure 2.2, is used to move segment, and grid division points on the geometry. To use this tool, click on a point and drag it to the desired position. When a segment point is moved, all the interior grid points associated with that grid line are also moved proportionally. The grid point on the opposite boundary, however, is not affected. Interior grid points can be moved individually with the Selection tool in the same manner.

Segment Tool

The *Segment tool* is used to divide the boundary into separate and different segments. Four types of segment specifiers are available: Wall, Inflow, Outflow, and Symmetry. Each segment has its own set of data. Data provided at segments serve to specify boundary conditions for the calculation. The type of the segment is defined using the Data tool (See Chapter 2, "Data Tool.") Segment points appear as squares on the boundary.

Figure 2.3   **Segment Tool**

To create a segment:

1. Select the Segment tool (Figure 2.3) from the Tool Bar.

2. Click on the boundary at the location a segment division is desired. A segment point will appear as a small square at this location. NCSA UIFlow automatically creates a corresponding grid division on the opposite boundary along with any grid points at intersecting grid lines.

To delete a segment:

1. Select the Segment tool from the Tool Bar.

2. In order to delete a segment one of the bounding segment points must be deleted. Click and hold the mouse on the desired point. A trash can will appear near each bounding segment point on opposite sides of the selected point.

    NOTE: If baffles or obstacles have been created which intersect the associated grid line, NCSA UIFlow will not allow the segment to be deleted. A dialog box appears and informs the user to first delete the baffles and obstacles before deleting the segment.

3. To delete the segment, drag the point to the trash can near the other bounding segment point for the segment to be deleted and drop it in.

4. Release the mouse button. The segment, its associated grid line, and the grid point on the opposing boundry are all deleted. The resulting segment will retain the attributes of the undeleted segment.

    Example: If the segment to the left of the point is specified as an Inflow segment and the segment to the right is specified as a Wall segment, dragging the point to the trash can on the right will cause the new segment to be defined as an Inflow segment.

Grid Division Tool

The *Grid Division tool* creates further divisions within a segment. The Grid Division tool allows the user to specify additional points on the geometry where UIFlow2D will perform calculations. Grid points appear as circles on the boundaries and at intersections within the geometry.

Figure 2.4 **Grid Division Tool**

To create a grid division:

1. Select the Grid Division tool (Figure 2.4) from the Tool Bar.

2. Click on the boundary at the location where an additional division is desired. A grid point appears at the location selected. NCSA UIFlow automatically adds grid points on the opposing boundary and all the intersecting interior lines.

To delete a grid division:

1. Select the Grid Division tool from the Tool Bar.

2. Position the cursor on the grid point to be deleted and depress the mouse button. A dialog box appears to request user confirmation.

3. Click OK or hit **RETURN** to delete the grid division.

   NOTE: If baffles or obstacles have been created which intersect the grid division line, NCSA UIFlow will not allow the grid point to be deleted. A dialog box appears and informs the user to first delete the baffles and obstacles before deleting the segment.

Baffle Tool

The *Baffle tool* creates a barrier which has length but no width. Baffles appear as thick colored lines on the geometry.

Figure 2.5 **Baffle Tool**

To create a baffle:

1. Select the Baffle tool (Figure 2.5) from the Tool Bar.

2. Position and click the cursor on the line segment where a baffle is desired.

To delete a baffle:

1. Select the Baffle tool from the Tool Bar.

2. Select the baffle to be deleted. A dialog box appears, requesting the user to confirm the deletion. Click OK or hit **RETURN** to perform the operation.

Obstacle Tool

The *Obstacle tool* allows the user to create a barrier with both length and width.

Figure 2.6 **Obstacle Tool**

To create an obstacle:

1. Select the Obstacle tool (Figure 2.6) from the Tool Bar.

2. Position and click the cursor in the cell in which an obstacle is desired.

To delete an obstacle:

1. Select the Obstacle tool from the Tool Bar.

2. Click on the obstacle to be deleted. A dialog box appears, requesting the user to confirm the deletion. Click OK or press **RETURN** to perform the operation.

Data Tool

The *Data tool* displays the data associated with a particular segment in the geometry. The segment for which the data is currently displayed is highlighted in the main view. To view the data of another segment click the mouse on the desired segment. If any interior point is selected the interior data is displayed. Each boundary segment has its own unique set of data, but only one set of data exists for all interior points.

The Data tool window is divided into two parts. The top part contains the editable data for the selected segment.
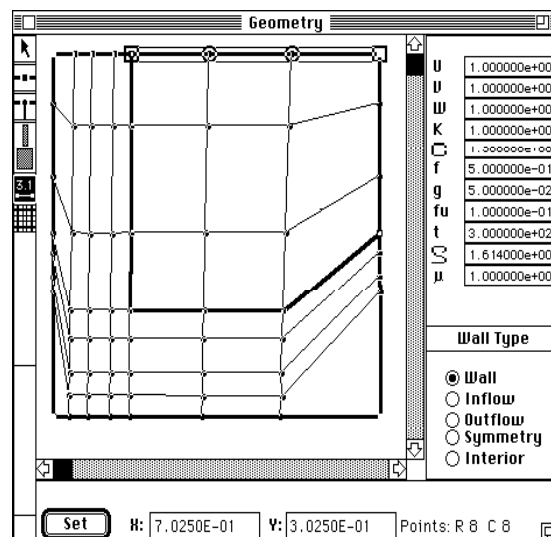
Figure 2.7   Data Tool

To edit data for a segment:

1. Select the Data tool (Figure 2.7) from the Tool Bar. The current data for the selected segment will be displayed to the right of the geometry (Figure 2.8.)

2. Click the mouse within the box of the variable to be edited and type the new values. This data will automatically be stored internally To store the new information permanently the file must be resaved.

Figure 2.8   Sample Data Tool Information Box

The second part of the Data tool window contains the Wall Type information for the segments. Four types of segment specifiers are available: Wall, Inflow, Outflow and Symmetry. The default selection for all created segments is "Wall." To change the Wall Type for a segment:

1. Select the Data tool from the Tool Bar. The current data for the selected point or segment will be displayed to the right of the geometry (Figure 2.8.)

2. Click the button next to the desired Wall Type. The segment will change color to reflect the change in type.

To view the interior data either click on the inside of the geometry or click on the "Interior" wall type button.

Fine Grid Tool

The *Fine Grid tool* reveals the number of grid points in the geometry according to the number of grid levels selected in the Solution Parameters dialog box (see Chapter 3, "The Options Menu.") The grid levels range from one (the default) to five. The selected level acts as a multiplier for the grid divisions created using the Grid Division tool.

NOTE: The fine grid display is visible only when the Fine Grid tool is selected. When the tool is deselected, the number of visible grid divisions equals the number created with the Grid Division tool. (UIFlow2D, however, performs its calculations according to the number of selected fine grid levels, regardless of whether the fine grid divisions are visible or not.)

Figure 2.9   Fine Grid Tool

To view the fine grid divisions:

1. Select the Solution Parameters command in the Options menu to bring up the Solution Parameters dialog box.

2. Drag the "Number of Grid Levels" scrollbar to the right to increase the grid divisions multiplier from one (the default) up to five (the maximum.)

3. Close the Solution Parameters dialog box.

4. Select the Fine Grid tool (Figure 2.9) from the Tool Bar. The fine grids will be displayed in an alternate color.

Magnification Tool

The *Magnification tool* is used to look more closely at a particular area of the geometry. It can also be used to shrink the geometry and get an overall sense of the entire topology. A total of five consecutive magnifications or reductions is possible, starting with an unmodified geometry.

Figure 2.10 **Magnification Tool**

To use the Magnification tool:

1. Select the Magnification tool (Figure 2.10) from the Tool Bar. The mouse cursor will change to a magnifying glass.

2. Position and click the magnifying glass inside the geometry window. The program will magnify the geometry using the left hand cornor as its reference point.

To de-magnify the geometry, hold down the **OPTION** key when clicking the mouse.

Status View

The status view section of UIFlow's Geometry window provides the user with information about what is currently happening in the main view. This includes reporting the location of points and basic operational messages. Further, the user can enter the desired coordinates for a point and press the set button. This will move the selected point to those coordinates.