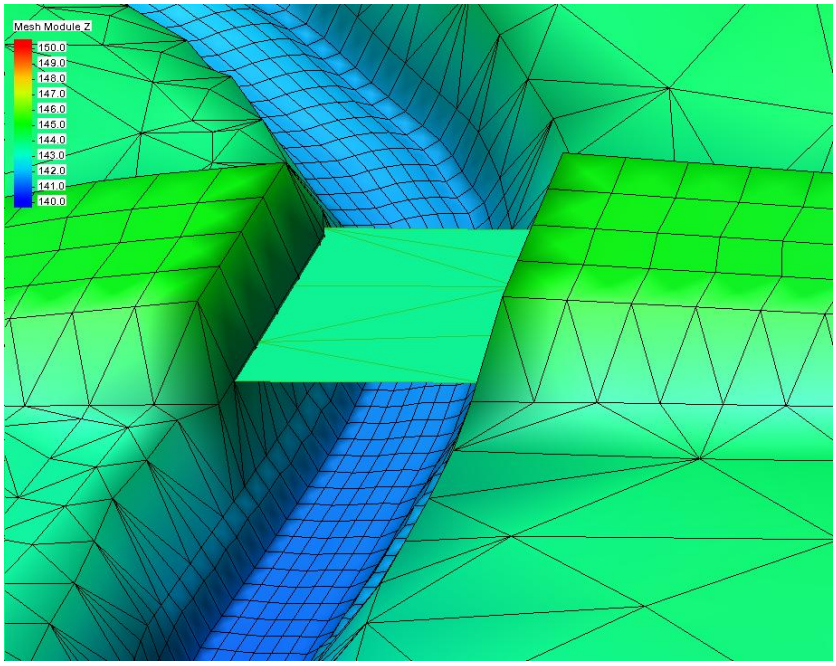
SMS 14.0 Tutorial

Scatter Data – Create

Creating a Scattered Dataset Interactively



Objectives

This tutorial demonstrates how to create a scattered data set or TIN (triangulated irregular network) interactively in the Surface-water Modeling System (SMS).

Prerequisite Tutorials

- Overview

Required Components

- SMS Core

Time

- 5–10 minutes

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1 Introduction

Scattered datasets, in the Surface-water Modeling System (SMS), represent spatially varied data. Generally, the first example of this is elevation data stored at survey points. The point is located in plan space with an (X,Y) coordinate, and the elevation is a scalar dataset with one value per location. By connecting the (X,Y) coordinates into triangles, a surface is defined. This surface is referred to as a TIN (triangulated irregular network).

This tutorial illustrates how to create a scattered dataset interactively in SMS with a sample application.

2 Getting Started

Start by importing a project file containing an existing mesh:

1. Launch the SMS application.
2. Select *File* | **Open…** to bring up the *Open* dialog.
3. In the *Files of type* drop-down, select “Project Files (*.sms)”.
4. Browse to the *data files* folder for this tutorial and select “MiniModel.sms”.
5. Click **Open** to import the project and exit the *Open* dialog.

The initial project should appear similar to Figure 1.

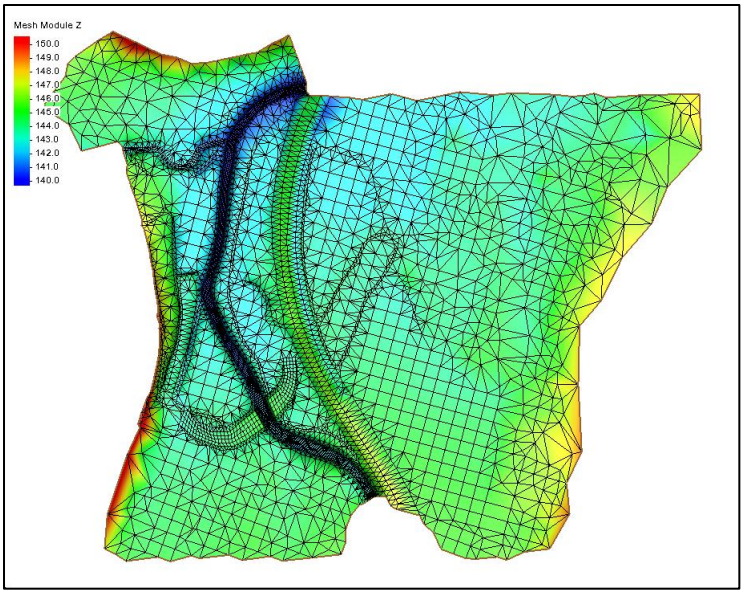

Figure 1 Initial project

This project includes:

- A mesh (Mini Model) representing a fictional terrain which includes a roadway embankment, a couple of streams and two bridge abutments on either side of the streams.
- A coverage (Open Boundaries) including two arcs which identify where flow would enter and leave this surface.
- A coverage (Material Zones) including polygons which identify different land use or vegetative cover regions in the surface.
- A display theme (Bridge Location) which defines a view to help in the workflow for this tutorial. For information on themes see the *Display Themes* tutorials.

Note: for convenience, the default contour options for both scatter sets and meshes have been set to have the same attributes in this project.

If desired, use the **Pan** , **Zoom** , and **Rotate** tools to (or using the mouse) to evaluate this surface.

3 Digitize Points

A " Scatter Data" set consists of points ((X,Y) coordinates) with associated values. Often these will come from a survey file in a csv (comma separated values) format or similar. In that situation, SMS can import this file directly and create the resulting TIN.

This tutorial will create a TIN that represents the underside of the bridge that would exist over the stream. This type of surface is used in hydraulic models that support the ability to simulate pressurized flow. If the computed water level rises to the surface of the bottom of the bridge, it cannot increase, and pressurized flow will result.

To create the TIN that represents this surface:

1. In the Project Explorer, select the " Bridge Location" theme to zoom into the bridge.
2. Click on the **Scatter Data Module** icon to make the scatter module active.

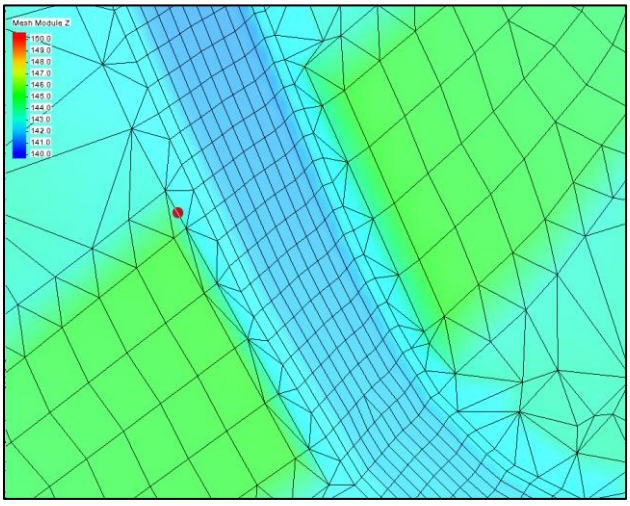

Figure 2 Point on left bank of channel

3. Select the **Create Scatter Point** tool to make it active.
4. Click to make a point on the left side of the channel near the top of the natural channel embankment (as shown in Figure 2). Think of this as where the bottom of the bridge would intersect the abutment.

SMS creates a new point in a new scattered data set at the selected location, with the default value. Unless otherwise specified, this value will be 0.0. This project has a lighting model enable, with a fairly small z-range. This results in a shading effect on the surface. Creating a new point with a value of 0.0, which is interpreted as an elevation, greatly increases the z-range and almost eliminates the shading effect.

5. In the *Z:* edit field, enter “143.55” to set the correct elevation for this point.

Changing the z-value restores the previous z-range and the shading effect returns. This also sets the default value for newly created points.

6. Click a few more points along the line of the channel bank as shown in Figure 3.

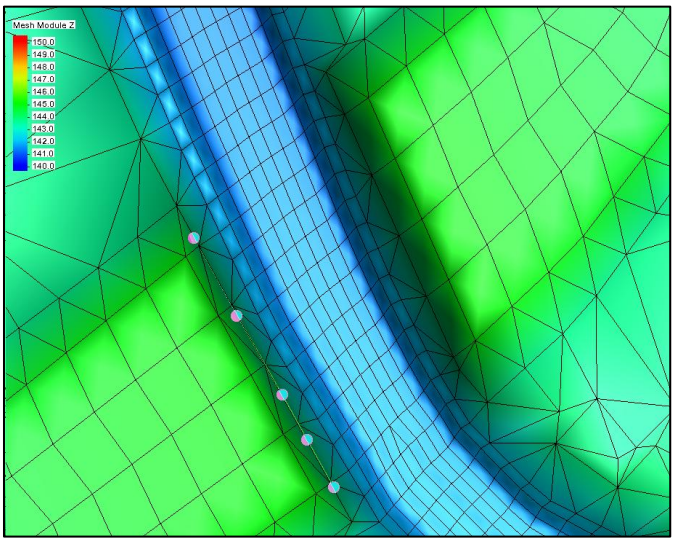

Figure 3 Multiple points on left bank of channel

7. Click a point on the right back of the channel (Figure 4).

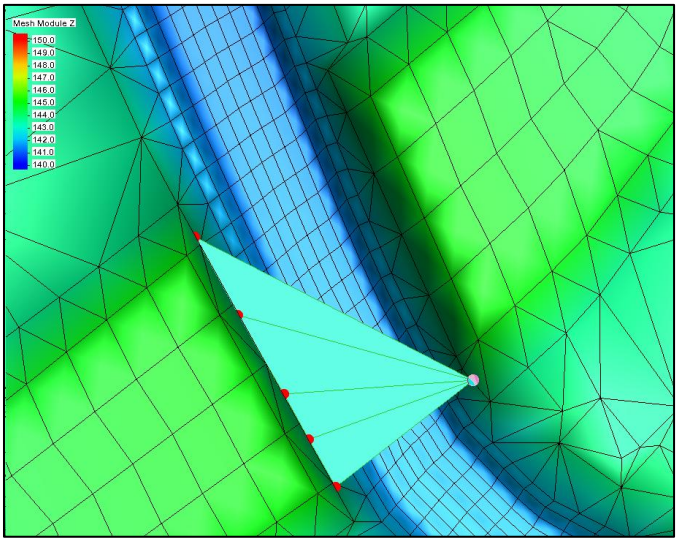

Figure 4 Point on right bank of channel

As the points are created, SMS connects them into a TIN as is evident in the figure.

8. In the *Z:* edit field, enter “143.6” to set the elevation for this new point.

This also updates the new default value. While these values are not significantly different, it illustrates how the surface is not limited to a constant value.

9. Click a few more points along the line of the channel bank as shown in Figure 5.

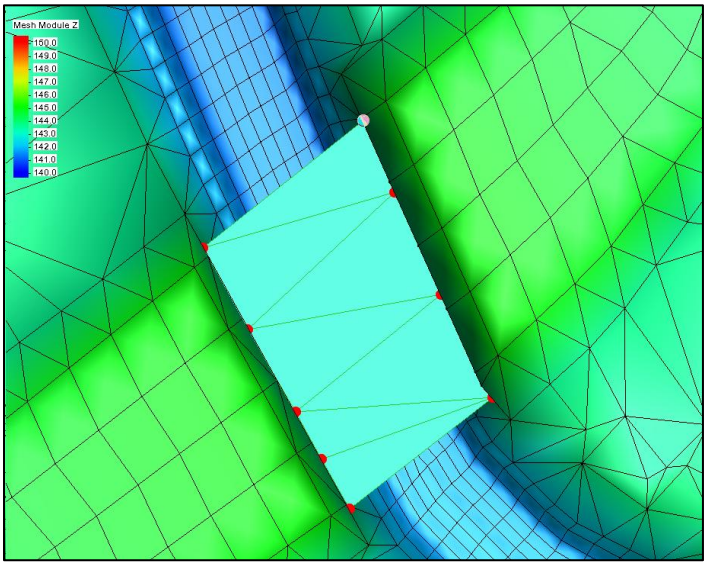

Figure 5 Multiple points on right bank of channel

10. Right-click on the “ Scatter” dataset and select **Rename**.
11. Enter “Pressure Elevation” as the new name. This name describes its function.

These steps have created a triangulated surface that represents the underside of the bridge. This is a very simple surface, but the same process can be used to create very complex surfaces. However, remember that normally a complex surface will come from some form of automated data gathering (survey) process.

4 Modifying the TIN

The TIN was created by connecting each of the points into triangles. This may not result in the desired triangles. For example, this process results in a convex hull (no concave nodes around the boundary of the TIN). To illustrate how to edit the TIN:

1. Select the *Triangles* | **Select Thin Boundary Triangles** command from the menu.

If the digitization process resulted in skinny triangles around the edge of the TIN, these triangles will be identified. Normally, they are not desirable. If the bottom of the screen displays a message that there are triangles selected, click the **Delete** key on the keyboard to delete these skinny triangles. SMS will ask for confirmation to delete the selected triangles. Click **Yes** to delete them.

2. Select the **Swap edge** tool to make it active.
3. In the Graphics Window, click on one of the edges of the TIN.

Note how the orientation of the edge changes. This tool allows customization of the triangulation of the points, and hence the shape of the surface. In this case, since the surface is nearly planar, the orientation of the edge makes very little difference.

Refer to the other *Scatter Data* tutorials for additional operations that can be performed on a scatter set. Also refer to the *Mesh Editing* tutorial. Many of the tools to manually edit a mesh also apply to manually editing a TIN.

5 Exporting the Scatter Set

Scattered datasets can be exported to use in other projects. To export the scatter set:

1. Right-click on the "  Pressure Elevation" scatter set and select **Export…** to bring up the *Export Scatter* dialog.

The default file type for exporting a TIN is an "XMDF" file which is based on HDF5 (like NetCDF).

2. For the File name, enter the name "Bridge Deck".
3. Click **Save** to create the exported file and close the *Export Scatter* dialog.

SMS has saved the TIN as a generic file that can be loaded into any SMS project.

6 Conclusion

This concludes the "Scatter Data – Create" tutorial. Several features have been demonstrated including:

- Creating a new scatter set.
- Setting the default value for digitization.
- Editing a TIN.
- Exporting a TIN.

Also note the default digitization value can be set using the **Node Module** in the **Node Options** command.

To create an additional scattered dataset, when one or more already exists in the SMS project, right-click on the **Scatter Data** entry in the data tree and select **New Scatter Set.** This creates a new scatter set and makes it active so that points created by digitization are added to the new set.