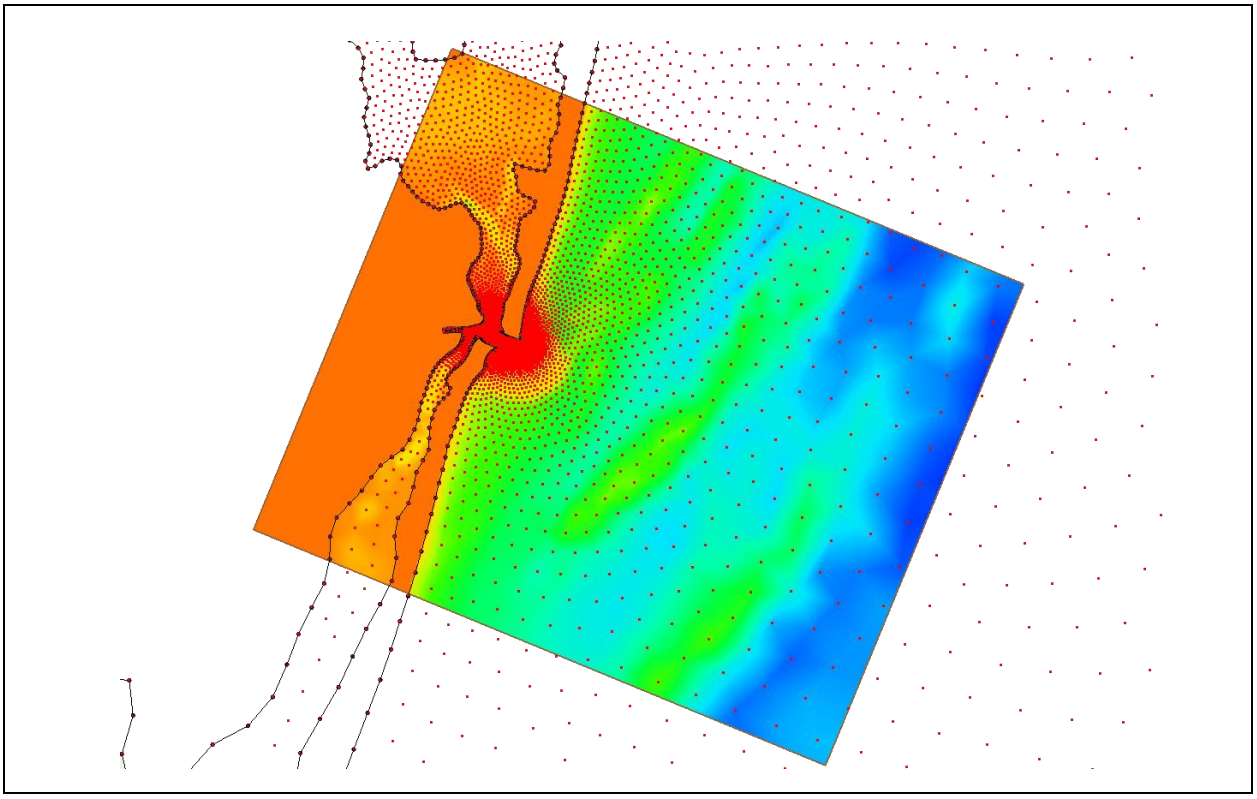
SMS

v. 13.0

SMS 13.0 Tutorial

Quadtree Generation



Objectives

This tutorial demonstrates how to create a quadtree grid.

Prerequisites

- SMS Overview
- Map Module

Requirements

- Map Module
- Quadtree Module
- Scatter Module

Time

- 5–10 minutes

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1 Getting Started

Bathymetry data and an arc defining the shoreline are provided in a project file containing the data from which the quadtree will be generated. The bathymetry data is represented as a scatter point dataset—also called a triangulated irregular network (TIN).

Start by importing the project file:

1. Launch the SMS application.
2. Select *File* | **Open…** to bring up the *Open* dialog.
3. Select "Project Files (*.sms)" from the *Files of type* drop-down.
4. Browse to the *Quadtree_Generation\data files* folder and select "ocean_city.sms".
5. Click **Open** to import the project and exit the *Open* dialog.

The project should appear similar to Figure 1. The data used for this tutorial is from the Ocean City inlet and the surrounding coastline in the state of Maryland in the United States. The shoreline is represented as an arc in the "CMS-Flow" coverage. An elevation dataset has also been included for use in the tutorial. The projection for the project has already been set.

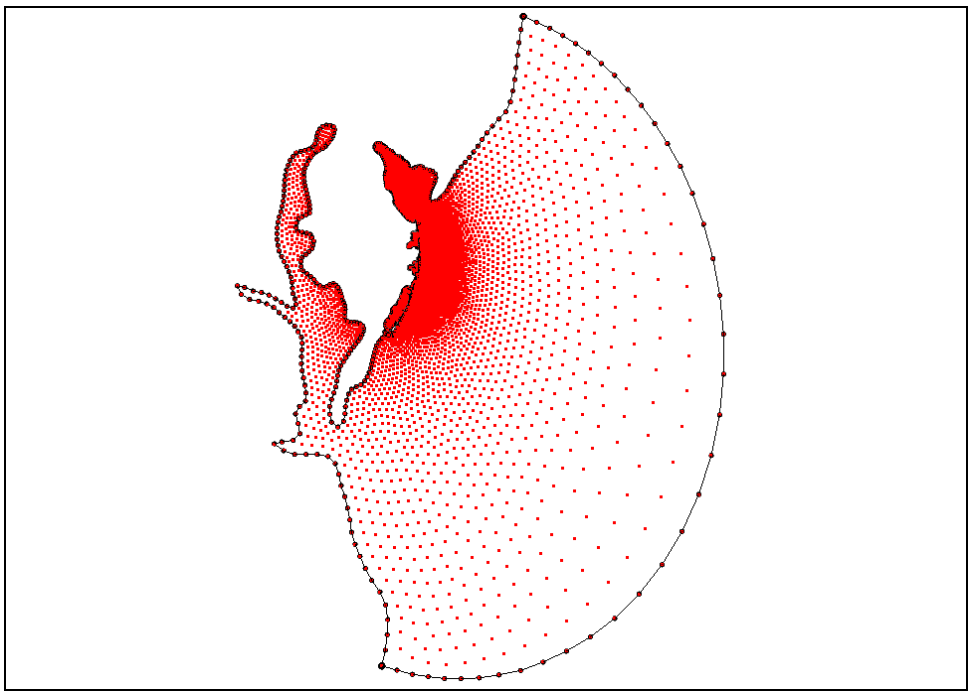

Figure 1 Ocean City inlet

2 Creating a Quadtree Grid

Create the quadtree grid to be used for numerical computations by doing the following:

1. Select "CMS-Flow" in the Project Explorer to make it active.
2. Using the **Zoom** tool, drag a box over the area show in Figure 2.

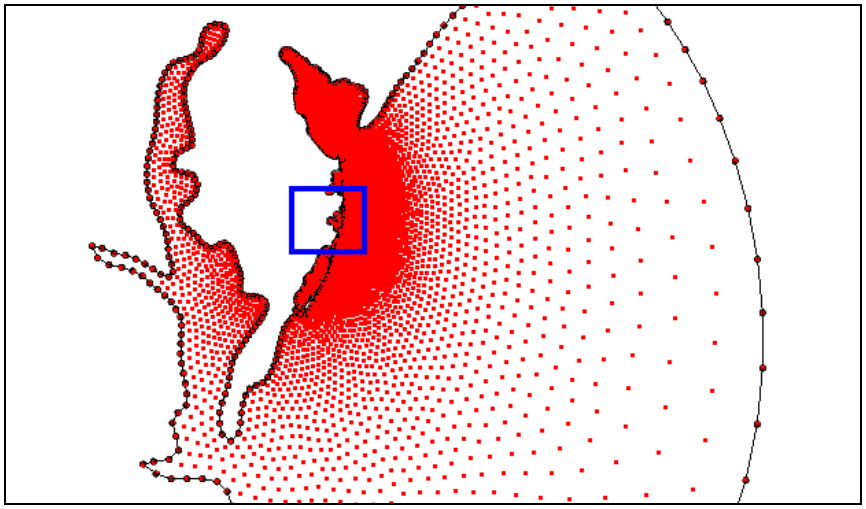

Figure 2 Zoom area indicated by the box

3. Right-click "Map Data" and select **New Coverage** to bring up the *New Coverage* dialog.
4. In the *Coverage Type* section, select "Quadtree Generator" under "Generic".
5. Enter "Inlet" as the *Coverage Name*.
6. Click **OK** to close the *New Coverage* dialog and create the new "Inlet" coverage in the Project Explorer.
7. Select "Inlet" to make it active.

2.1 Defining the Extents

1. Using the **Create 2-D Grid Frame** tool, define the extents of the computational domain. This is done with three clicks (see Figure 3).
   - The first click defines a corner of the CMS-Flow domain. Click in the region near the lower left corner of the domain shown in Figure 3.
   - The second click defines an edge of the domain and the extent of the domain along that edge. Click near the lower right of the domain shown in Figure 3.
   - The third click defines the extent of the domain perpendicular to the first edge. Click at the upper right corner of the domain to define this distance. The purple line in Figure 3 illustrates the desired grid frame. It is okay if the final grid frame does not appear exactly like the example. The exact dimensions will be set in a later step.

2. Right-click "Inlet" and select *Convert* | **Map → Quadtree Grid** to bring up the *Map → Quadtree Grid* dialog.

This dialog allows explicit modification of the extents of the grid frame and setting of the desired grid attributes. The exact values for the position and size of a grid do not generally matter in a real world simulation.

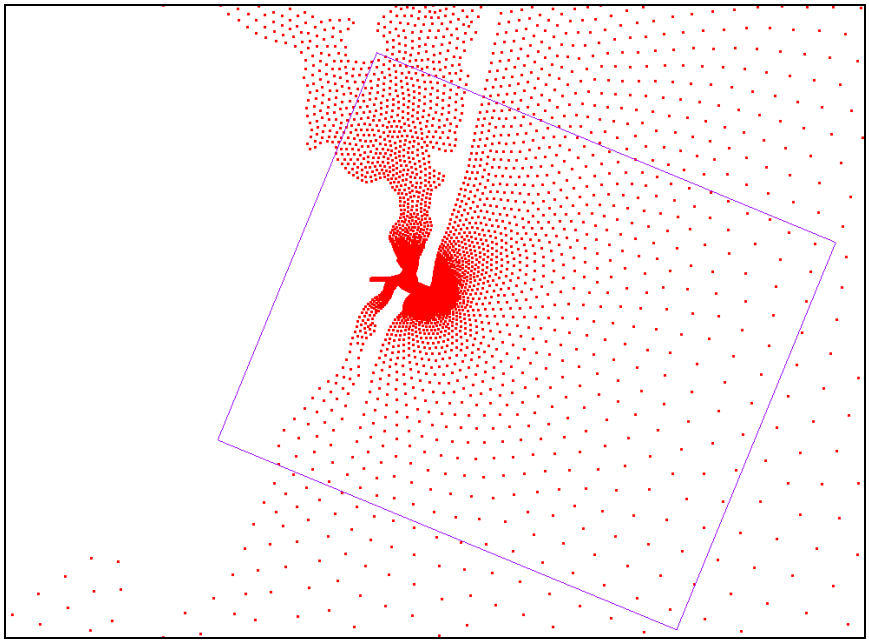

Figure 3 Grid dimensions

3. For consistency in this tutorial, enter the following in the *Origin, Orientation and Dimensions* section:
   - "560770.5" for *Origin X*
   - "70055.4" for *Origin Y*
   - "337.6" for *Angle*
   - "15450.0" for *I size*
   - "13000.0" for *J size*
4. In the *I Cell Options* section, select the *Cell size* radio button and enter "50.0" (this is the column cell size).
5. In the *J Cell Options* section, select the *Cell size* radio button and enter "50.0" (this is row cell size).

Notice that the number of cells is computed and reports that there will be 309 columns and 260 rows.

6. In the *Depth Options* section, select "Scatter Set" from the *Source* drop-down.
7. Click **Select…** to bring up the *Interpolation* dialog.
8. In the *Scatter Set To Interpolate From* section, select "depth". This defines the source for depth data for the model.

In this case, depths (measured from the surface downward, so a positive number gives the distance below the surface) are used instead of elevations. If a survey is done relative to a sea level datum and the data is measured as elevation (distance above sea level), the datum would need to be switched or a depth dataset computed using the data calculator.

9. Click **OK** to close the *Interpolation* dialog.
10. Click **OK** to close the *Map* → *Quadtree Grid* dialog.

SMS will create a quadtree grid within the defined grid frame and will add it to the Project Explorer as "Inlet Grid" under the "Quadtree Data" folder. SMS has defined the cells, assigned depth values to each cell and created cell strings around the boundaries.

2.2 Changing the Display Options

To better see the depths on the grid, change the grid display by doing the following:

1. Select "Inlet Grid" to make it active.
2. Click **Display Options** to bring up the *Display Options* dialog.
3. Select "Quadtree" from the list on the left.
4. On the *Quadtree* tab, turn off all options except for *Contours* and *Boundary*.
5. On the *Contours* tab, in the *Contour method* section, select "Color Fill" from the first drop-down.
6. Click **OK** to close the *Display Options* dialog.
7. Turn off "Depth Values for Grid" in the Project Explorer.
8. Select "CMS-Flow" to make it active.

The project should appear similar to Figure 4.

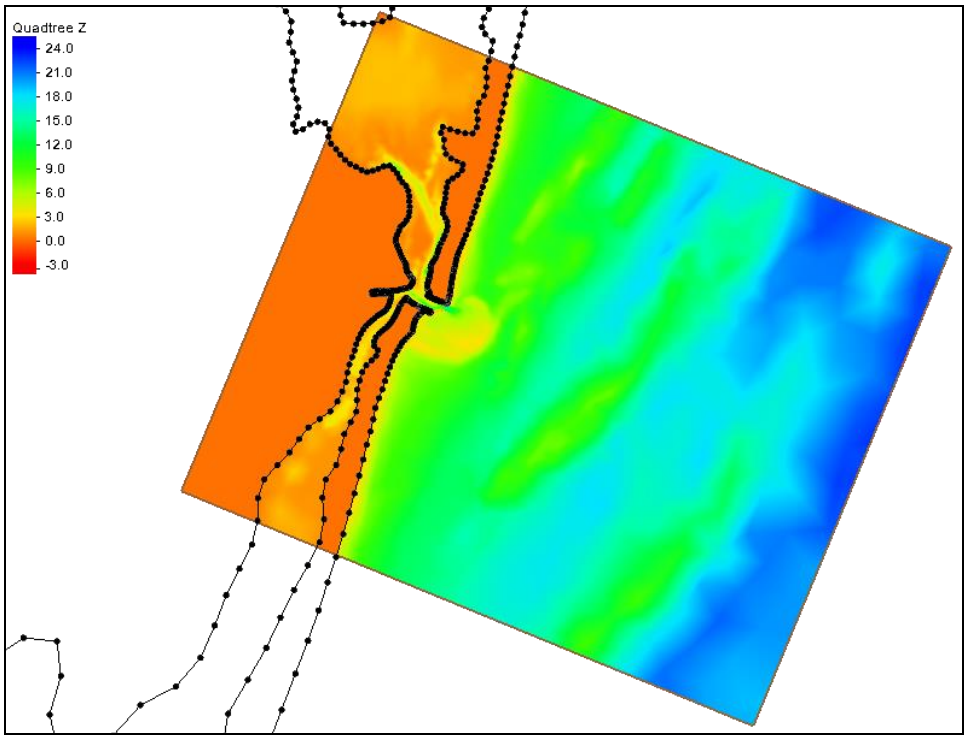

Figure 4 Quadtree contours with color fill

With the quadtree grid now generated, it can be included in a model simulation, such as for CMS-Flow.

3 Conclusion

This concludes the "Quadtree Generation" tutorial. Feel free to continue to experiment with the SMS interface, or exit the program.

