# Scene Graph Display Tool

The SceneGraphDisplay Tool is used to view the hierarchical tree structure of the Scene of a Graphics Application written on the GoblinXNA framework. It provides a means to display the scene graph structure and also view the properties of the various scene graph nodes during runtime. The tool is implemented as a plug-in dynamic library.

Getting started:
1. Include the provided DLL file SceneGraphDisplay.dll in the project.
2. Include the namespace `SceneGraphDisplay` in the main file of the project.
3. Declare a variable of type "SGForm" in the application's namespace and initialize it to null.
   `SGForm fs = null;`
4. Include the following snippet of code in a function used to start the SceneGraphDisplay Tool.

```
fs = new SGForm(scene);
MouseInput.Instance.MouseClickEvent += new
HandleMouseClick(fs.SG_MouseClickHandler);
fs.RunTool();
fs.Visible = true;
```

The above four lines of code does the following things.

- The SGForm object variable has to be initialized with the Scene object of the application.
- For object (GeometryNode) picking to be enabled in the application screen, add the event handler SG_MouseClickHandler to MouseClickEvent of the current application.
- Call the function RunTool() to start the tool. This function will spawn a thread, which will run an infinite loop of Update function calls (which will traverse through the SceneGraph and update the TreeView)
- Make the Display tool form visible.

(For example, this snippet of code can be added in the Keyboard event handler of the application. But care should be taken that the RunTool() function call is made only after the scene graph of the application is populated.)

5. Add the function call UpdatePickedObjectDrawing in the Draw function of the main application.

```
if (fs != null)
   fs.UpdatePickedObjectDrawing();
```

This function call is responsible for drawing the bounding box around a picked object on the application screen.


Features of the Tool:

1. The tool is a Windows Form which contains two tabs and one data grid table. The first tab contains a tree view of the scene graph and the second tab contains a graphical view of the scene graph.
2. Both the tree view and the graphical view are synchronized. All the various nodes of the scene graph are added as nodes in both the tree view and the graphical view. If there is any change in the scene graph of the application, then corresponding changes in the tree view and graphical view are immediately shown (with a maximum delay of 100 milliseconds)
3. Tree View:

a. Clicking on a node in the tree view – All properties of the corresponding scene graph node get enumerated in the 'Properties' data grid table. The selected node is highlighted.

b. If the selected node is a geometry node – then the corresponding object in the application gets highlighted (a bounding box is drawn around all the objects contained within the selected geometry node). The currently selected geometry node is highlighted with a blue background color.

c. If a particular geometry node is outside the current camera bounding frustum (out of view), then it is highlighted with a red background color.

4. Graphical View:

a. It contains both an enlarged view and a small graphical view of the SceneGraph.

b. Clicking on any nodes either in the enlarged view or the small graphical view, highlights the corresponding node (a black filled rectangle is drawn behind the node circle) and all the properties of the corresponding scene graph node get enumerated in the 'Properties' data grid table.

c. If the selected node is a geometry node – then the corresponding object in the application gets highlighted

d. If a particular geometry node is outside the current camera bounding frustum (out of view), then the corresponding node circle is colored red.

e. In the smaller panel (if the graphical hierarchy does not fit into the panel), scroll bars are provided for navigation. In the enlarged view, mouse drag can be used to move the display area in any directions.

f. Zoom Track slider is provided next to the small panel. There are five levels of zoom. The zoom control is for both the small panel and the enlarged panel.

g. A small legend is drawn in the right hand corner of the Graphical Display tab, showing the mapping of node colors to the scene graph node types.

5. Picking an object from the application screen: Clicking on a particular object in the main application screen will highlight the corresponding node in the tree view as well as the graphical view with blue color. Also a bounding box is drawn around the picked object in the application screen.

6. Properties DataGrid Table: The properties table enumerates all the property values for the selected node. Some complex objects such as Model, Network are just listed with the class names as the values. Right clicking on such complex object rows, will show a popup menu "Click here for detailed information". On clicking this button, the complex object property values are filled up in the DataGrid table. To return to the property values of the currently selected node, a back button is provided on the upper right corner above the table.