

Polylines and Contours

This tutorial introduces you to the concepts of “polylines” and “contours” within Simmetry3d.

Concepts

In this tutorial you will learn:

- what are “polylines” and “contours”
- how to create them
- how to edit them
- How to make them visible and invisible
- How to use them for other purposes

Prerequisites

- Project Tree
- Tool Options Bar
- Object tools

Polylines

Polylines are really just sequences of lines, and the lines can be either straight or curved (splines). The sequence of lines can either be “open” – the start of the sequence is not the same point as the end; or “closed” – the start and end are at the same point and a loop is formed. For closed polylines there can be “holes” defined in the polyline – these are closed polylines which are within the outer polyline.

You will see there is a node in the Project Tree called “Polylines” this shows all the polylines which exist in the current project. Polylines are categorised into “groups” – this is purely for convenience sake. The best plan is to group similar polylines into the same group. Groups of polylines can be made visible and invisible.

Although initially it may be difficult to see the need for polylines, it will soon become apparent that they are very useful things. Their uses are as follows:

- 1) Defining areas of the terrain for texturing.
- 2) Defining routes for the terrain tools to travel along.
- 3) Defining areas for selection of the terrain.
- 4) Creating 3d objects from the polyline shapes.
- 5) Defining a route across the terrain and deriving a cross section of the terrain along this route.

Their usefulness is increased by the fact that you can edit them after you have created them – so the route they follow can be “tweaked”.

Contours

These are structured in the same way as the polylines; so again you will find an node in the Project Tree called “Contours”, which shows all the contours which exist in the project. The editing of the contours is exactly the same as the polylines the difference comes from their semantics. Again they can be grouped; this time though each group has a height associated with it and will contain only contours which represent that height. The uses of the contours are as follows:

- 1) For visualisation purposes – they are familiar to lots of people as a way of visualising terrain relief.
- 2) Generating 3d terrain data.

Contours can be imported from GIS/CAD sources, or can be generated automatically from the terrain in Simmetry 3d. The reverse process is that Simmetry 3d can take a set of contours and construct the 3d terrain from them. This can be used in conjunction with the contour/polyline editing tool to experiment with the effects of moving contours closer together or further apart.

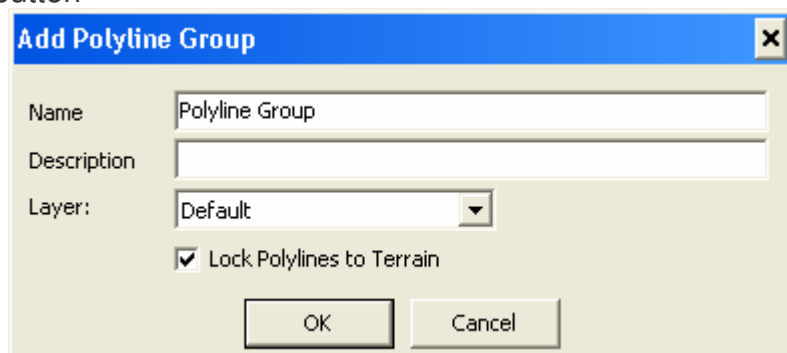
EXERCISE 1

Creating and editing a polyline

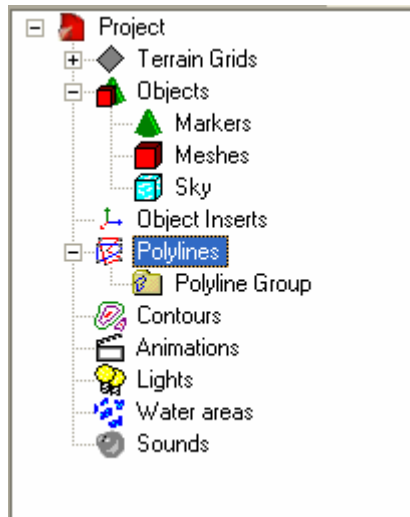
- File|New and accept the default options
- Choose “Polylines” Mode:



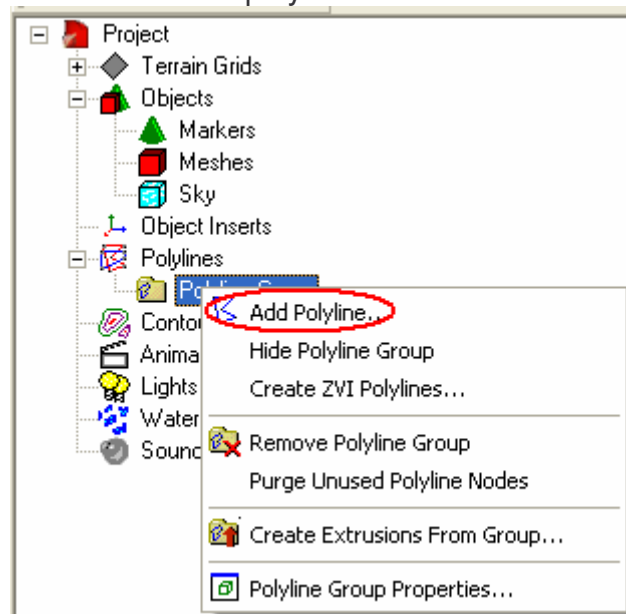
- In the project tree – right click the Polylines node and choose “Create group”, - a dialog will appear.
- In this dialog give the group a name “Polyline Group” and press the “Ok” button



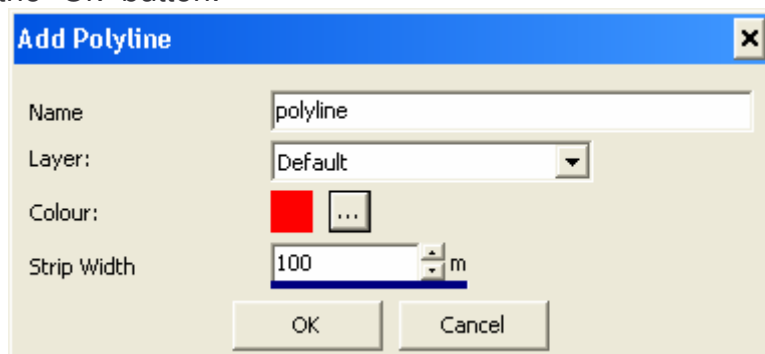
- This will create a polyline group and you will see it appear in the Polylines section of the Project Tree:



- Right click on the polyline group node in the tree view – this will show a pop-up menu – choose Add polyline:



- This will display a dialog box – enter the name “Polyline” and then press the “Ok” button:



- You are now ready to start entering points into the polyline. This is done by pointing the mouse onto the terrain and pressing the left mouse button. Notice that options have been added to the “Tool Options Bar”.
- Add a few points in this way
notice that if you click and hold the mouse down you can drag the new point to its required position.

- Explore the options available on the Tool Options Bar, in particular “Linear” and “Close Polyline” and “Start New” – see what effect they have.
- You should quickly become proficient in creating polyline, both open and closed, both linear and spline-curved.
- To make a closed polyline quickly just click on the first node in the polyline – Simmetry will detect that the polyline is now closed.

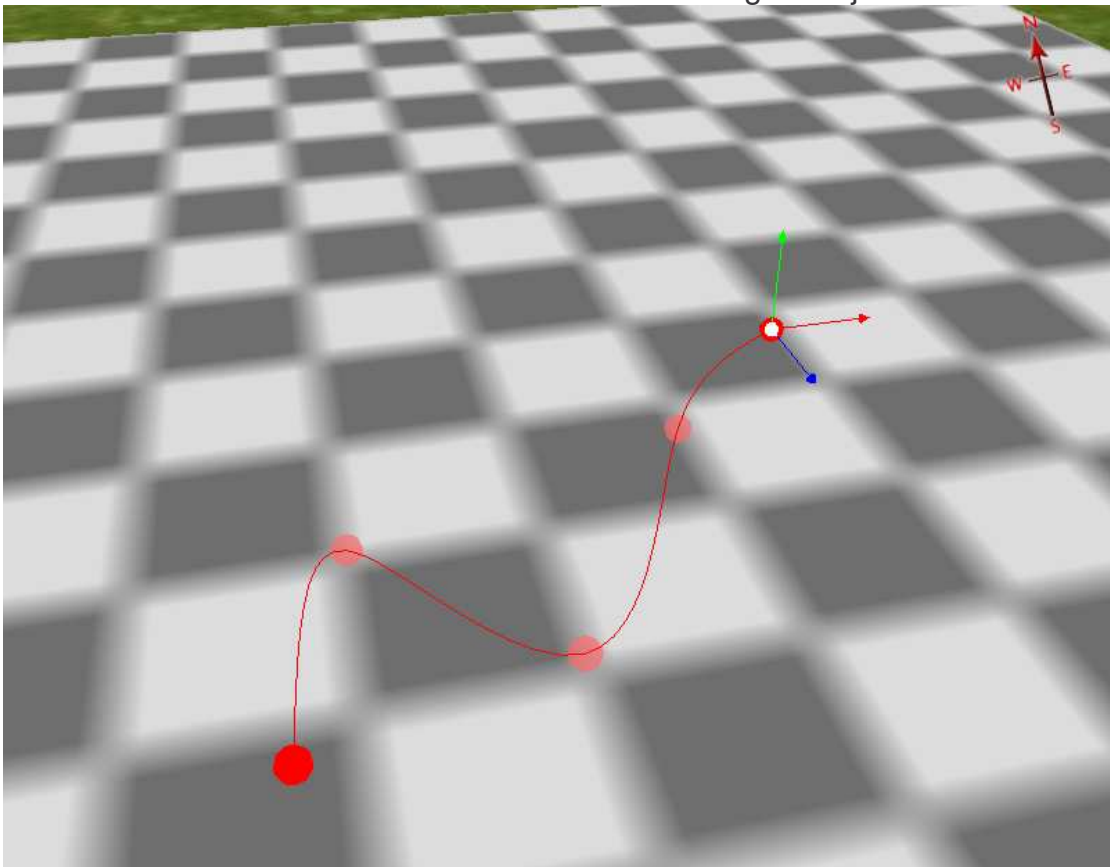
Once you have some polylines entered – you can try and edit one of them

- Go to the Project Tree and right click on one of the polyline nodes, and choose “Edit polyline” from the pop-up menu.
- This starts the polyline tool again – notice that the mode has changed to “Move point”:



- The polyline tool will now allow you to click on one of the nodes in the polyline (they have all been highlighted with a sphere) and to drag it to a new position.
- Click on a node

notice how the 3d axis marker appears at the node point – you should have seen this marker when moving 3d objects about.



You will recall that you can either click on the square in the middle or at the end of the axis arrows to constrain the movement to that direction.

Notice also that you cannot move the node “up” – polyline nodes are locked to the terrain surface. If you build the terrain under the polyline you will notice that the polyline will adjust itself to stay on the terrain.

- Finally experiment with hiding and showing polylines in the 3d view.

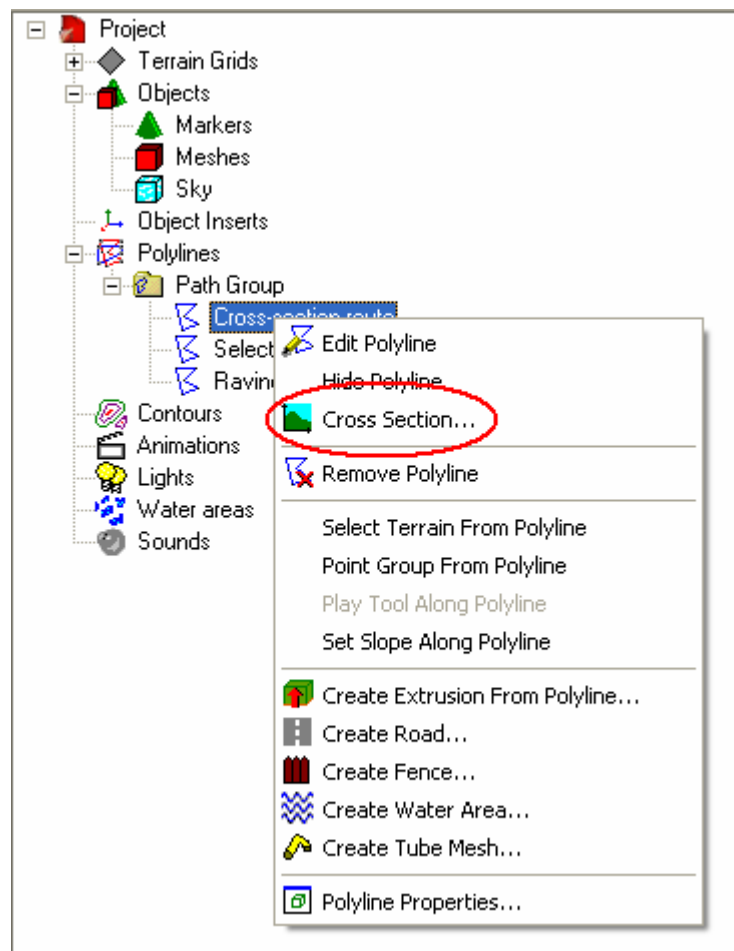
You can hide/show all polylines by right clicking the Polylines node in the Project tree and choosing “Show polylines”. A tick appears next to it when polylines are showing.

- Alternatively make a single polyline visible/invisible by right clicking on that polyline’s node in the Project tree and choosing “Hide polyline” / “Show polyline” in the menu, You can also try doing the same with the polyline group which will hide all the polylines in that group.

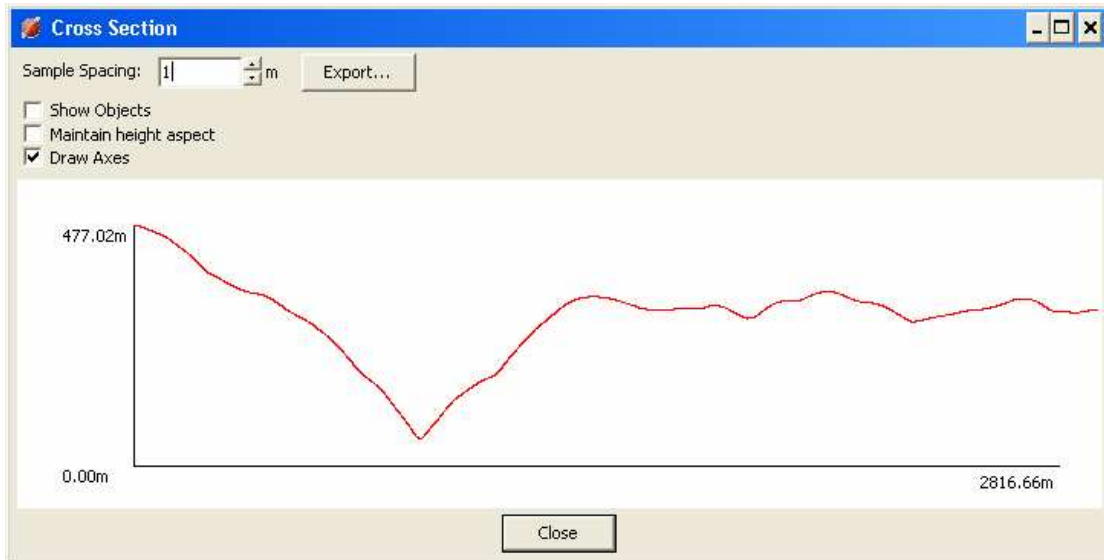
EXERCISE 2

Doing things with polylines

- File | Open “Polylines.s3d”.
- This has 3 polylines in it – “Cross-section route”, Selection Area” and “Ravine path”.
- Right click on “Cross-section route” item in the Project Tree – the polylines popup menu should appear:



- Choose “Cross Section” – a dialog showing the cross section of the terrain along the polyline should appear.



- Next right click on the “Selection area” polyline in the Project tree and choose “Select Terrain From Polyline”.
This will select the terrain underneath the polyline. If the polyline is closed then the whole area is selected; if however the polyline is open then the polyline’s “Strip Width” is used to give the polyline some width and the terrain under this width is selected.
- Choose Selection | Select None
- Next start the dig tool. Then right click on the “Ravine path” item in the Project tree, and choose the “Play tool along polyline” option.
This will run the dig tool along the polyline and you should end up with a ravine in the terrain along the polyline. You may need to adjust the dig tool parameters to get a realistic ravine – use the Undo feature and keep playing the tool along the polyline until you get the parameters correct.
- Choose “properties”.
This allows you to change the polyline’s properties.

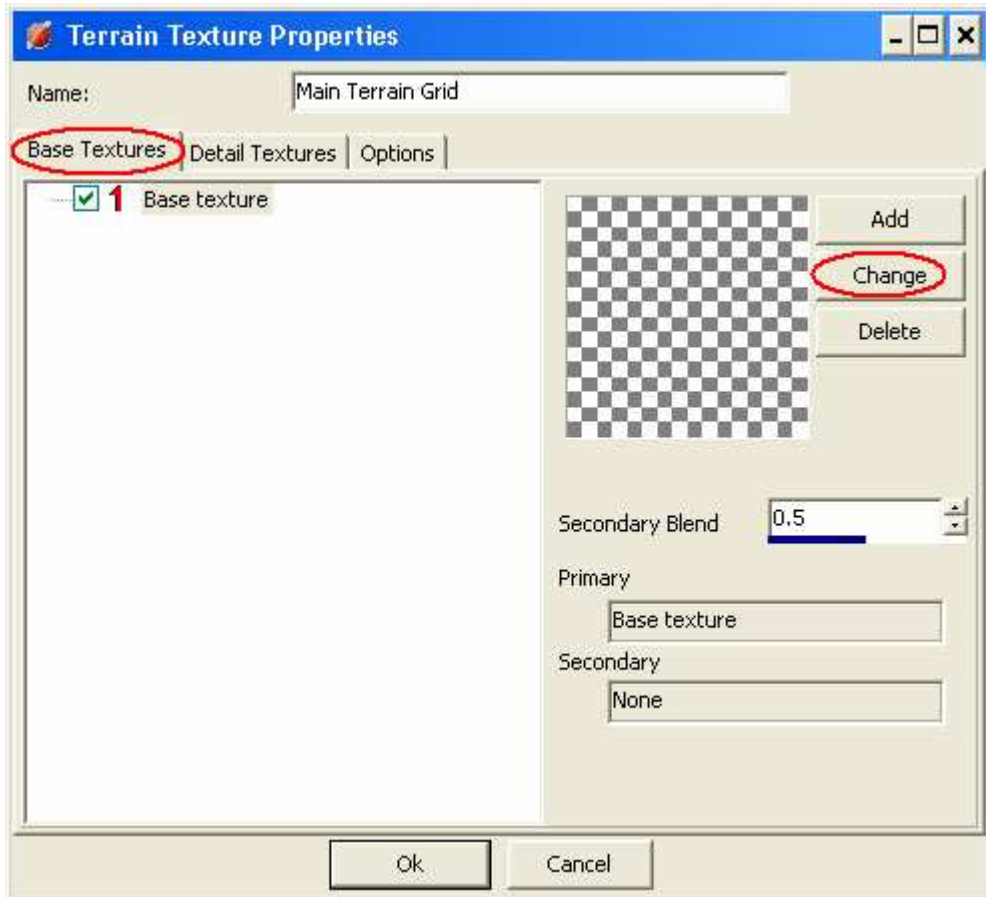
Use of polylines for texturing will be included in the texturing tutorial.

- Practice adding a contour group (refer to exercise 1)
- Practice adding a contour (refer to exercise 1)

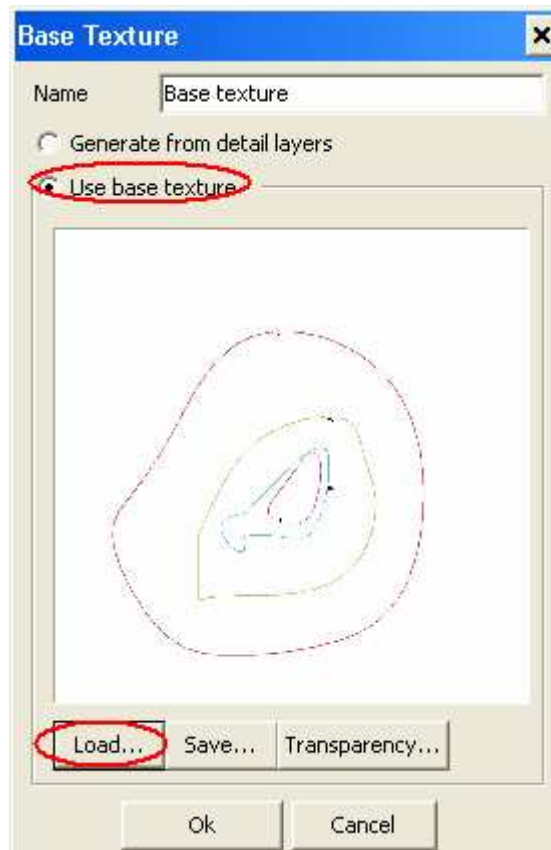
EXERCISE 3

Overlaying a contour plan, tracing the contours and then generating the 3d terrain.

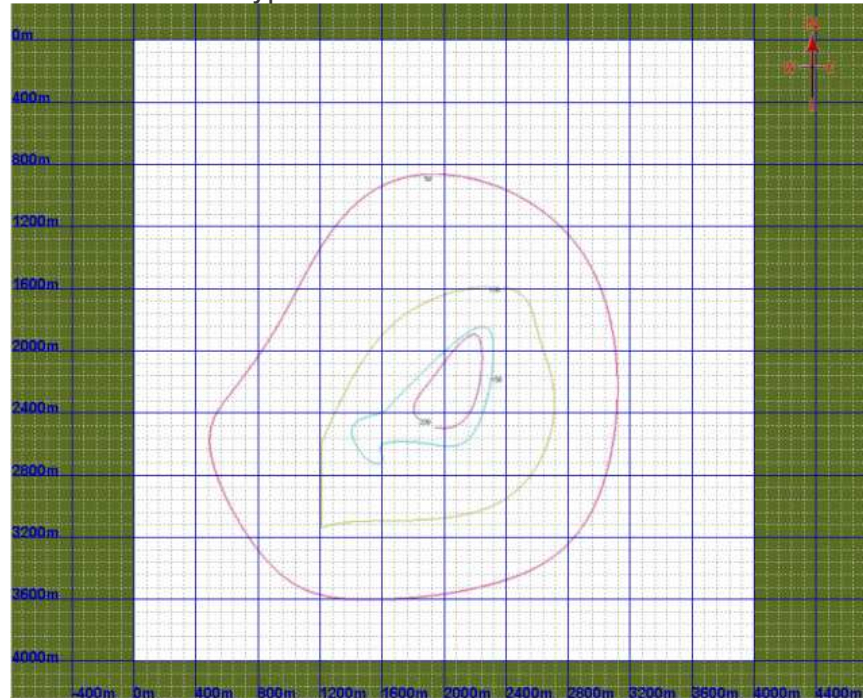
- File | New, choose 4000x4000 tile size.
- Texture | Terrain Texture Properties – goto the Base Textures tab, and change the base texture:



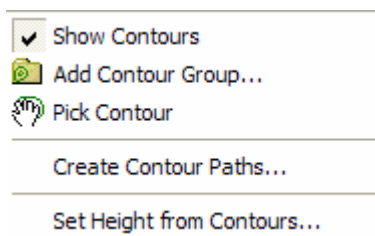
- Choose “Use base texture” and then press the “Load” button. This lets you choose the contour plan to overlay the terrain – choose “contourBitmap.jpg”:



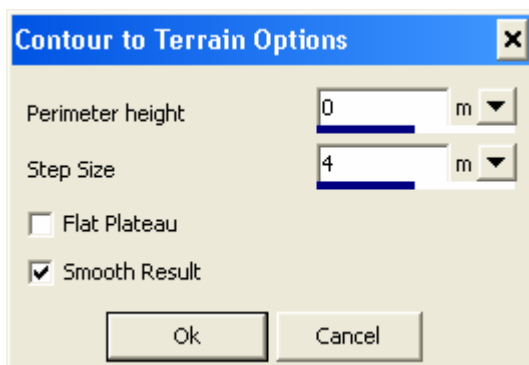
- Ok the dialog boxes then make sure you are in Textured viewing Mode and set the camera type to “Plan”:



- Now create a contour group for each height shown in the over-layed texture, (the heights are marked in text next to each contour – 50, 100, 150 and 200).
- Trace round each contour by “Add contour”
- When you have finished that (alternatively there is a “contours.con” file – use the File | Import | Contour Importer menu option to load this), right click the Contours node in the Project Tree:



- Choose “Generate Terrain from contours”, the following dialog will appear:



- Experiment with the settings – Undo will revert the terrain to its previous state after each experiment.

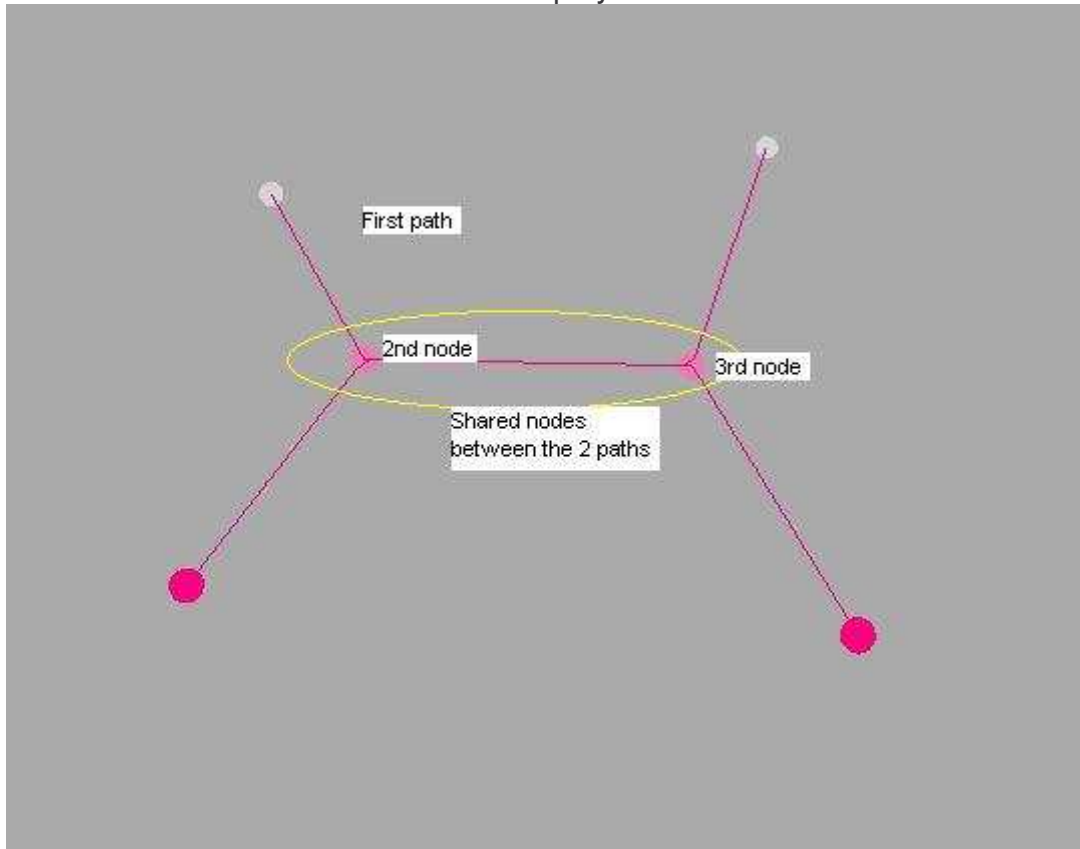
Advanced Options

Polylines can be made up of some linear lines and some spline curves. Try the following:

- For a new polyline - Select “Linear” on the Tool Options Bar, and then add 4 points.
- Now Unselect “Linear” and add another 4 points
notice that the first half of the polyline is linear and the second half is curved.
- Next try this:
- Start a new polyline, and Unselect “Linear” – add 3 points
this will allow you to enter a curved polyline – add 3 points.
- Now press the “New sub-polyline” button and enter another 4 points.
You should notice that the polyline has a distinct non-curved angle where the new sub-polyline started.
- Find the “Snap to Grid” option and turn it on. Now add some points to the polyline
(You may also need to go to the Edit | Settings dialog box and turn on the “Orthogonal grid” on the GUI tab). Choose Top view and you will see a grid over-laid on the terrain. – you will see that their position is constrained to the grid points.

Very Advanced

- Start a new polyline – make it a linear one, and add 4 points to the polyline
- Start a new polyline (“Start new” on the Tool Options Bar).
- Add a point , then click on 2nd node of the first polyline (you may need to Select “Show all nodes” in order to see where this node is).
- Click on the 3rd node of the first polyline it should look like this:



This has shared these 2 nodes between the 2 polylines – if you go and edit either polyline and move either of these nodes – then it will affect the other polyline too. It also means that the line between the 2 nodes is always shared too. This can be a very useful when polylines are used for defining areas of colour when texturing the terrain. (If you want a node to be in the same position as another node, but not to be “shared”, then hold the shift key down when adding the nodes).