

Composite Objects in Simmetry 3d

This tutorial demonstrates how composite objects may be created and edited in Simmetry3d and how they can be used within animations.

Concepts

In this tutorial you will learn about:

- Creating Composite Objects
- Editing Composite Objects
- Hierarchies of Composite Objects
- Animations in Composite Objects

Prerequisites

- Objects Tutorial
- Animations Tutorial

What are Composite Objects?

As their name suggests these are objects which are made up from other objects. They allow other objects in Simmetry3d to be aligned appropriately and then grouped into a single object which can then in turn be used in the same way as any other object in Simmetry3d. The types of objects which can be grouped in this way are:

- Meshes
- Markers
- Lights
- Sounds
- Composite Objects
- Animations

In essence they encapsulate part of the insert hierarchy into a “re-useable” group of objects. The insert hierarchy defines how the objects are arranged relative to themselves, and the objects which the inserts reference define which objects are encapsulated into the composite object.

Animations which include channels which define how the inserts in the hierarchy move can also be included in the composite object. This allows the composite object to have dynamic qualities which can be called upon when they are in turn referenced in other animations. An example of this could be a door object encapsulated into a composite object in conjunction with animations of the door opening and closing. Another example could be of a wind turbine composite object with an animation of the propeller rotating.

Composite objects can be stored in the mesh library in exactly the same way as other types of objects.

Why use Composite Objects?

Grouping objects together into composites simplifies the design process by “hiding” the grouped objects and inserts, and “showing” them as a single composite object. This logical grouping is both intuitive and practical. Big objects can be made up of a variety of smaller ones; once the big object has been made it can be made into a composite and re-used, without worrying about how it was composed. With the ability to use other composite objects within a composite this design method can extend to many levels.

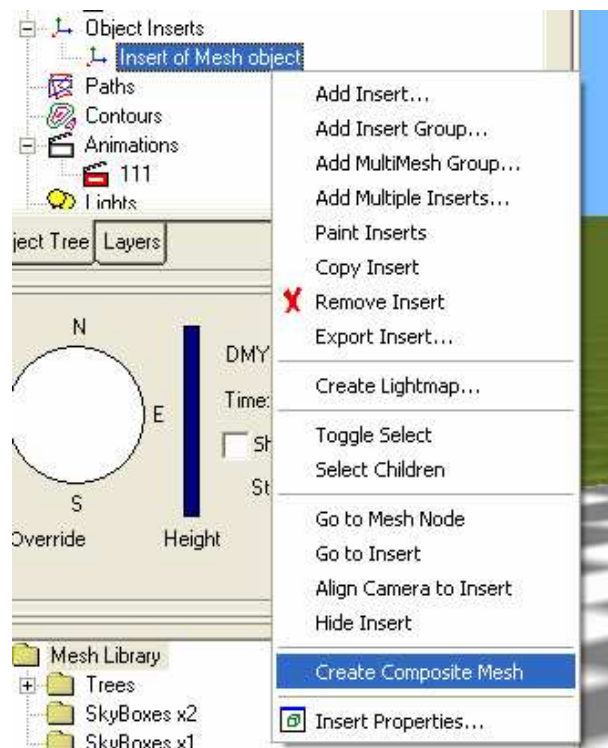
Because composites can be stored in the mesh library they represent the ideal way to reuse objects in other projects.

Composites also encapsulate the relative movement of objects within themselves. This greatly simplifies the procedure of animating a whole dynamic scene.

EXERCISE 1

Creating a simple composite object.

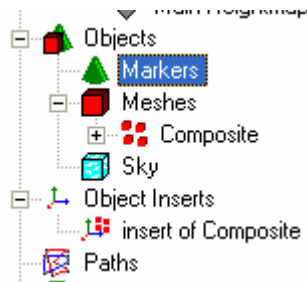
- Open “Composites\Ex1.s3d”
- Notice that a single mesh object has been placed on the terrain. Find the insert of the object in the Project Tree and right click on it:



- Choose “Objects” mode from the Tool Modes toolbar:



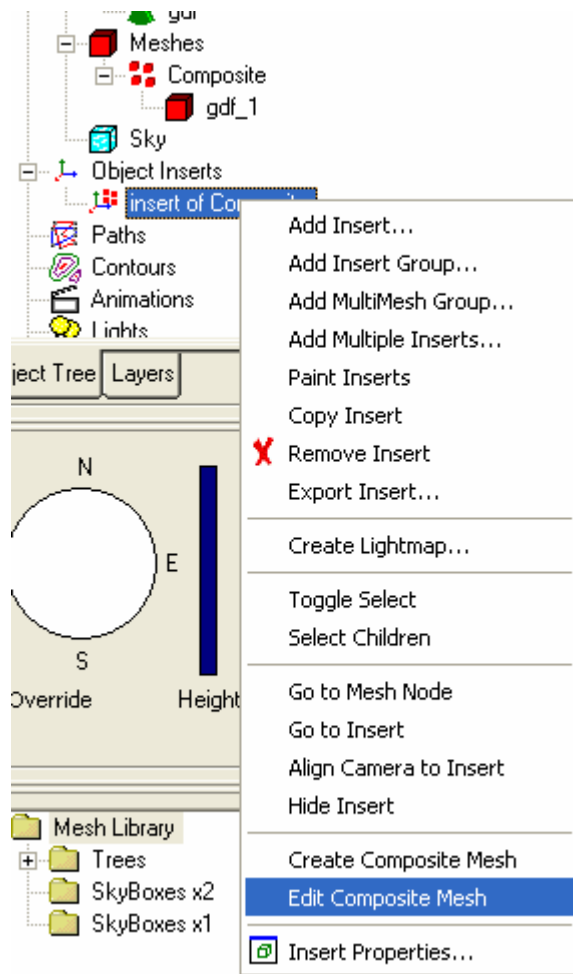
- Choose “Create Composite Mesh” from the menu.
- Notice that the Mesh object has disappeared from the project tree and has been replaced with “Composite” and “insert of Composite”. If you expand the Composite node in the Project Tree you will see the objects which have been used in the composite.



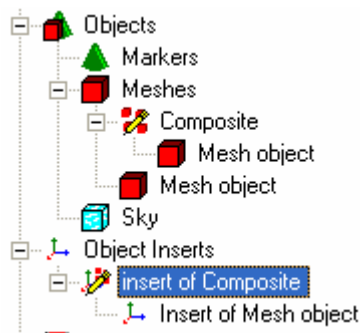
EXERCISE 2

Editing a composite object. We will continue with the previous example.

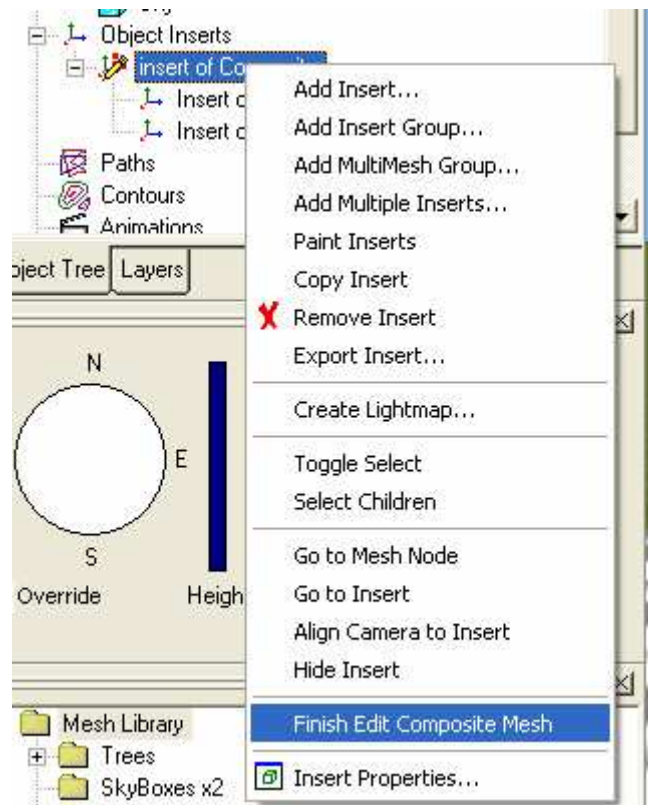
- Find the insert of Composite in the project tree and right click on it:



- Choose “Edit Composite Mesh”. Notice that the icon in the project tree of the insert of Composite changes so to does the icon for the composite object – this shows you which objects are currently being edited:



- Expand the insert of Composite node to reveal the “Insert of Mesh Object”. Make a copy of this insert by lift clicking on it and dragging it into the 3d view. Drop it next to the existing one.
- Now right click on the “insert of Composite”:

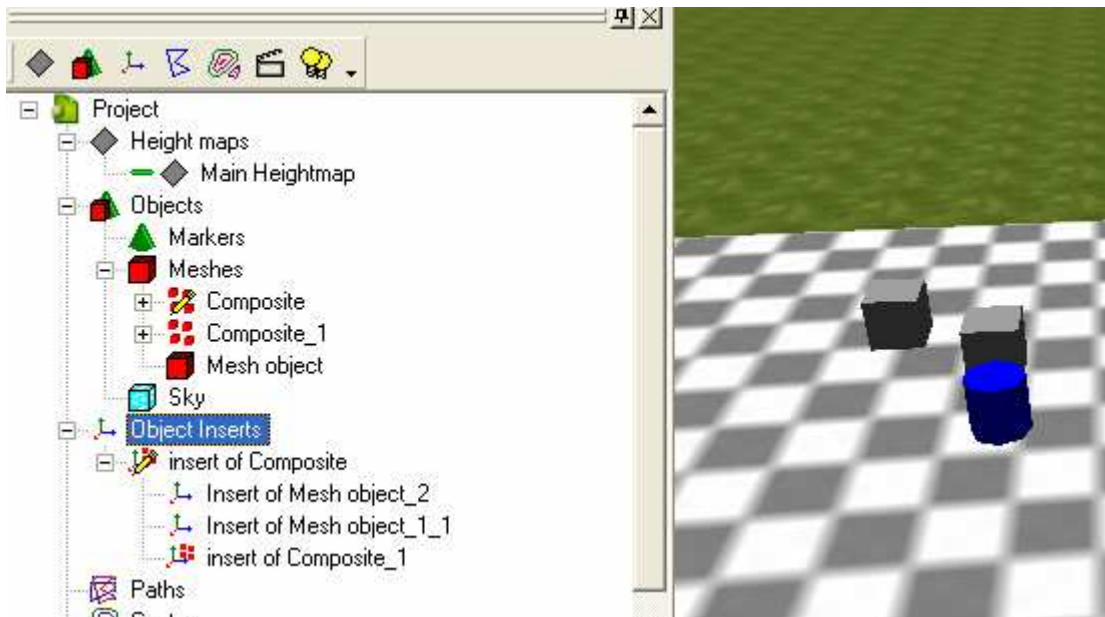


- Choose “Finish Edit Composite Mesh”. This updates the Composite Mesh to the new object hierarchy within the edited insert. (It also updates any other inserts of the Composite which may exist).

EXERCISE 3

Using a composite object within a new composite object; again continue from the previous exercise

- Drag the “Object mesh 2” onto the 3d view – this will create an insert of that mesh.
- Find this insert in the project tree and right click on it and choose “Create Composite Mesh” – the same as you did in exercise 1.
- You will now have 2 composite meshes
- Find the insert of the original one in the project tree and right click on it and choose “Edit Composite Mesh” – same as exercise 2.
- Now find the insert of the new composite in the Project tree and drag it onto the composite mesh insert you are editing – this will make it a child of that insert and hence part of the Composite being edited:



- Right click on the “insert of Composite” and choose “Finish Edit Composite Mesh”. The newer composite is now contained in the original composite mesh.

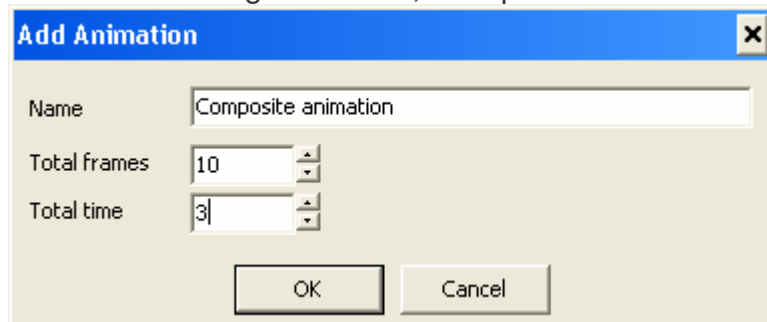
Notice that the newer composite remains available to place in other places where as the ordinary meshes contained in the composites do not. This is the only difference you will find when constructing a composite from other composites as opposed to other ordinary objects.

EXERCISE 4

Adding an animation to a composite object

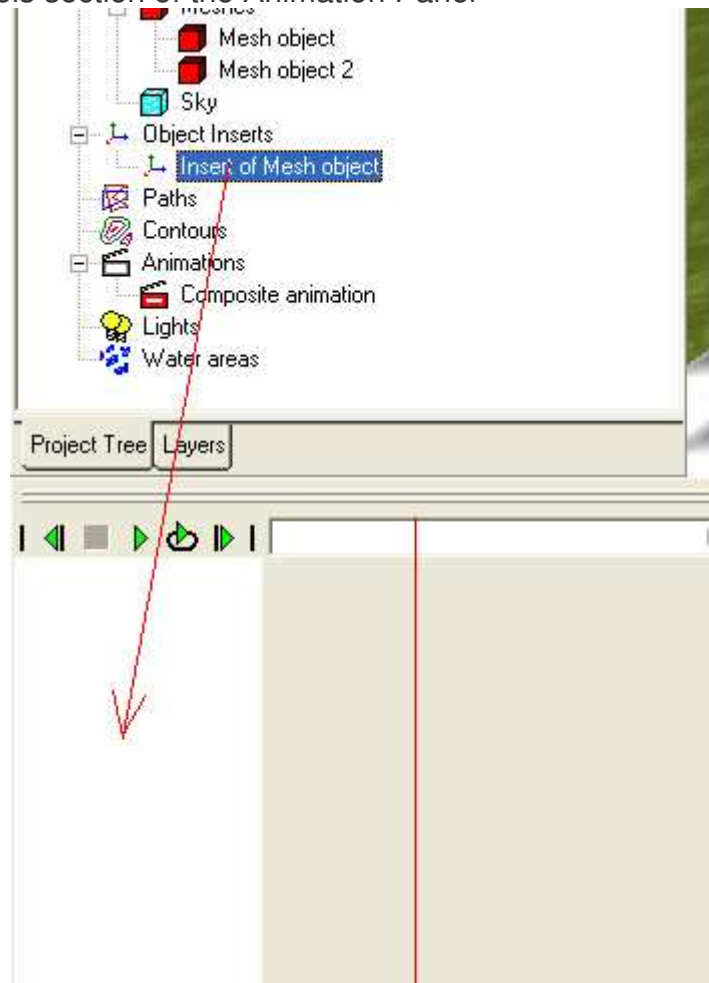
Start in the same way as exercise 1.

- Open “Composites\Ex1.s3d”
- Find the Animations node in the Project Tree, and right click on it and choose “Add Animation...”.
- Set the field in the dialog as follows, then press the OK button:



- Make sure you have the Animations Panel showing – this is needed to help construct the animation (refer back to the Animation Tutorial)

- Find the “insert of Mesh object” in the project tree and drag it onto the channels section of the Animation Panel

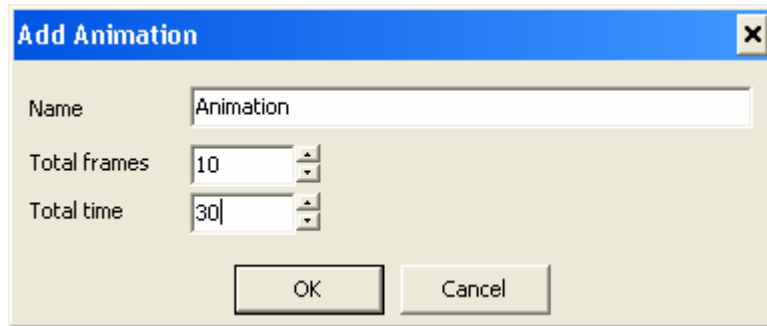


- This creates a channel for the Mesh object insert. Record some keys, moving the object for each key (refer back to the Animation tutorial).
- When you are happy with the animation (there is a “composites\ex4.s3d” with one prepared in it already if you want to refer to that), you can create a composite in the same way as in exercise 1. The difference this time is that the animation you have just created will be included in the composite. The reason for this is that Simmetry3d detects that the animation only referenced inserts used within the composite and hence deduced that it should be part of the composite.

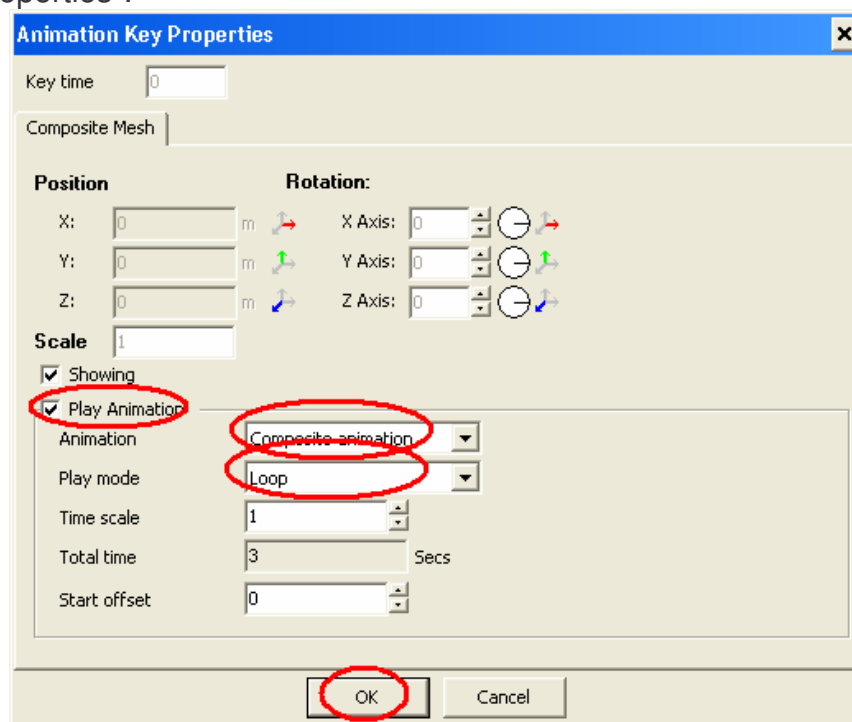
EXERCISE 5

Playing composite object animations.

- Open “Composites\Ex5.s3d” (This is actually the completed exercise 4 file).
- Create a new Animation:



- Drag the node “insert of Composite” in the Project tree into the channels section of the Animation Panel.
- Create a key for frame 0, then right click on the key and choose “Properties”:



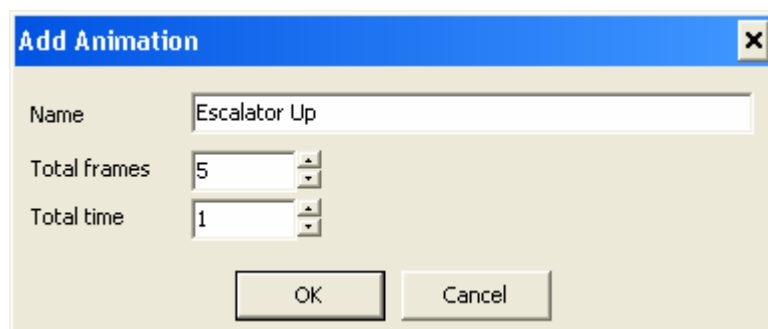
- Check the box marked “Play Animation”; this will enable the animation controls beneath it. The Animation drop down list shows the available animations – in this case there is only one – it’s the one you created in the previous exercise. The play mode allows you to choose whether the animation should loop or just play once. The other options allow you to adjust the speed of the animation and whether it should start at the beginning or at some time offset into the animation.
- Choose OK after setting the properties as shown above. Now press the play button on the Animation Panel – the animation in the composite should play continuously in a loop.

EXERCISE 6

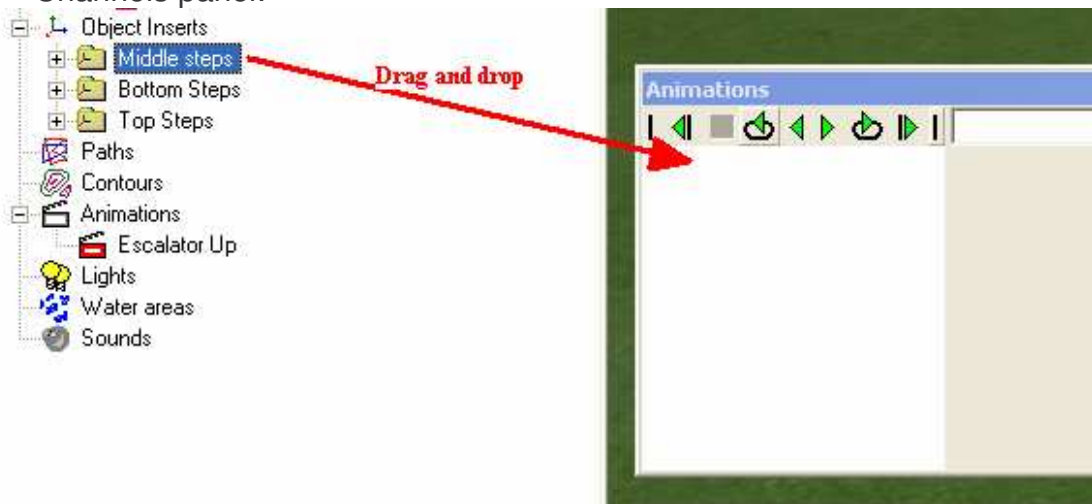
Creating a simple escalator composite

The animation for an escalator is actually quite simple. Create a set of steps first. The animation only needs to move each step as far as the next step up. When the animation plays, each step moves as far as the next step and then “jumps” back to its original position and starts again. The steps in the middle of the escalator can be grouped together and the whole group moved as a single entity; the steps at the start and end move slightly differently so are best moved individually although the principle remains the same.

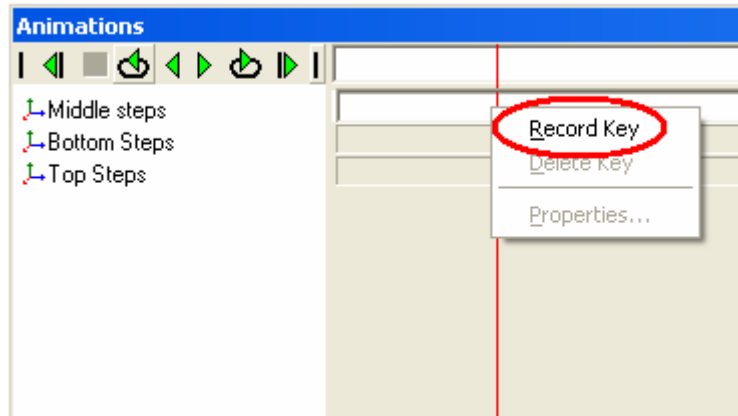
- Open “Ex6.s3d”
- You will find a series of steps inserted on the terrain. They have been grouped into “Bottom Steps”, “Middle Steps” and “Top Steps”.
- All that is required is to animate the 3 groups. The Bottom and Top steps move horizontally where as the middle steps move up diagonally.
- First create a new animation by right clicking on the “Animations” node of the project tree, and choose “Add Animation...”:



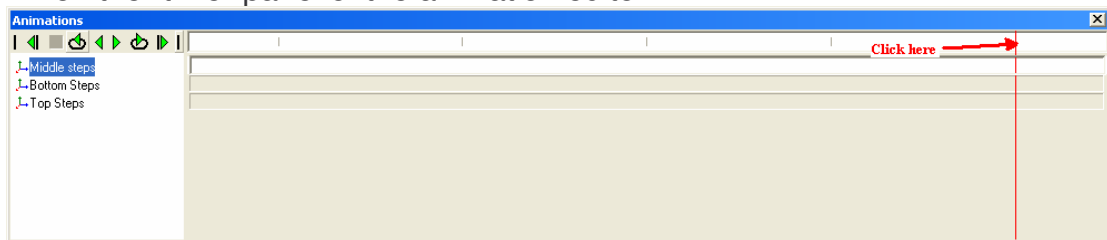
- Next we want to create 3 channels for the 3 groups of inserts. Drag and drop each group insert from the project tree onto the Animation Channels panel:



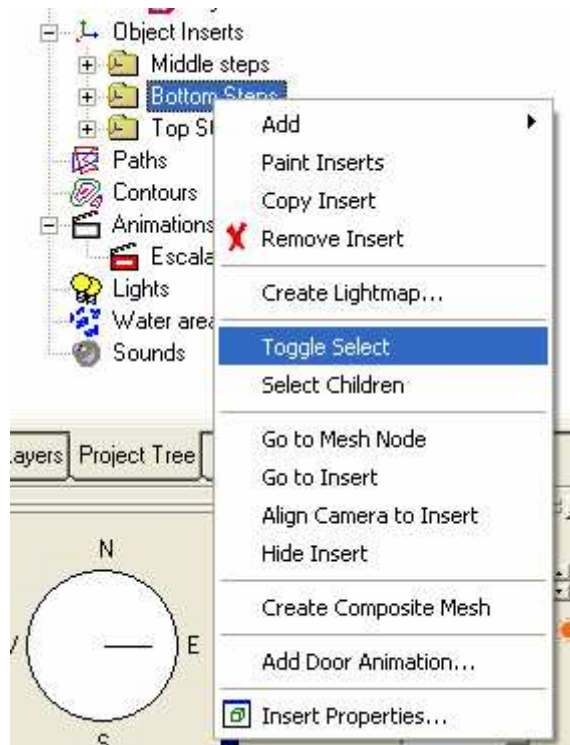
- Next record the first key for each channel by right clicking on the keys panel and choosing “Record Key”



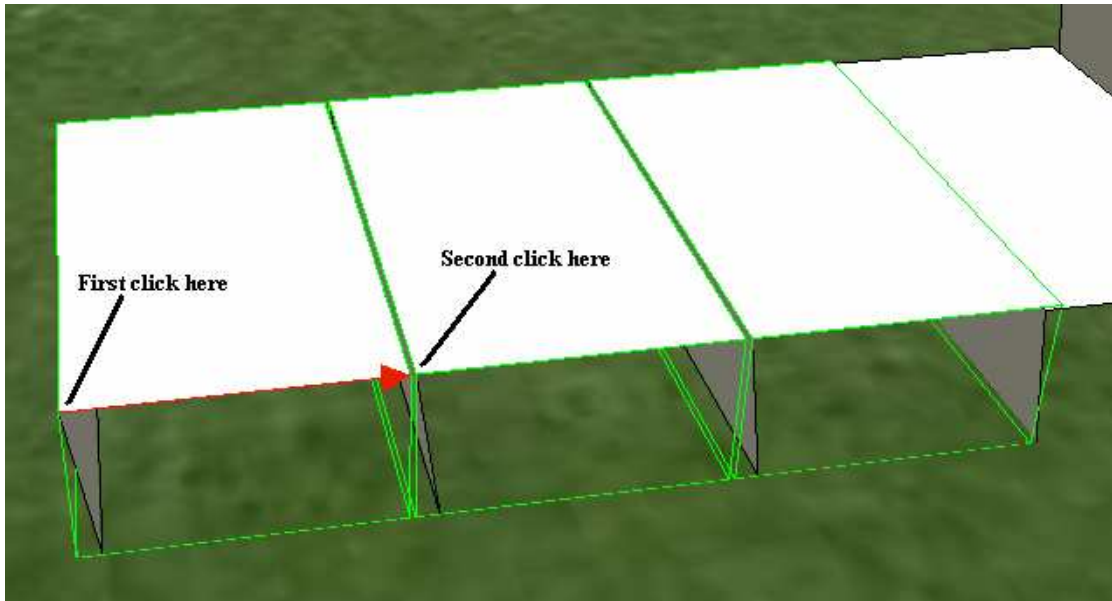
- Now move the frame time to the last frame in the animation by clicking on the “time” panel of the animation editor:



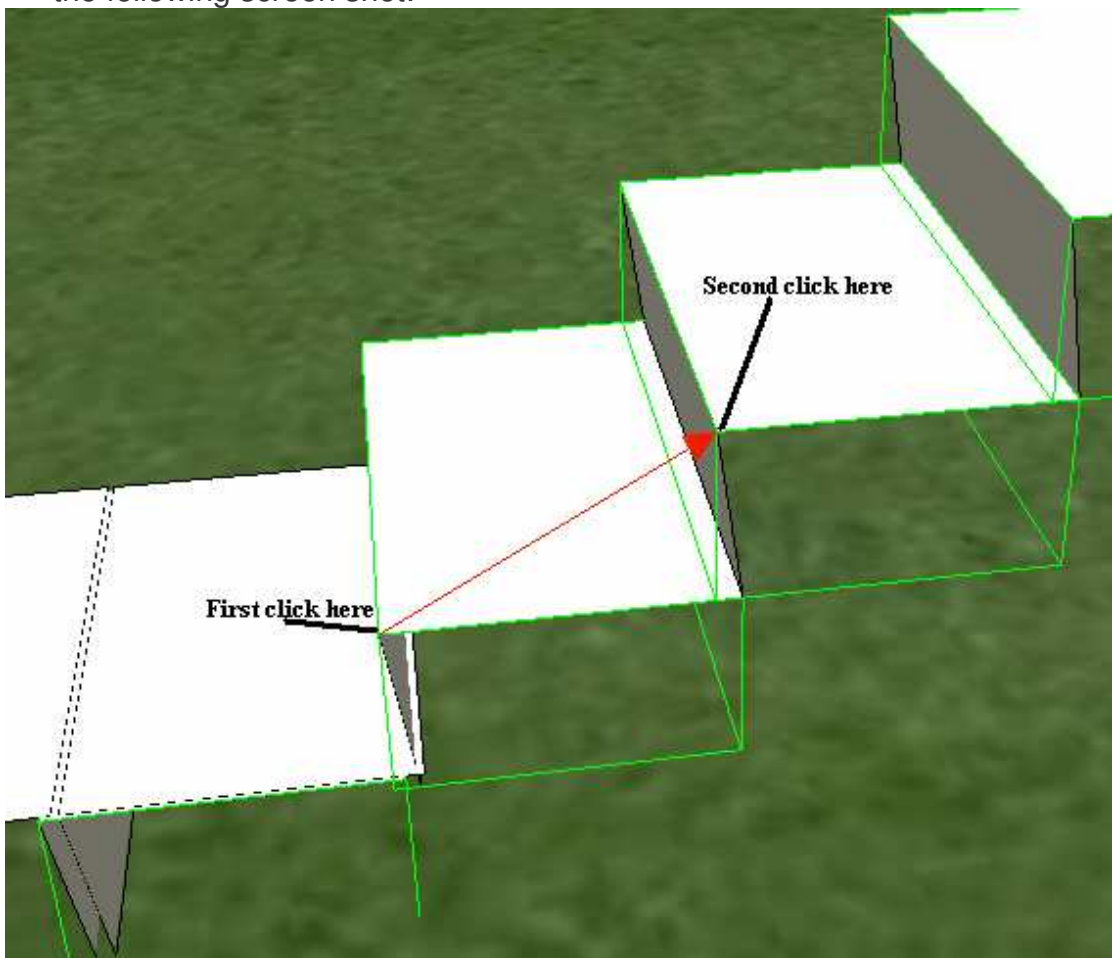
- We are ready to move the steps now. First select the “Bottom Steps” group by right clicking its node in the project tree and choosing “Toggle Select”:



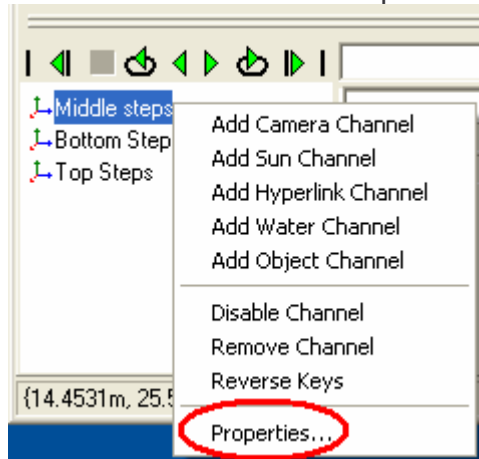
- Start the “Move Two Points” tool. Check that the “Edit|Snap Mesh Vertex” is highlighted – this will allow you to specify exact points on the steps for each of the move points. TIP: click and hold the mouse key down until you see the arrow “lock” onto the corner of the step.



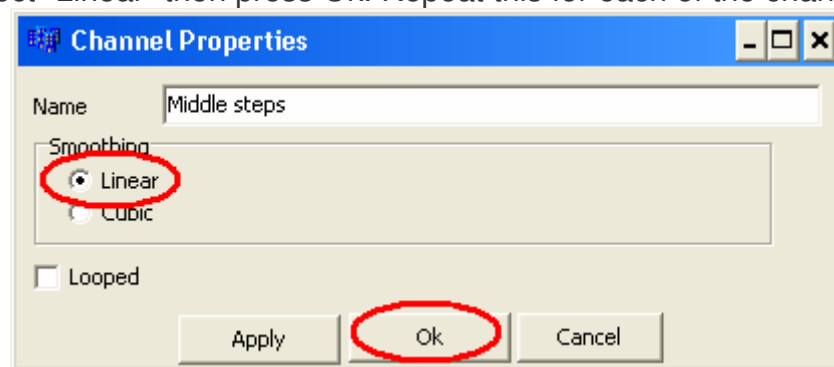
- This will move the bottom steps along by exactly one step width. Record the key for the Bottom Steps channel. (Right click on the channel and select “Record Key”).
- De-select the “Bottom Step” group – “Object Select None”
- Select the “Middle Steps” group by right clicking on its node in the project tree and choosing “Toggle Select”.
- Start the “Move Two Points” tool and click in the two points shown in the following screen shot:




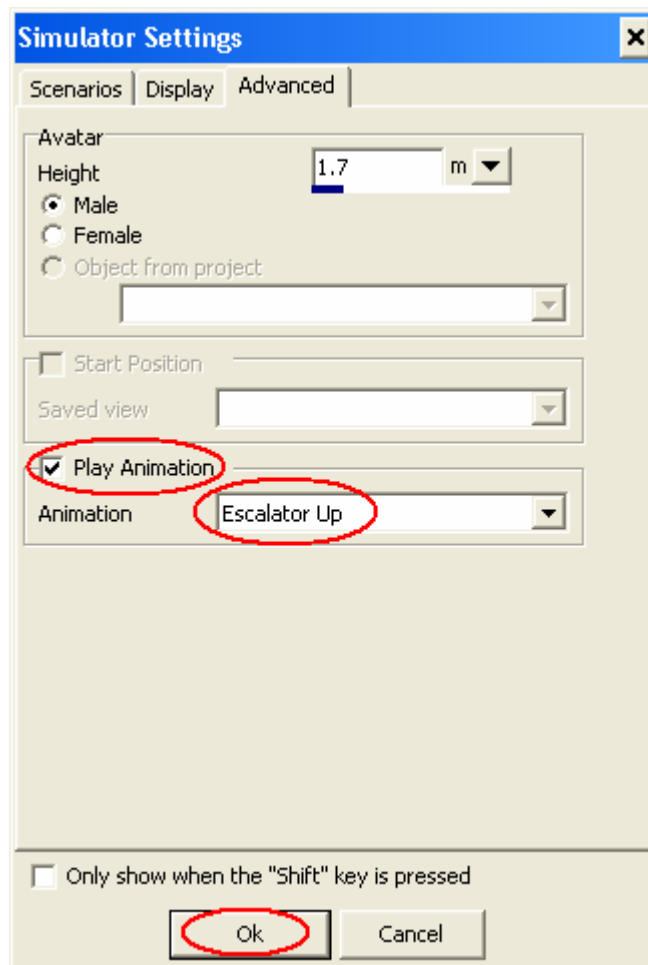
- This will move all the middle steps up diagonally by exactly one step. Record a key for this channel.
- Deselect the middle steps.
- Select the “Top Steps” group (right click on its node and choose “Toggle Select”).
- Start the “Move Two Points” tool and move the top steps horizontally by one step width in the same way as you did the bottom steps, then record the key for this channel.
- Finally we want to change the way in which the movement is calculated from “Cubic” to “Linear” – this gives a smoother result. Right click each channel and choose “Properties”:



- This will move all the middle steps up diagonally by exactly one step. Record a key for this channel.
- Select “Linear” then press Ok. Repeat this for each of the channels.



- Test the animation by pressing the “Loop” button 
- Now test in the simulation mode – remember to select the animation to play whilst in the simulator:



- You will be able to move the avatar onto the bottom step of the escalator and you will be transported to the top!
- Now you can right click on the group containing the 3 groups of steps by choosing "Create a composite mesh".