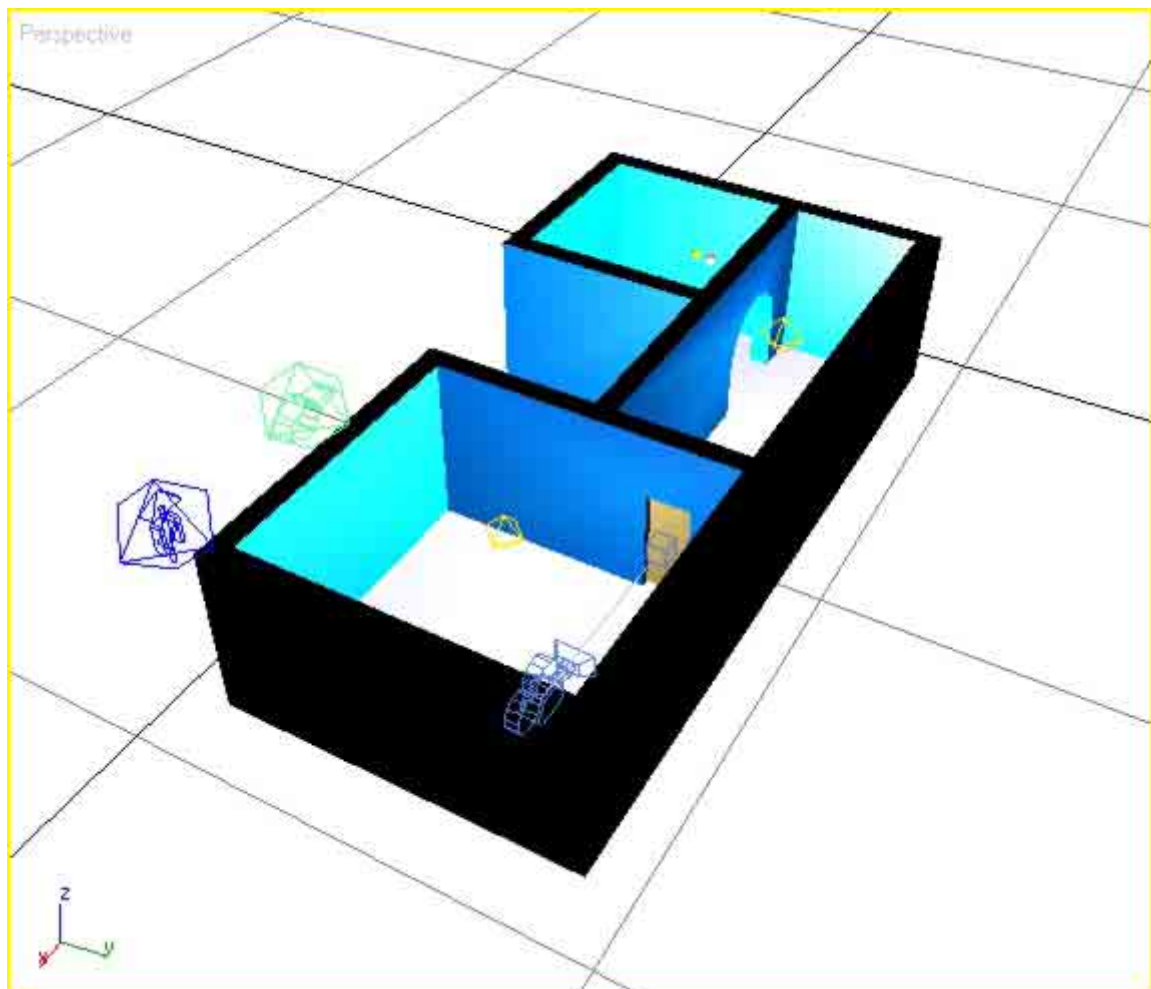


3d modelling for Virtual Reality

Tutorial #2 – VRML sliding door!

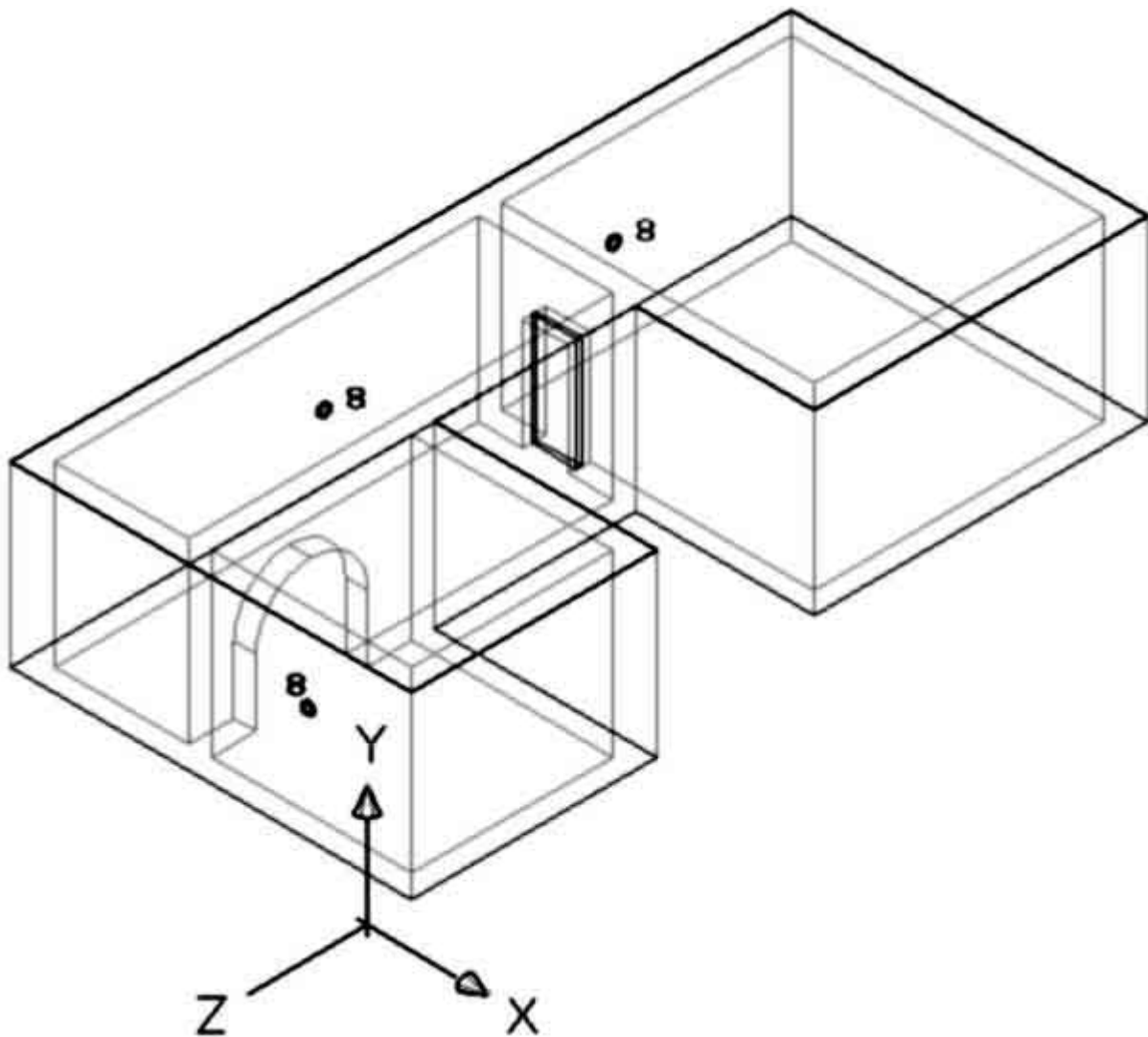


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1 Introduction.

This tutorial will guide you through one way of setting up an animated sliding door in a vrml world using 3ds max.



You will be provided with a prepared AutoCAD (**3rooms.dwg**) model of three rooms, comprising walls, ceiling, floor and a door, as shown above. You will import the AutoCAD model to **3ds max**. You will apply lights, materials, cameras, and a navigation helper as previously done in the [Tutorial #1 – VRML room of primitives!](#) tutorial. You will animate the door to make it slide, and then create a ‘touch sensor’ helper to control the door opening. Finally you export as a virtual reality model in the form of a **VRML** file.

You will view and interact with the VRML file (world, *.wrl) using a web browser.

When completed you will be able to freely navigate around and view the internal spaces and click on the door to open it.

2 Prerequisites.

You need access to a PC with AutoCAD (could be Architectural Desk Top) by AutoDesk, and 3ds max by Discreet. You will also need access to a web browser with a VRML client installed.

You should have successfully completed [Tutorial #1 – VRML room of primitives!](#)

You may also like to refer to the document below for more information:

[3ds max to VRML](#)

3 Download the AutoCAD 3D model.

You can find the 3rooms.dwg file on the internet. Go to the CAD resource site...

<http://www.plymouth.ac.uk/cad>

...and follow the links to your module page. You should see the link to the 3rooms.dwg file in the table. Save this file to a new folder on your workstation called **3rooms**.

4 Importing the geometry to 3ds max.

Now you will import the AutoCAD **3rooms.dwg** file into **3ds max**. Remember, all of these files are being stored in the **3rooms** folder.

4.1 Importing into 3ds max.

Start 3ds max. (Under D for Discreet).

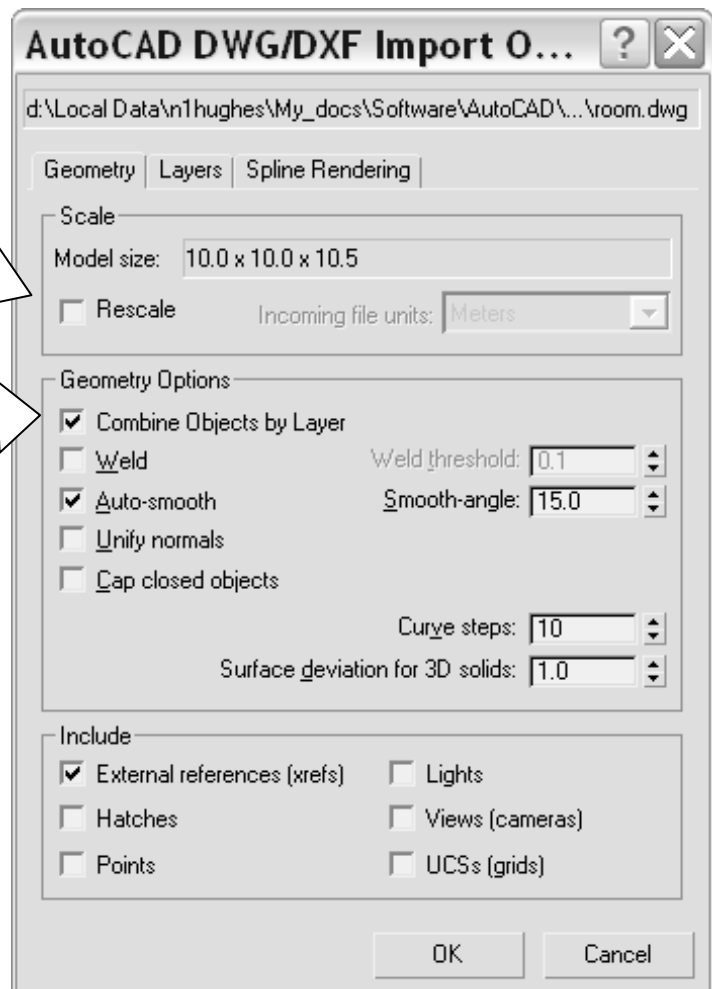
To import the **3rooms.dwg** file:

File Import...

Browse to the **3rooms.dwg** file and **Open** it.

In the **AutoCAD dwg/dxf import options** window ensure that **Rescale** option is **unselected**. This ensures that the room model dimensions remain in meters.

Also ensure that **Combine Objects by Layer** is selected. This combines each layer in the AutoCAD model with a corresponding selectable object in the 3ds max model.



OK the **AutoCAD dwg/dxf import options**.

Once the room has loaded save the model as a 3ds max file, **3rooms.max**, from the File > Save pulldown menu.

5 Developing the basic vr model.

As in the previous tutorial, 3ds max will be used to create the VRML file, or world, of the room, **3rooms.wrl**.

The VRML file will be viewable in a web browser with a VRML client (plug-in).

5.1 VR model response time.

One important factor in interactive media creation is how many frames per second (fps) the system can refresh the display when the user is interacting with it. Remember that a refresh/response rate of 10 fps is considered to be the lowest frame rate acceptable for interactive work. The number of surfaces in the model has a huge influence on this. The other major variable is of course the actual computer system being used which is possibly out of your control, so it is best to keep the model as simple as possible.

5.1.1 3ds max utility to count polygons.

There is a utility in 3ds max which enables you to count the number of polygons in your model. Check out the **More...** button under the **Utilities** tab, and select the **Polygon Counter**.

As a guide, you should aim at no more than 3000 polygons, certainly no more than 5000. This should be the first thing you check when you open up the model in 3ds max. You may need to go back to the CAD model and simplify the geometry, or perhaps delete some of those nice looking downloaded tree and car blocks! Response times are also affected by texture bitmaps and of course the system being used to view the world. The only real way to ensure that your world responds satisfactorily is to test it.

5.1.2 Cortona frame rate display.

A useful feature of the Cortona VRML client is the frame rate counter. Right mouse button click in the display area and select:

Preferences

General tab, and set **Display Frame Rate** to **Frames per second**.

The **fps** value should appear in the bottom left corner of the browser window when viewing the VRML world.

5.2 Using the VRML97 Exporter.

Ensure that the 3rooms.max file is open. To create a VRML file or world from the 3ds max model simply export it as a **VRML97** file, from the pulldown menu:

File

Export...

In the **Select File to Export** window

Save in: **3rooms**
File name: **3rooms**
Files of type: **VRML97 (*.WRL)**

Click on **Save**.

In the resulting **VRML Exporter** window simply accept the default settings by clicking on **OK** and the file will be created and saved.

5.3 **Testing the VRML world.**

Open the **3rooms.wrl** file just saved, using your web browser. You may need to turn the headlight on if all is black.

Now is a good time to remind yourself how to use the VRML client you have on your system. When the 3rooms.wrl world has loaded experiment with the controls. Try to spin or slide the view. Can you move forwards and sideways? (VRML viewing plug-ins usually have a link on their control panel to some help documentation.)

Explore the contents of the world you have just created and ask your self these questions:

What are your first impressions when the world first loads?

How easy is it to navigate around?

Does it give you the impression that you are 'immersed' in the world?

5.4 **Giving the world some viewpoints.**

When 3rooms.wrl loaded in the web browser, your initial view (viewpoint) was automatically set for you. You can define as many viewpoints (cameras) as you like in 3ds max and you can specify any one of them as an initial viewpoint on the VRML world when it loads. Cameras/viewpoints should be used as much as possible. If in doubt, create another camera. They provide very useful navigation aids in the VRML world.

5.4.1 **Creating an initial viewpoint.**

In 3ds max, create a target camera, 1.6m (units) from the floor, looking inside the single room with the sliding door. Give the camera a name that relates to its position, i.e.

Room1. Make sure that the camera is positioned inside the room and looking at the door.

Save the 3ds max file and export it as 3rooms.wrl. This time observe the **Initial View** field in the **VRML97 Exporter** window. Set it, using the pulldown, to the camera you have just created in the 3ds max file. Then click OK to save the VRML file. Check how the world looks now using your web browser.



If you keep the web browser open on the same 3rooms.wrl file, each time you export, using the same file name (3rooms.wrl), all you need to do is refresh the browser to view your changes (the **f5** key may do this).

Notice how the world is now presented using the viewpoint you created.

5.5 Giving the world some lights.

In the VRML world you could see the objects because a headlight was provided for you, by default. This headlight shines a light in the direction you view the world. You can add as many of your own lights to the scene as you like, and you can do this in 3ds max...

Open up the 3rooms.max file and create an **omni** light (shines in all directions):

**Create
Lights > Standard lights > Omni**



For more guidance on creating lights **check out the 3ds max help system**, particularly the tutorials.

Create an omni light in each of the rooms.

Save, export to VML97 as usual, and view the world. Notice the light effect. Incidentally, the VRML client additionally still allows you to switch the headlight on or off.

5.6 Giving the walls and floor a realistic appearance.

Optional for this exercise but good practise.

The objects in the 3rooms.wrl world have colours which are derived from the original AutoCAD model. This is OK, but you may decide that a more realistic appearance is required for the purposes of your model. It is possible to assign a digital image (or map a bitmap, as they say) to any surface you wish in the VRML world. This can be done in 3ds max.

Define a new material for the floor, ceiling, walls and the door, selecting an appropriate bitmap for each.

Note that there is a utility in 3ds max which enables you to collect together all of the resources, such as bitmaps, used in your model and to save them in a location you specify. Check out the **More...** button under the **Utilities** tab, and select the **Resource Collector**. You can then browse to the location you wish to save the files. I recommend that for this example you specify the **3rooms** folder.



For more guidance on working with materials **check out the 3ds max help system**, particularly the tutorials.

Save and export as a VRML97 file. In the **VRML97 Exporter** window look at the **Bitmap URL prefix** settings and ensure that the tick box is unticked. The Bitmap URL

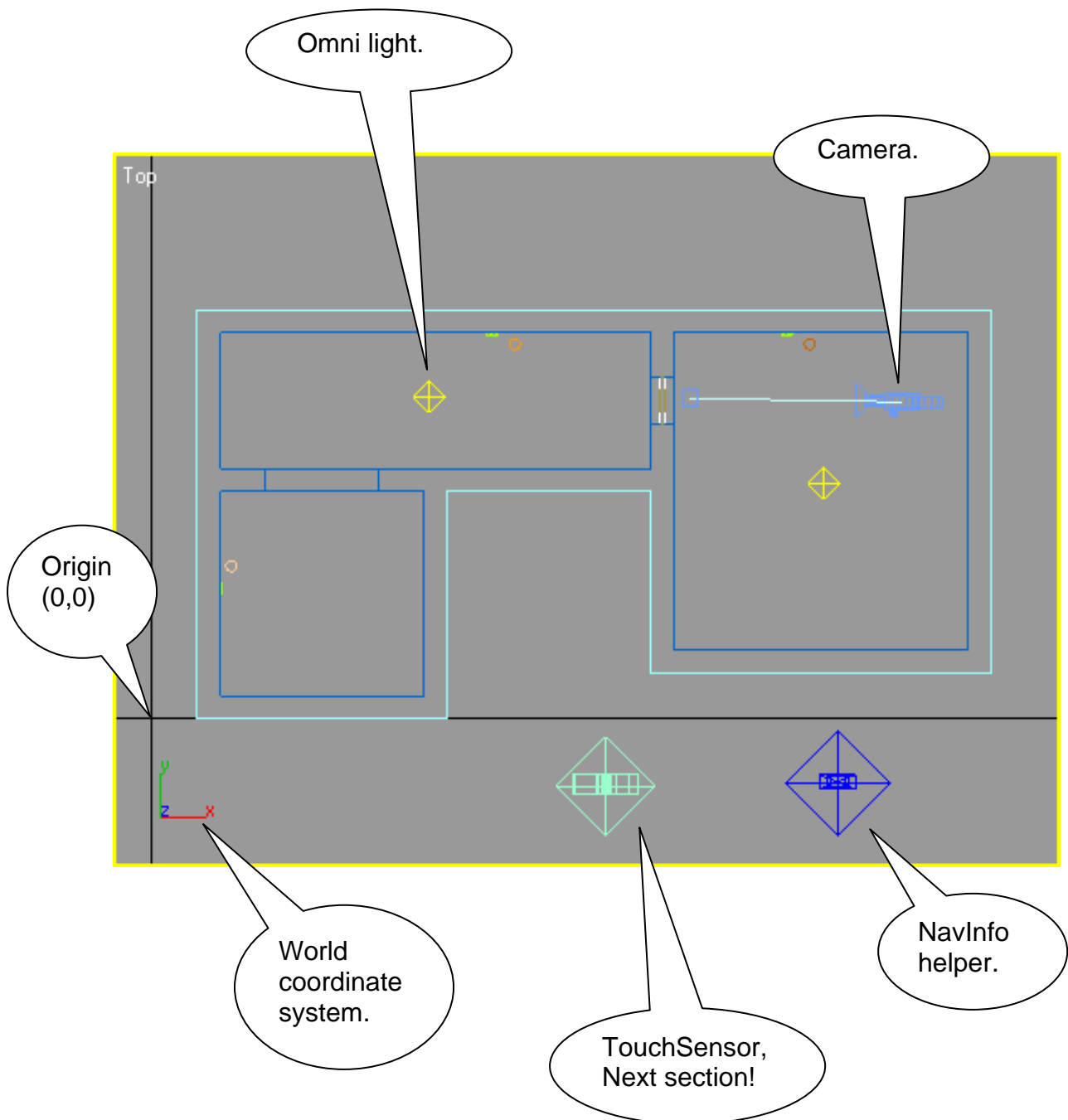
prefix is the path to the images used in the world. As the files for this example are in the same folder as the world file, no prefix or path needs to be used.

View the 3rooms.wrl world. How does it seem now as you navigate around? Do you get a better sense of how you are moving around in the room? The bitmap gives you a good visual reference when moving, particularly if you are close to a wall.

5.7 NavInfo helper.

Add a NavInfo helper to the model and set the terrain height to 1.6, the same as the camera height and the collision distance to 0.25, so you can get through the door easily! (These may be the default settings.)

So, you should end up with the max model like in the top view shown below.



6 Animating the door.

3ds max can animate anything that can be changed within the model, from colours, transparencies, positions, rotations, light colours, etc. Animating is quite straight forward once you have the basics. In this section you will animate the door sliding open.

6.1 Moving the door.

Activate the Left viewport by clicking in it.

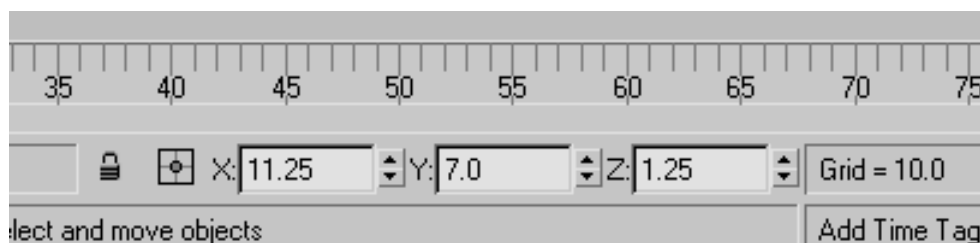
Using the H key select the door object probably called **layer:DOOR**.

You will now experiment with moving the door by changing the coordinate values of its center or **pivot point**. Firstly, note the world coordinate system shown by the small icon in the bottom left corner of the viewport. We will move the door in the **y** direction.

Click the move button.



Look in the **Y:** box of the selected objects coordinates. Note the current value is 7.0 meters from the origin. Change this value to 6.1 and observe how the doors position changes.



You could also drag the door, but coordinates give us more precision when positioning objects.

6.2 Animating the door movement.

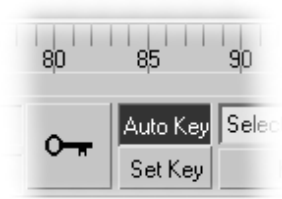
You will use the Auto Key facility to create two key frames, one at frame 0, one at frame 100.

Ensure that the time slider is on frame 0 and that the door is at Y: 7.0.

Activate Auto Key:

Watch out when Auto Key is on!

Any changes you make to the model will be recorded at the current frame indicated on the time slider!



So, this has generated a key frame at frame 0.

Now move the time slider to frame 100. Change the door Y coordinate to 6.1.

This generates a key frame at frame 100, with the doors Y value changed to 6.1.

Turn off Auto Key.

Play the animation, or move the time slider manually to view the door sliding.

Easy.

You can animate anything you like using this basic method of creating key frames and changing the model.

6.3 How to open the door in VRML.

To play this animation in the VRML world you will use a TouchSensor node, created using a TouchSensor helper in 3ds max.

Create the helper,

Create the TouchSensor helper:

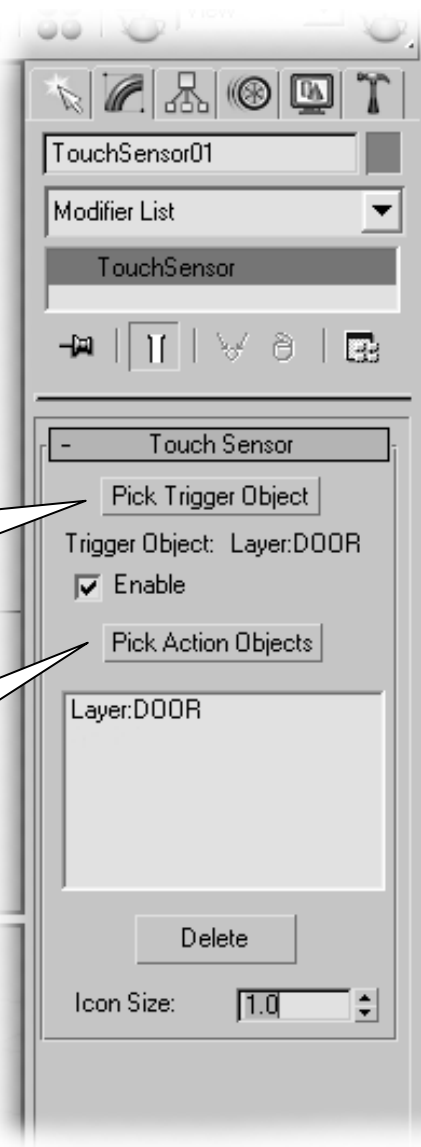
Create
Helpers > VRML 97 > TouchSensor

Drag out the helper in the top viewport.

Click on the Modify tab, and set up the sensor as shown here:

Use the H key and select the **Layer:DOOR** object as the trigger object. This is the object you will have to click on to activate the animation.

Use the H key and select the **Layer:DOOR** object again, this time as the action object. This is the object that has an action associated with it, an animation in this case.



Save and export the model.

Test out the functionality. Does the pointer change when you move it over the door? Does the door slide open when you click on it?

6.4 Further work.

This is a simple example of how to create and trigger an animation in 3ds max/VRML. You could model a button on the wall to use as the trigger object to open the door. You could animate cameras to give guided walk/fly arounds. You could experiment using the ProximitySensor node to trigger an animation.

To close the door again is more complicated, and you would have to write some code into the VRML file. Check out the internet for tutorials, there are lots. Alternatively you could create a single animation of the door opening, waiting say for 20 seconds, and then closing.

Experiment.