

DMM TUTORIAL 8: The DMM Scene Node

As soon as you create a DMM object, a **DMM Scene Node** is automatically created. Each newly created DMM Object is connected to the scene node. It's attributes control the global settings affecting the whole scene. It is possible to have several DMM scene nodes in a single Maya scene. You can then manage them in order to optimize the simulations.

Another useful tool to control the rendering of your DMM scene is the **DMM Cache**. It saves the DMM simulated Tet Mesh vertex positions at each frame. You can then choose to render only a portion of the simulation or use motion blur for instance.


In this tutorial you will

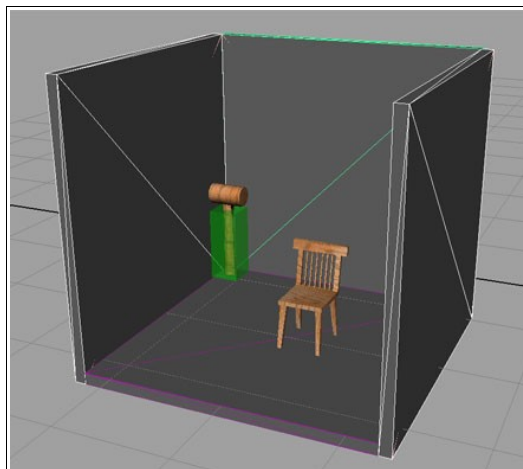
- manage complex scenes by using several DMM Scene Nodes
- change DMM Scene Node attributes
- use the DMM Cache to render only part of the DMM simulation

Using multiple DMM Scene Nodes

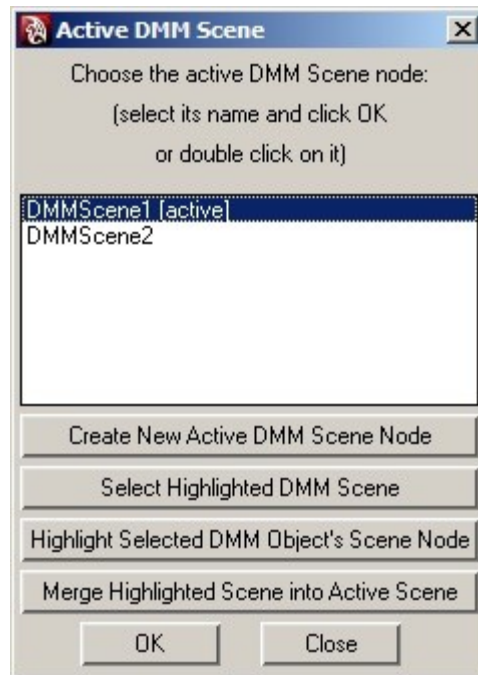
We are going to combine our scenes from tutorial 4 (the hammer breaking the chair) and tutorial 7 (the tree without the key-frame animation). We will build a room for the hammer and the chair, while the tree will stay "outside".

If we use only one DMM scene for the whole Maya scene, the interactions between all DMM objects will be calculated. This is unnecessary as we already know that the objects "indoors" will never interact with the objects "outdoors". Therefore we can create two separate DMM Scene Nodes which will each run their own DMM simulator. There won't be any connection between their DMM Objects.

1. Open the *tutorial8_start1.ma* scene provided in tutorial8.zip. (The hammer and chair scene).
2. Create 3 walls by duplicating the floor and repositioning it. (The walls are DMM passive)
 - Select the floor.
 - Select *DMM Asset/ Duplicate DMM Object* or .
 - Move the duplicated DMM object to the desired location.
 - Do the same for the other walls.



3. Import the *tutorial8_start2.ma* scene (also provided here in tutorial8.zip). (The tree scene).
4. Create a floor for the tree.
5. Open the DMM Scene Manager
 - Select *DMM Scene/DMM Scene Manager*
 - You can see that you now have two DMM Scenes as a second DMM Scene is automatically created for any imported Maya scene.



6. Check that all the DMM Objects are assigned to the appropriate scene
 - Select *DMM Scene / List DMM Objects*.
7. You can also select all the objects connected to the same scene node.
 - Select a DMM Object
 - Select *Edit DMM / Select DMM Object / Connected to Same DMM Scene*
8. You can also check which DMM Scene Node a DMM object is assigned to
 - Select a DMM Object
 - Open the *DMM Scene Manager (DMM Scene / DMM Scene Manager)*
 - Select the *Highlight Selected DMM Object's Scene Node* button.

Note: If you were creating this scene from scratch, you would have to do the following

1. Create all the DMM objects in Scene1 (floor, walls, chair, hammer) and their animation.
2. Create a new DMM scene
 - Select the *Create New Active DMM Scene Node* button in the *DMM Scene Manager*.
3. Create all the DMM objects in this new scene (the tree, the Maya field, the floor) and their animation.

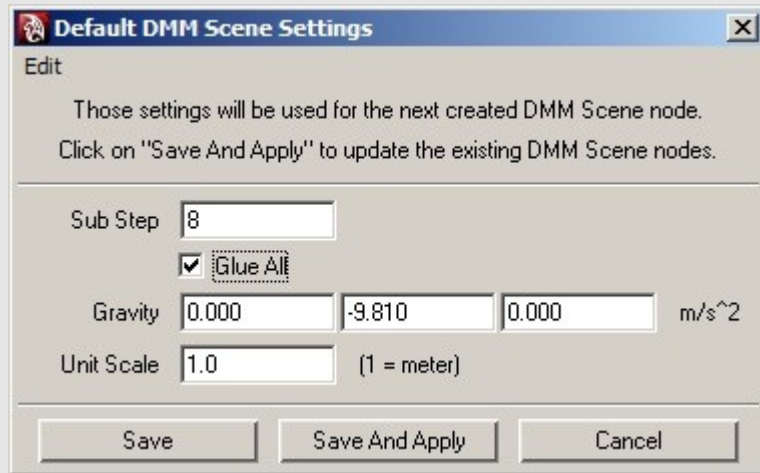
Note: When a new DMM Object is created, it is connected to the "active" DMM Scene node

To set the active scene node:

- Open the *DMM Scene Manager (DMM Scene / DMM Scene Manager)*
- Double click on the node name or select it and click on the *OK* button

Additional note about DMM Scene Node creation:

When you create a new DMM Scene Node, it uses the default DMM Scene Settings. You can modify these by selecting *DMM Scene / Default DMM Scene Settings...*



Managing the different DMM scenes and changing their attributes

The global settings affecting the DMM simulation are accessible as attributes of the DMM Scene node.

9. In the *DMM Scene Manager* select *DMMScene2* (the tree).
10. Click on the *Select Highlighted DMM Scene* button to have Maya select the specified DMM Scene node and show it's attributes in the *Attribute Editor*.

Lets have a look at these different attributes

DMM Scene Node Attributes:

Disable: This attribute can be keyed (it is visible in the Channel Box) to enable and disable the DMM simulation at specific times.

Sub Step: Number of time steps for the DMM simulator per visual frame. The higher the value, the better the quality of your simulation will be but also the longer the calculation time. The default value is 8. If your scenes doesn't simulate properly, you can try changing this setting. The result and quality of the simulation can change pretty much depending on this setting.

Gravity: Gravity vector in m/s^2 .

Glue All: The implicit Glue described in Tutorial 5. All overlapping Tets at the beginning of a simulation are glued.

DMM Scene Cache: Cache DMM Object data at each visual frame. We will learn more about this later in this tutorial.

11. Import the file *camera.ma* (provided in tutorial8.zip)
12. View the Camera1's movements.
 - Frame 0 to 150: it records what is happening "outside".
 - Frame 150 to 180: it moves to the room.
 - Frame 180 to 250: it records what is happening in the room.
 - Nobody is going to see what happens to the tree after frame 180. All simulation calculations after that frame are unnecessary. Therefore, to optimize the scene, we can disable the DMMScene2 Node after frame 180.
13. Select the DMMScene2 Node.
 - Open the DMM Scene Manager.
 - Click on the *Select Highlighted DMM Scene* button.
14. Open the Channel Box.
15. Add a key frame to turn on the *Disable* attribute at frame 180.
16. Play the simulation. You can see that after frame 180, the tree "freezes".

Using the DMM Cache

You might have already noticed that you cannot play a DMM simulation backwards. Also you cannot "scrub" through the timeline and view the simulation at different states.

When activated, the DMM Cache allows you to do all that. It saves the DMM simulated Tet Mesh vertex positions at each frame, so you can move along the timeline in any direction and see the state of the object's simulation. Also, complex simulations will run faster when replayed with cache on.

Note: DMM Cache must be enabled when using motion blur. Indeed, this causes Maya to go back and forth in time while rendering, which is impossible to do for the DMM simulator unless the Cache is on.

Each DMM Scene node controls its own Cache. We are going to use the Cache to clip off the beginning of the simulation in the tree scene. Indeed, during the first seventy or so frames, the simulation is "settling": gravity has just been enabled, the leaves are falling into place. We do not want to keep this in the final rendering, but they have to be calculated by the DMM simulator. By clipping them off in the DMM Cache, they will still be simulated, but not rendered.

17. Turn the DMM Cache on for Scene2 (the tree).
 - Make sure the active scene is Scene2 (in the *DMM Scene Manager*). If not, double click on it.
 - Select *DMM Scene / Enable DMM Cache*
 - Or click the *Select Highlighted DMM Scene* button and select the box next to *DMM Cache* in the *Attribute Editor* for DMMScene2
18. Play the simulation once to cache it.

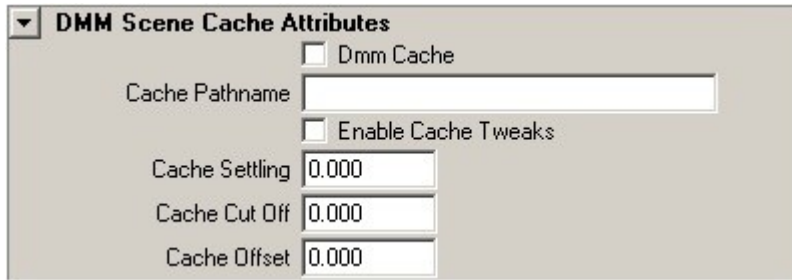
Note: When the DMM Cache has just been turned on, the cache is empty. The animation needs to be played once to cache the DMM simulation. Only a played frame will be cached.

19. Now you can move in the timeline and you can see the simulation of the tree at any state (but not that of the chair and hammer, since they are part of another scene node).

We are now going to modify the Cache attributes to clip the first 70 frames. As we saw before, the attributes for the DMM Cache are listed in the SMM Scene Node's attributes.

20. Open the DMMScene2 attributes.

- Select the DMMScene2 in the *DMM Scene Manager*.
- Click on the *Select Highlighted DMM Scene* button.



21. Select the box next to *Enable Cache Tweaks*

22. Set Cache Settling to 3 (seconds). The frames before frame 72 will not be displayed, thus hiding the "settling" phase of the simulation.

Important note: If your Maya project settings are not accurate (your scene isn't located in the specified Maya project scene folder for instance) you should specify the *Cache Pathname*. Indeed, Maya needs to know where the DMM Cache is to do the rendering and might not find it if you are not using the default Maya project paths.

The final scene is provided in tutorial8.zip (*tutorial8.ma*). The DMM Cache for Scene2 is also provided but you will have to update the Cache Pathname.

There also is a video of the final animation (*tutorial8_video.mov*).

Additional notes about the DMM Cache:

- The Cache Pathname attribute takes an absolute directory path and describes where to write the DMM cache file. If left blank, the cache file is written in the same directory as the scene file.
- When turned off, and turned back on, the DMM cache is cleared of its data.
- When the Maya scene file is renamed and DMM cache is on, the cache file will be renamed the next time the animation is played.
- When doing batch rendering with DMM cache turned on, the same cache file is re-used.