

DMM TUTORIAL 3: Using Passive Regions

You may want to control some amount of animation in your scene (key frame animation). This can be done with **DMM Passive Regions**. Any part of an object which is within a DMM passive region will not be simulated. So if you animate an object in the traditional way, these "fixed" parts will follow the key framed animation whilst the rest of the object/scene is simulated.

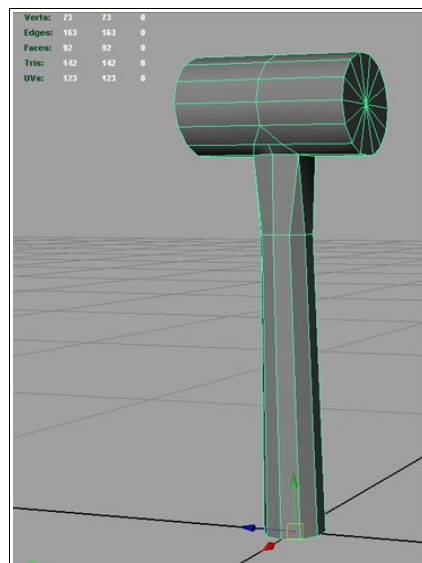
In this tutorial you will

- Create a simple DMM simulated scene
- Add a passive region to one of the DMM objects and see how this modifies the simulation
- Animate the object by using key frame animation and see how this modifies the simulation
- Edit the passive region and see how this modifies the simulation

Creating the scene

We will use the chair you built in tutorial 2 as a starting point.

1. Open your scene. (If you don't have this scene anymore you can use the *tutorial3_start.ma* file which is provided here.)
2. Create a DMM passive floor plane with the following dimensions: Width: 5 / Height: 0.1 / Depth: 5. (For more information about creating a floor plane see Tutorial 1)
3. Make sure the chair is on top of the floor plane and about at it's center.
4. Build a polygon hammer with your favorite Maya tools. It should be about the same size as the chair (1.5m high) (less than 200 tris).



5. Convert it to a DMM object

- Select *DMM Asset / Create DMM Object from Polymesh* or



If you want to make a more complex polygon model, you can also use the *Surface Mesh* method detailed in Tutorial 2.

6. Assign DMM materials to your objects. (We will learn more about DMM materials in Tutorial 4)
 - Select the chair
 - Select *DMM Material / Assign New DMM Material / wood*
 - Select the hammer
 - Select *DMM Material / Assign New DMM Material / Concrete_Medium*
7. Place the hammer horizontally at a height of about 1.5 meters next to the chair (not directly on top of it).

If you play the simulation you will see that the hammer falls to the ground. We will now add a passive region to the hammer and see what this changes.

Adding a passive region to the hammer

1. Select the hammer

2. Select *DMM Asset / Add New DMM Passive Region to DMM Object* or



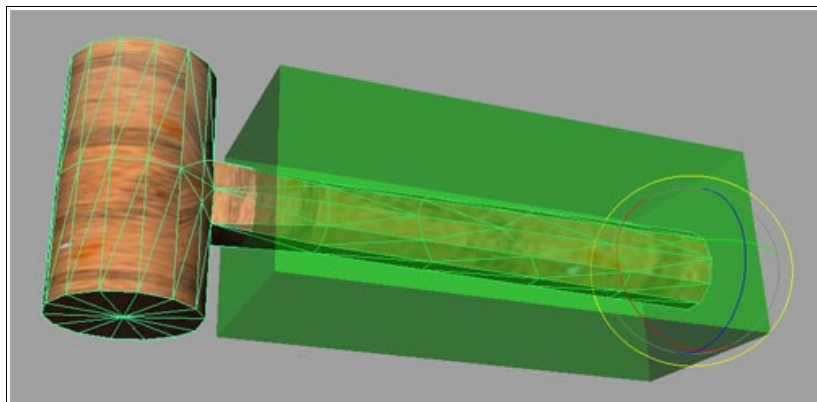
This creates a polymesh cube and assigns it as a DMM Passive Region of the selected DMM Object.

Note: About the default size and position of Passive Regions:

- The created cube is of a unit size and centered with respect to the selected object.
- If multiple objects are selected, one DMM Passive Region is created and assigned to all of them. It is positioned at the geometric center of the bounding box encompassing the selected DMM Objects.


3. Resize and move the Passive Region so that it includes the hammer's handle.

Important note: DMM Passive Regions define which **vertices** of the Tet Mesh will be DMM Passive. If no actual vertices fall inside a DMM Passive Region, the region will have no effect, even if it overlaps the Tet Mesh.




If you play the animation you can see that the hammer no longer falls.

Additional notes about Passive regions:

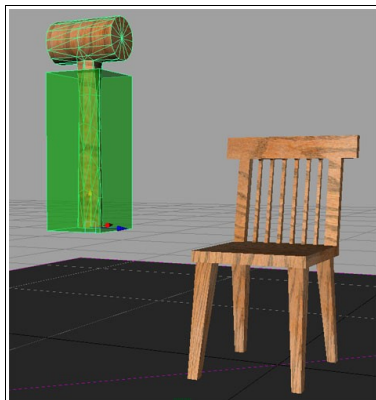
1. Any number of DMM Passive Regions can be added to an object and they can be shared between multiple DMM Objects.
2. If a shape other than a box is preferred for a DMM Passive Region then any convex shape can be used.
 - Select a polymesh
 - Select *DMM Asset / Make Polymesh into DMM Passive Region* or The polymesh will be added as a passive region to the DMM Object.
3. It is also possible to paint individual Tet Mesh vertices to be DMM Passive for exact control of the mesh. But this is not recommended because if the density of the mesh is changed later, then the vertices will have to be repainted.

Animating the hammer

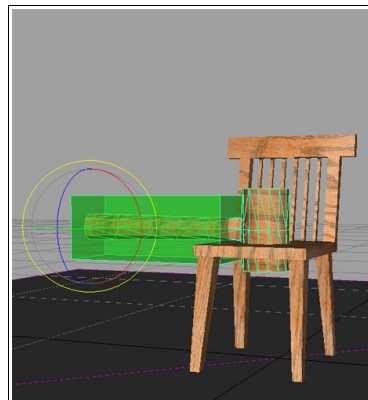
1. Parent the DMM Passive Region to the hammer. This will ensure that it will move with it when you add the key frame animation.
2. Make the Source Cage Visible
 - Open the DMM Asset Manager: *Edit DMM / Asset Manager* or 
 - In the *Tetrahedron Mesh* section select the *Visible* box for the *Source Cage*.

Note: You will notice that when you move the hammer at frame 20, only the Source Cage will move. The Output Surface Mesh stays in the same position as in frame 0. Therefore, if you want to see what you are animating, you have to make the Source Cage visible.

3. Rotate the hammer to a upward vertical position and add a key frame at frame 1
4. Rotate the hammer to a downward vertical position and add a key frame at frame 20 so that it hits the chair.



Frame 1



Frame 20

5. Play the simulation for 50 frames. The hammer should break the chair.

Editing the Passive region

1. Resize the Passive region so that it includes only about a third of the handle and see how it affects the simulation.

