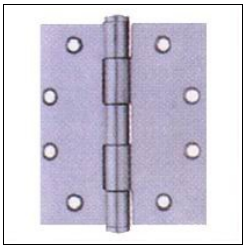
Technique to create joints with DMM

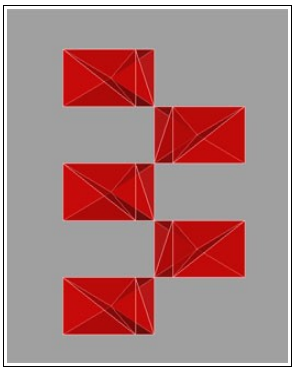
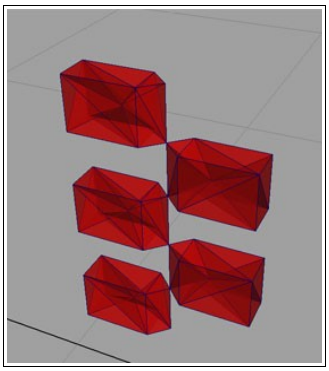
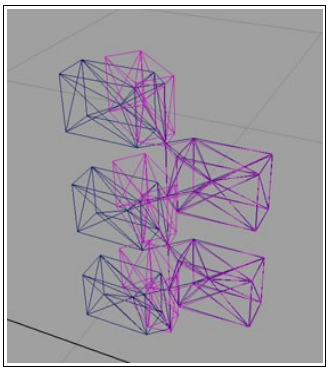
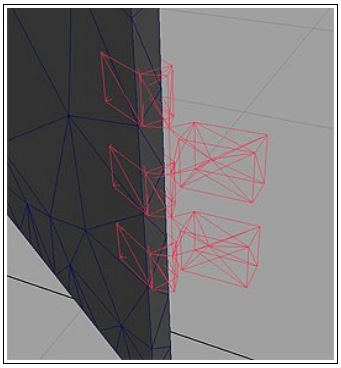
At the moment, DMM doesn't have a dedicated function to create joints and hinges. However, there is a way to create them by using a few tricks. This is what is explained in this tutorial.

You have to create DMM objects that are specifically modeled or constructed for that purpose.

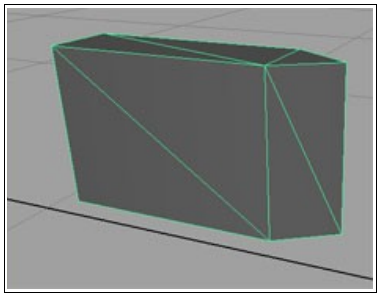
1. Define exactly what kind of joint you want to use. For example:



2. At first, each individual part of your final joint structure has to be created as a separate object.

3. Design a very simple polygon mesh for your joint's basic element with a minimum number of polygons.

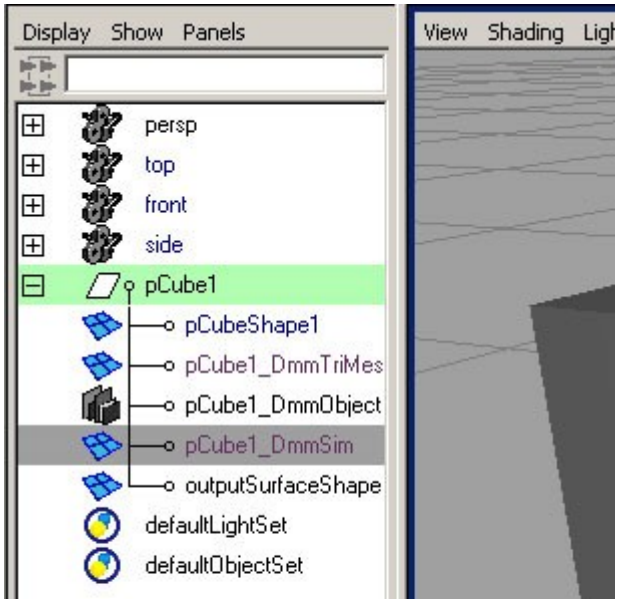


4. Convert it to a DMM object.

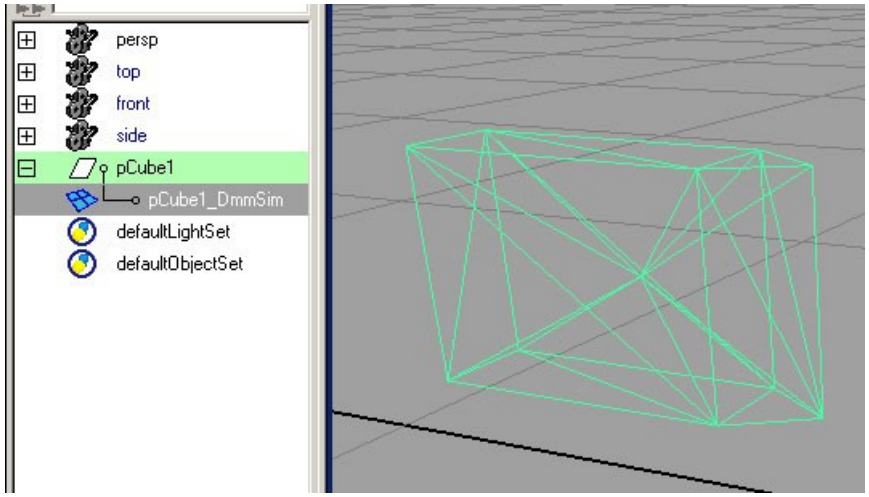
   - Select *DMM Asset / Create DMM Object from Polymesh* or 

Now comes the tricky part. You need to "brake" the DMM object into components and remove all of them except for the DMM Simulated Tet Mesh.

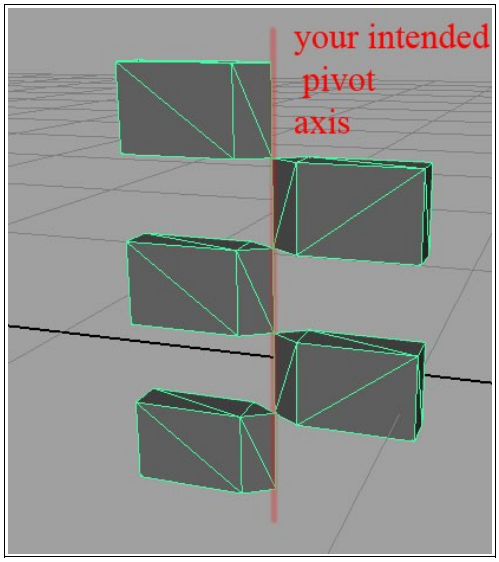
5. In the *Outliner*, expand the shape view to see the different components of your DMM object.



6. Delete the Maya History of your DMM object. This will brake certain links and the object will not simulate anymore.
   - *Edit / Delete by Type / History*
7. Delete all shapes under the transform except for the *DmmSim shape* node
8. In the Attribute Editor change the DmmSim Object Display settings:
   - Visible ON
   - Template OFF
9. If you want you can add a shader to it so it does not display as a wireframe in all the rendering modes.

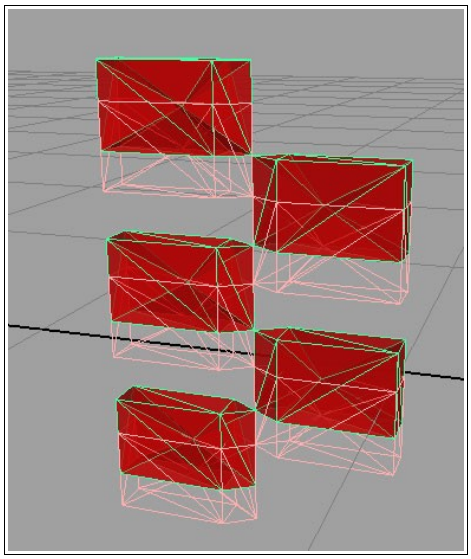


10. Duplicate this mesh to create the structure for your final joint model (as seen in figure 2). Use snapping to ensure that your elements are properly aligned. The pivot axis runs along the ideal line formed by the collocated vertices between the duplicated elements.



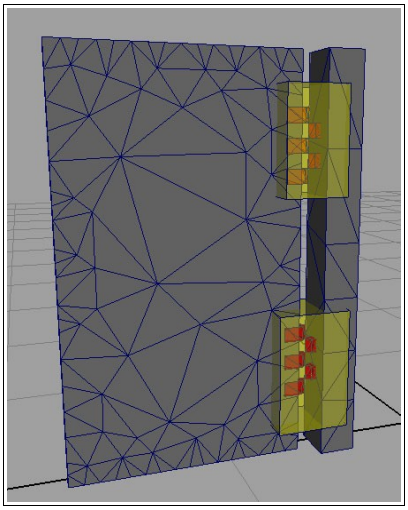
Note: These are not DMM objects anymore. Therefore, you have to use the regular Maya Duplicate tool and not the *Duplicate DMM Object* tool.

11. Combine all your elements into a single mesh.
12. Merge all collocated vertices.
13. Convert your joint structure into a bare DMM Object
    - *DMM Asset / Create Bare DMM Object / From Tetrahedral Mesh*
14. Play the animation to verify that your joint structure is now a DMM object and that it falls under the effect of gravity.



15. Create a DMM door and pole or wall.

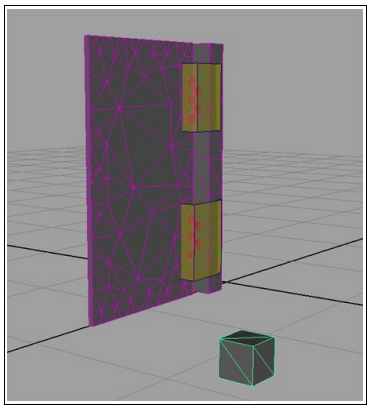
16. Make the pole or wall Passive.
17. Duplicate your joint structure and place the joints strategically.
18. Use Glue Regions to ensure that one end of the joint structure is attached to the door edge, and the other end is attached to the pole or wall.
    - Select the door, joint structure and wall.
    - Select *DMM Asset / Add New Glue Region to DMM Object* or 
    - Adjust the glue region to the desired shape and location.

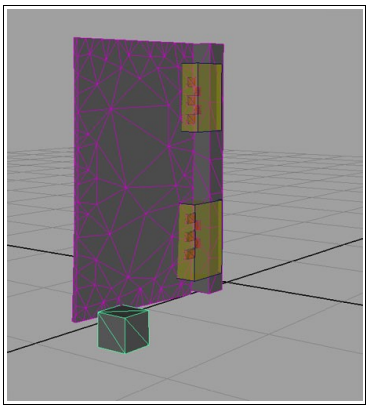


19. Adjust the materials for the joints: keep them stiff and unbreakable. We used the iron material from the library and changed the Toughness to 0 (unbreakable).
20. Adjust the material for the door. It needs to be light, otherwise the joints might snap off. We used the wood material from the library.

If you play the simulation now, there isn't much to see! We will just push the door slightly with another DMM object to make it move.

21. Create a DMM Cube primitive and make it Passive.
22. Animate it to touch the door.


Frame 1


Frame 20

23. Play the simulation. You can see that the door moves by pivoting on its joints.