COL781: Assignment 2, Mesh Processing

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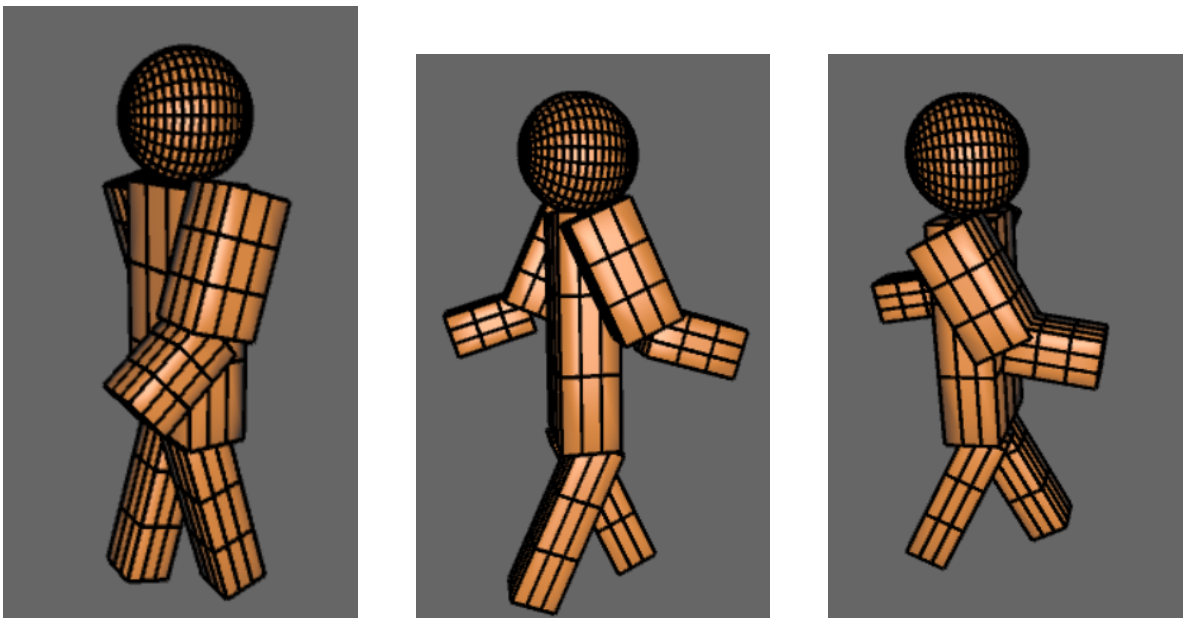
1 Catmull Rom splines

We designed the bone mesh for mimicking a human body that starts to jog, the keyframes of the animation are:



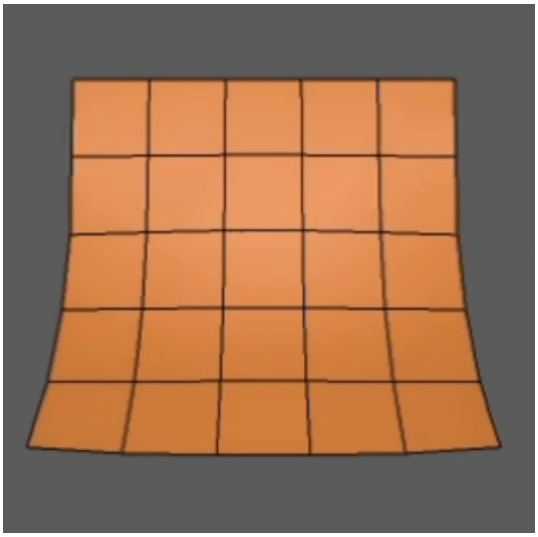
(a) First frame (b) Second frame (c) Third frame

Figure 1: Animation of a human being

2 Hanging cloth under gravity

We model the cloth as a structure made of point masses and springs, we calculate the gravitational and spring forces at each time step and render the image, we also recompute the normals at every frame to give the cloth a realistic look.

(a) High resolution cloth



(b) Low resolution cloth

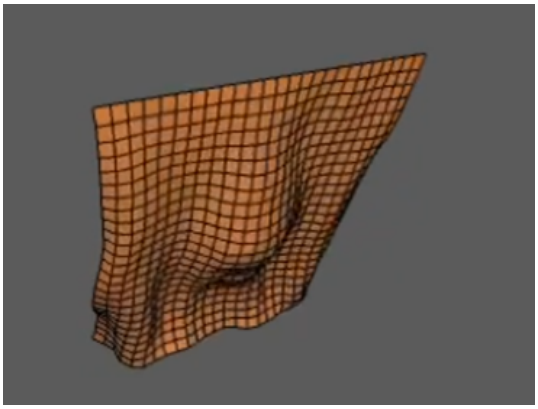
Figure 2: Cloth falling under gravity

3 Collisions

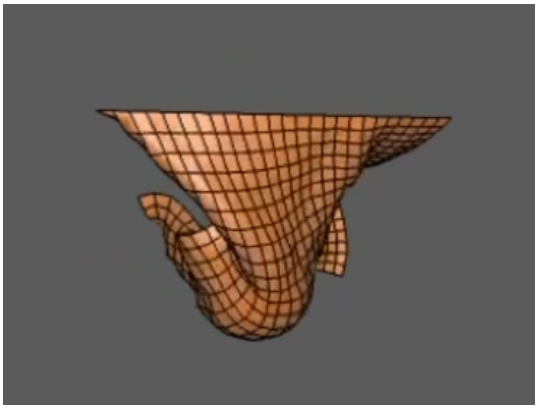
We write equations to handle collision of point particles with:

1. Static sphere
2. Static plane
3. Moving sphere
4. Rotating sphere

Collision with static and rotating spheres:



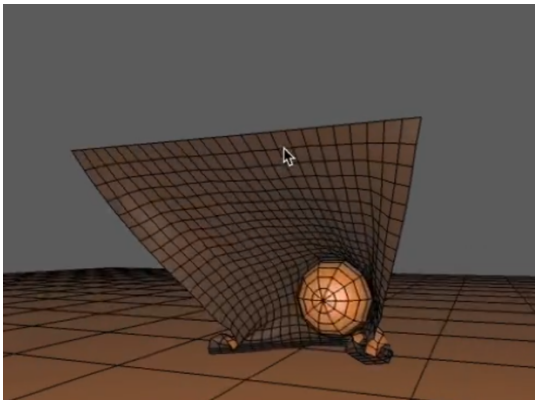
(a) Static sphere



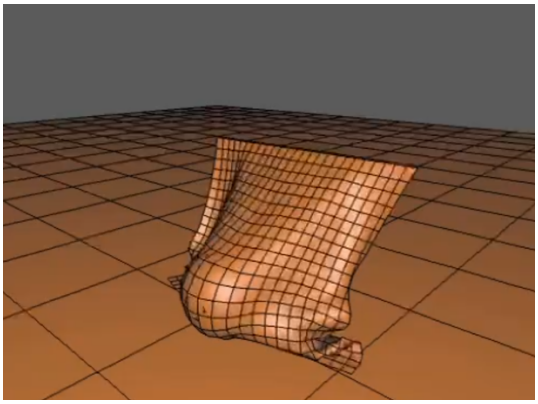
(b) Rotating sphere

Figure 3: Cloth colliding with spheres

We now show a frame where a sphere collides with a cloth and the cloth also collides with a ground plane.



(a) Back view



(b) Front view

Figure 4: Cloth colliding with plane and sphere

4 Handling self collisions

To handle self collisions we make a grid (stored as a hashmap for memory efficiency), and if distance between any two particles is less than a certain distance, we apply appropriate impulses to impart velocities to the particles. We have included this demonstration in the videos, to compare kindly watch normal and collisions handled.

5 Conclusion

We are able to implement every part of the assignment, videos for demonstration can be found here.