

Assignment 5 : Cloth Simulation with the Mass Spring System

STUDENT NAME: YUHAO ZHANG

STUDENT NO.: 2021533141

EMAIL: ZHANGYH7@SHANGHAITECH.EDU.CN

1 INTRODUCTION

In this PA we implemented a naive cloth simulator, below are the task we have done.

- [must] Define mass particle properties and initialize particles.
- [must] Define spring properties and create springs connected particles.
- [must] Implement the mass spring simulation algorithm with gravity.
- [optional] Apply external force to simulate the effect of wind.
- [optional] Couple the cloth with sphere colliders, and simulate the cloth falling on a sphere.

2 IMPLEMENTATION DETAILS

2.1 Initialize particles

Because we can represent the cloth with a series of mass particles, we need to record the information we need to record the information we need in these particles, such as mass, force and velocity.

We also need to initialize them properly: which mass is a fixed value, and the force and velocity are zero at the beginning.

2.2 Define and connect springs

We need springs between particles to simulate the elasticity of the cloth, and for each spring, we need to store the stiffness and the rest length of it. Then we need to connect particles using springs, here, we use the layout given in the document: connect each particle with its eight neighboring particles. It is a simple layout and the only thing we need to notice is that the rest length of them are different.

2.3 Implement the mass spring simulation algorithm

We can use the formula given in the tutorial from Stanford to compute the force on each mass particles in each time and compute their velocity. Then, we can update their position. If we do this process continuously, we can simulate the state of the cloth.

We also need to fix two points of the cloth, which is also not difficult, just find their index and skip these two points when updating the position.

2.4 Wind simulation

Wind will give the cloth another force, in the Stanford tutorial we can find a formula that represents a wind and add the calculated force to the particles.

2.5 Add sphere collider

It's similar to how we fix two points, if we found that a particle is in the collider after an update, we drag the particle outside the collider by force.

For better observation, we draw the collider in the same scene.

3 RESULTS

The results will be shown below.



Fig. 1. cloth



Fig. 2. cloth with wind effect

1:2 • Student Name: Yuhao Zhang
Student No.: 2021533141
Email: zhangyh7@shanghaitech.edu.cn

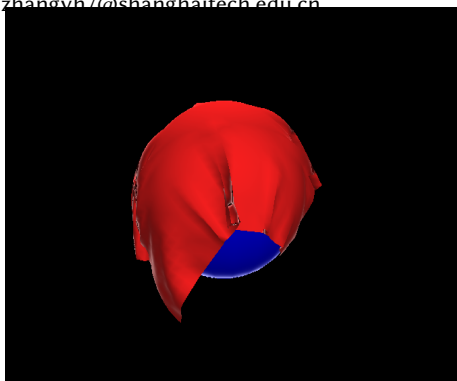


Fig. 3. cloth falls on the ball