



THE SECRET OF CLOTH SIMULATION

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**THE SECRET OF
CLOTH SIMULATION**

Cloth only bends!

Observation

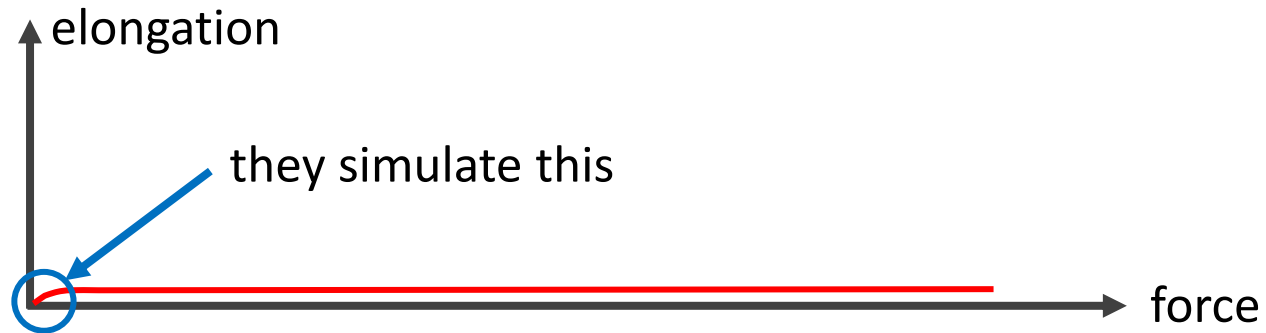
- As rigid bodies are not rigid, cloth is stretchable
- Typically only between 0 – 5% with a very strong stretch limit



- Try it at home!
 - Shirts, jeans, skirts, leather jacket, rain jacket, towels, curtains, tents, tarpaulin, flags, carpets
- Gravity is rarely strong enough to cause noticeable stretching
- I have never noticed too little stretching in a cloth simulation
- Too much stretching is a bad visual artifact!
- Latex? No dynamics, quasistatic motion, use skeletal skinning!

Conclusion

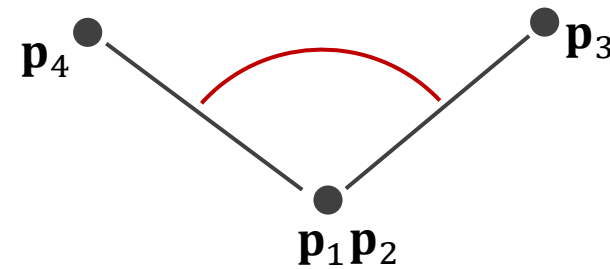
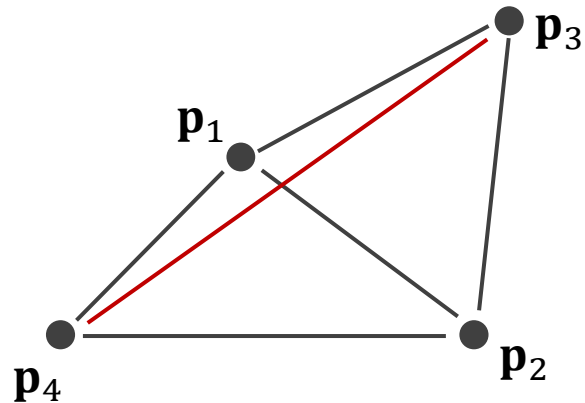
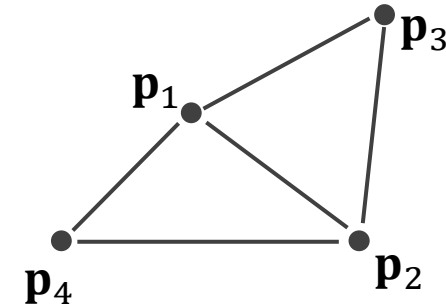
- Forget all sophisticated cloth models!



- We want to simulate an infinitely stiff material! How?
- Force based methods explode
- Use zero compliance distance constraints on cloth mesh edges with XPBD!
- No parameters to tune!

Bending Resistance

- The only remaining effect is bending resistance (one parameter)
- Handle as constraint between two neighboring triangles
- Two popular approaches:



- Additional distance constraint (compliant)
- Simple, weak in flat state

- Angle constraint (future tutorial)
- Strong in flat state, more expensive

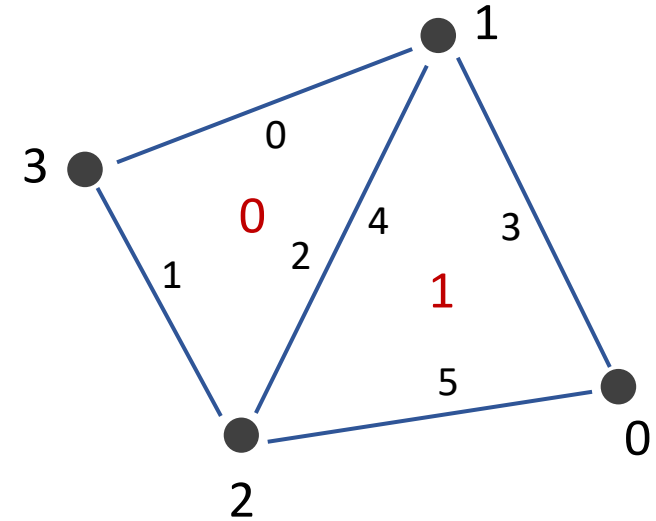
Finding Triangle Neighbors

- Define $\text{globalEdgeNr} = 3 * \text{triNr} + \text{localEdgeNr}$
- Create edge list $\{\min(\text{id0}, \text{id1}), \max(\text{id0}, \text{id1}), \text{globalEdgeNr}\}$

{1,3, 0}		{0,1, 3}	-1
{2,3, 1}		{0,2, 5}	-1
{1,2, 2}	sort by ids	{1,2, 2}	4
{0,1, 3}		{1,2, 4}	-1
{1,2, 4}		{1,3, 0}	2
{0,2, 5}		{2,3, 1}	-1

find id matches

edge neighbor list



Let's implement it...