Example: modeling strands of hair with springs.

Hooke's law: force is linear with displacement.

\[ \vec{f}_s = K \Delta \vec{p} \]

Springs create interparticle forces.

Particle i feels a force from particles \( i-1 \) and \( i+1 \).
The same idea applies to modeling cloth - but more complicated with bookkeeping for 2d connections.

tension/compression
shear / torsion
bending

what to do here??
boundary condition
A simpler way to model cloth: model particles + constraints and step in time with Verlet integration.

2 stages

Stage 1: updating points from external forces

Stage 2: updating constraints (springs)

\[ p_{\text{next step}} = \sum_{\text{next}} \mathbf{k} \cdot \mathbf{P} - \mathbf{p} \]

\[ \mathbf{p} = \mathbf{z} + \frac{1}{2} \mathbf{\Delta t} \]

Verlet integration.

\[ S = \frac{1}{2} k (q - p) \]

\[ S' = \frac{1}{2} q' - \alpha_2 (q' - p) \]

\[ S' = \frac{1}{2} \mathbf{p} + \alpha_1 (q - \mathbf{p}) \]

\[ \mathbf{q} = \mathbf{z} + \mathbf{\Delta t} + \alpha_1 (q - \mathbf{p}) \]

\[ \mathbf{p} = \mathbf{z} + \frac{1}{2} \mathbf{\Delta t} + \alpha_1 (q - \mathbf{p}) \]

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