

ElementSets from MeshConnectivity

VertexOneRing from Neighborhoods(M)

M : TriangleMesh

$x_i \in \mathbb{R}^3$ original positions

$m \in \mathbb{R}$ mass

$damping \in \mathbb{R}$ damping

$K \in \mathbb{R}$ stiffness

$dt \in \mathbb{R}$ step size

$bottom \in \mathbb{R}$ ground height

$V, E, F = \text{ElementSets}(M)$

$e(i, j) = \|x_i - x_j\|$ where $i, j \in V$

$\text{computeInternalForces}(i, v, xn) = \text{tuple}(vn, f + \begin{pmatrix} 0.0 \\ -98.0 \\ 0.0 \end{pmatrix})$

where

$i \in V$

$v_i \in \mathbb{R}^3$

$xn_i \in \mathbb{R}^3$

$f = \sum_{j \in \text{VertexOneRing}(i)} (-K) (\|disp\| - e(i, j)) \text{ dir}$ where $disp = xn_i - xn_j$, $dir = \frac{disp}{\|disp\|}$

$vn = v_i \ e^{-dt \text{ damping}} + dt \ f$

$\text{applyForces}(i, v, f, xn) = \text{tuple}(vn, xnn)$

where

$i \in V$

$v_i \in \mathbb{R}^3$

$f_i \in \mathbb{R}^3$

$xn_i \in \mathbb{R}^3$

$a = \frac{f_i}{m}$

$vn = v_i + a \ dt$

$vnn = \begin{cases} \begin{pmatrix} 0 \\ -vn_2 \\ 0 \end{pmatrix} & \text{if } xn_{i,2} < bottom \\ vn & \text{otherwise} \end{cases}$

$xnnn = \begin{cases} \begin{pmatrix} xn_{i,1} \\ bottom \\ xn_{i,3} \end{pmatrix} & \text{if } xn_{i,2} < bottom \\ xn_i & \text{otherwise} \end{cases}$

$xnn = xnnn + vnn \ dt$