ElementSets from MeshConnectivity

VertexOneRing from Neighborhoods(M)

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\begin{aligned}
M:&\ \text{TriangleMesh}\\
x_i &\in \mathbb{R}^3 \text{ original positions}\\
m &\in \mathbb{R} \text{ mass}\\
\mathit{damping} &\in \mathbb{R} \text{ damping}\\
K &\in \mathbb{R} \text{ stiffness}\\
\Delta t &\in \mathbb{R} \text{ step size}\\
\mathit{bottom} &\in \mathbb{R} \text{ ground height}
\end{aligned}
$$

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\begin{aligned}
V, E, F &= \mathit{ElementSets}(M)\\
e(i,j) &= \|x_i - x_j\| \text{ where } i, j \in V\\
\mathit{ComputeInternalForces}(i, v, xn) &= \mathit{tuple}(vn, f + \begin{pmatrix} 0.0 \\ -98.0 \\ 0.0 \end{pmatrix})\\
&\text{where}\\
&\quad i \in V\\
&\quad v_i \in \mathbb{R}^3\\
&\quad xn_i \in \mathbb{R}^3\\
&\quad f = \sum_{j \in \mathit{VertexOneRing}(i)} (-K)\ (\|d\| - e(i,j))\ \vec{d} \qquad \text{where } d = xn_i - xn_j,\ \vec{d} = \frac{d}{\|d\|}\\
&\quad vn = v_i\ e^{-\Delta t\ \ \mathit{damping}} + \Delta t\ f\\
\mathit{ApplyForces}(i, v, f, xn) &= \mathit{tuple}(vn, xnn)\\
&\text{where}\\
&\quad i \in V\\
&\quad v_i \in \mathbb{R}^3\\
&\quad f_i \in \mathbb{R}^3\\
&\quad xn_i \in \mathbb{R}^3\\
&\quad a = \frac{f_i}{m}\\
&\quad vn = v_i + a\ \Delta t\\
&\quad vnn = \begin{cases} \begin{pmatrix} 0 \\ -vn_2 \\ 0 \end{pmatrix} & \text{if } xn_{i,2} < \mathit{bottom} \\ vn & \text{otherwise} \end{cases}\\
&\quad xnnn = \begin{cases} \begin{pmatrix} xn_{i,1} \\ \mathit{bottom} \\ xn_{i,3} \end{pmatrix} & \text{if } xn_{i,2} < \mathit{bottom} \\ xn_i & \text{otherwise} \end{cases}\\
&\quad xnn = xnnn + vnn\ \Delta t
\end{aligned}
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