arccos, atan2 from trigonometry

ElementSets from MeshConnectivity

Faces, Vertices, Edges, OppositeFaces, NeighborVerticesInFace, OrientedVertices from Neighborhoods(M)

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\begin{aligned}
M &: \text{TriangleMesh} \\
x_i &\in \mathbb{R}^3
\end{aligned}
$$

$$
\begin{aligned}
V, E, F &= \mathit{ElementSets}(M) \\
\theta(i, f) &= arccos\left(\frac{(x_j - x_i) \cdot (x_k - x_i)}{\|x_j - x_i\| \ \|x_k - x_i\|}\right) \\
&\quad \text{where} \\
&\qquad i \in V \\
&\qquad f \in F \\
&\qquad j, k = \mathit{NeighborVerticesInFace}(f, i) \\
\mathit{area}(f) &= \tfrac{1}{2} \ \|(x_j - x_i) \times (x_k - x_i)\| \\
&\quad \text{where} \\
&\qquad f \in F \\
&\qquad i, j, k = \mathit{OrientedVertices}(f) \\
A(i) &= \sum_{f \in \mathit{Faces}(i)} \mathit{area}(f) \text{ where } i \in V \\
N(f) &= \frac{(x_j - x_i) \times (x_k - x_i)}{2 \ \ \mathit{area}(f)} \\
&\quad \text{where} \\
&\qquad f \in F \\
&\qquad i, j, k = \mathit{OrientedVertices}(f) \\
K(i) &= \frac{2 \ \ \pi - \sum_{f \in \mathit{Faces}(i)} \theta_{i,f}}{A_i} \text{ where } i \in V \\
l(e) &= \|x_j - x_i\| \\
&\quad \text{where} \\
&\qquad e \in E \\
&\qquad i, j = \mathit{Vertices}(e) \\
\phi(e) &= \pi - atan2(\|N_1 \times N_1\|, N_1 \cdot N_2) \\
&\quad \text{where} \\
&\qquad e \in E \\
&\qquad f_1, f_2 = \mathit{OppositeFaces}(e) \\
&\qquad N_1 = N(f_1) \\
&\qquad N_2 = N(f_2) \\
H(i) &= \frac{1}{4} \sum_{e \in \mathit{Edges}(i)} l_e \ \ \phi_e \text{ where } i \in V
\end{aligned}
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