Appendix A: Laplace Relaxation

The artifacts from inappropriate tessellation can be fixed by an optional post-processing: follow LAWONN et al. [LGRP14] and apply a small number of constrained Laplacian relaxations with a fixed weight to all inner curve vertices of λ that are located on surface edges. We relax an inner curve vertex x on a surface edge (o, v) where o is the origin of the local coordinate system, and p and q denote the previous and the next vertex on the curve. For a relaxation parameter $\omega \in [0,1]$, the relaxed curve vertex x' is given as

$$\mathbf{x}' \coloneqq (1-\omega)\mathbf{x} + \omega\, t\mathbf{v} \qquad t \coloneqq \operatorname{clamp}\left(\frac{d_\mathbf{q}\langle\mathbf{e}|\mathbf{p}\rangle + d_\mathbf{p}\langle\mathbf{e}|\mathbf{q}\rangle}{\|\mathbf{v}\|(d_\mathbf{p}+d_\mathbf{q})}, 0, 1\right)$$

$$d_\mathbf{p} \coloneqq \|\mathbf{p} - \langle\mathbf{e}|\mathbf{p}\rangle\mathbf{e}\| \qquad d_\mathbf{q} \coloneqq \|\mathbf{q} - \langle\mathbf{e}|\mathbf{q}\rangle\mathbf{e}\| \qquad \mathbf{e} \coloneqq \frac{\mathbf{v}}{\|\mathbf{v}\|}$$

The Laplacian relaxation is a relatively straightforward operation. $d_\mathbf{p}$ and $d_\mathbf{q}$ represent the distance to the edge from p and q, respectively. With that, $t\mathbf{v}$ describes the point on the edge that connects p and q by the locally shortest path with respect to the edge. So, x' is an ω-weighted average between the previous curve vertex x and the point of the locally shortest path. The operation ensures that all inner curve vertices located on edges remain on their respective edges. Furthermore, curve vertices that are also surface vertices remain fixed throughout the whole process. Consequently, the topology of the curve is preserved, and discretization noise across edges filtered.