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Isotropic Point Cloud Meshing using unit Spheres (IPCMS)

Contributions

Our contributions are (full details to be found in [1]):

- presentation of a meshing algorithm that places touching spheres of uniform radius on the input,
- which creates edge lengths close to uniformity and of a guaranteed minimum length,
- ► as well as manifold output, provided a suitable input geometry and good enough normals.

Splats

I heory

Let ${\cal M}$ be an orientable, compact, closed ${\cal C}^2$ -manifold embedded into ${\mathbb R}^3$ of finite reach $\rho \coloneqq \inf \{ \|a - m\| \mid a \in \mathcal{A}_{\mathcal{M}} \land m \in \mathcal{M} \} \in \mathbb{R}_{>0}$, where $\mathcal{A}_{\mathcal{M}}$ is the *medial axis* of \mathcal{M} consisting



of the points $q\in \mathbb{R}^3$ fulfilling $\min_{p\in\mathcal{M}}|q-p|=|q-\hat{p}|=|q-\tilde{p}|$ for $\hat{p}
eq ilde{p}\in\mathcal{M}$.

Lemma: Let $p \in \mathcal{M}$ be a point and let N_p denote its normal. Then, for r <
ho, the image of $B_r(p) \cap \mathcal{M}$ under the projection π in direction of N_p to the tangent plane $T_p\mathcal{M}$ is a convex set.

Disk Growing







References

[1] H. Lipschütz, U. Reitebuch, K. Polthier, and M. Skrodzki. Isotropic Point Cloud Meshing using Unit Spheres (IPCMS). arXiv preprint arXiv:2305.07570, 2023.

[2] Z. Huang, Y. Wen, Z. Wang, J. Ren, and K. Jia. Surface reconstruction from point clouds: A survey and a benchmark. arXiv preprint arXiv:220502413, 2022.

