

VARIATIONAL FRAMEWORK FOR DISTORTION CONTROL IN SURFACE PARAMETERIZATIONS

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Surface parameterization establishes a coordinate correspondence between a surface and a planar or canonical domain. This provides coordinates in which surface-processing tasks can be carried out in a simpler computational setting. The usefulness of such parameterizations, however, depends on controlling induced angle, area, and metric distortions. In this talk, I will present a variational framework for distortion control in surface parameterizations. The discussion will focus on energy formulations underlying conformal [1], authalic (area-preserving) [2], and distortion-balancing parameterizations [3]. I will also discuss how these formulations lead to practical numerical optimization algorithms. Applications to surface registration and effective surface representations will be demonstrated to illustrate the practical utility of these methods.

REFERENCES

- [1] Y.-C. Kuo, W.-W. Lin, M.-H. Yueh, and S.-T. Yau, *Convergent conformal energy minimization for the computation of disk parameterizations*, SIAM J. Imaging Sci., **14** (2021), 1790–1815.
- [2] M.-H. Yueh, *Theoretical foundation of the stretch energy minimization for area-preserving simplicial mappings*, SIAM J. Imaging Sci., **16** (2023), 1142–1176.
- [3] S.-Y. Liu and M.-H. Yueh, *Energy-based distortion-balancing parameterization for open surfaces*, SIAM J. Imaging Sci., **18** (2025), 2059–2093.

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