

# POLYGONS IN HIGHER DIMENSIONS VIA CONFORMAL BARYCENTER SAMPLING

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## ABSTRACT

Topologists and geometers have been interested in the configuration spaces of linkages for a long time. In three dimensions, Millson and Kapovich observed that the configuration spaces of polygons (modulo rotations) were symplectic, leading to a natural structure on these polygon spaces [1] and eventually to a fast sampling algorithm [2]. Much of the MK method is inherently three-dimensional. However, in this talk, we present an extension of the MK construction which allows us to build and sample polygons of fixed edgelengths in a space of any dimension. Our method is a reweighted sampler; numerical experiments show it to be both accurate and efficient. It is based on ideas from hyperbolic geometry and depends on our previous algorithm for computing the conformal barycenter [3].

*Joint work with Henrik Schumacher.*

- [1] Kapovich, M. and Millson, J. 1996 The symplectic geometry of polygons in Euclidean Space. *J. Differential Geometry* **12**, 479-513.
- [2] Cantarella, J., Duplantier, B., Shonkwiler, C. and Uehara, E. 2016 A fast direct sampling algorithm for equilateral closed polygons. *J. Physics A* **49**, 275205.
- [3] Cantarella, J., Schumacher, H. 2022 Computing the conformal barycenter. *SIAM J. on Applied Algebra and Geometry*, to appear.