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A FRAMEWORK FOR ISOGEOMETRIC ANALYSIS BASED ON SMOOTH POLAR B-SPLINES

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One of the needs of CAD representations of arbitrary genus surfaces with finite number of polynomial patches is the introduction of holes surrounded by periodic configurations. Such holes can then be filled by means of polar spline surfaces, where the basic idea is to use periodic spline patches with one collapsed boundary. Applications of this approach include subdivision surfaces, free-shape modeling, and, as we demonstrate here, isogeometric analysis.

In order to obtain polar spline surfaces with specified continuity, the admissible set of control point configurations shrinks. In particular, at the collapsed boundary (invoking a singular point), imposition of C^k continuity constrains the inner k-rings of control points surrounding the singular point to a limited number of configurations. In hole-filling applications, the outer k-rings of control points are used to match the cross-derivative information at the hole boundary.

In this talk, keeping in mind applications to design as well as analysis, we focus on C^k polar spline parametric patches with arbitrary degree and arbitrary number of elements at the hole boundary. We present a simple, geometric construction of basis functions over such polar parametric domains possessing interesting properties as non-negativity and partition of unity. In addition, the constructed spline spaces show optimal approximation behavior, even at the singular point [1].

REFERENCES

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