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Multi-degree reduction of Bézier curves with constraints, using dual Bernstein basis polynomials

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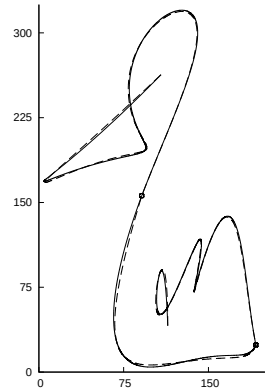
Abstract

We present a novel approach to the problem of multi-degree reduction of Bézier curves with constraints, using the dual constrained Bernstein basis polynomials, associated with the Jacobi scalar product. We give properties of these polynomials, including the explicit orthogonal representations, and the degree elevation formula. We show that the coefficients of the latter formula can be expressed in terms of dual discrete Bernstein polynomials. This result plays a crucial role in the presented algorithm for multi-degree reduction of Bézier curves with constraints. If the input and output curves are of degree n and m, respectively, the complexity of the method is $O(nm)$, which seems to be significantly less than complexity of most known algorithms. Examples are given, showing the effectiveness of the algorithm.



Key words: Multi-degree reduction of Bézier curves; Constrained dual Bernstein basis; Dual discrete Bernstein basis.

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