Comparison of intrinsic properties between b-splines and blending splines

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Change of representation of B-spline curves can be achieved by application of a blending-type spline construction. Expo-rational B-splines (ERBS) is a blending-type spline construction where local functions at each knot are blended together by C^k-smooth basis functions. For an ERBS curve the local functions can be B-spline curves. When a B-spline curve is blended with itself we get a perfect interpolation of position in the new curve, compared to the old curves. Change of representation of B-spline curves can be used in applications for transferring editing possibilities from control points to interpolation points, and for more general constructions of splines with a strictly local basis-function. In [1] explicit formulae for ERBS-based interpolation of curvature and torsion of unit-speed 3D-space curves was provided. Here we take a closer look at possible applications of these properties, and examine the effects on intrinsic properties like curvature, torsion and reparameterization on the resulting blending spline compared to the original B-spline. Computational aspects for the various formulae are considered.

References

[1] L.T. Dechevsky, G.H. Georgiev. Interpolation of Curvature and Torsion Using Expo-Rational B-Splines. *Large-Scale Scientific Computing*, 411–419, 2012.