Approximation by interval Bezier curves

T.W. Sederberg, Dept. of Civil Eng., Brigham Young Univ., Provo, UT, USA
R.T. Farouki

ABSTRACT
The interval Bezier curve, which, unlike other curve and surface approximation schemes, can transfer a complete description of approximation errors between diverse CAD/CAM systems that impose fundamentally incompatible constraints on their canonical representation schemes, is described. Interval arithmetic, which offers an essentially infallible way to monitor error propagation in numerical algorithms that use floating-point arithmetic is reviewed. Affine maps, the computations of which are key operations in the de Casteljau subdivision and degree-elevation algorithms for Bezier curves, the floating-point error propagation in such computations, approximation by interval polynomials, and approximation by interval Bezier curves are discussed.

INDEX TERMS
Polynomials, Equations, Approximation error, Computer aided manufacturing, CADCAM, Tolerance analysis, Monitoring

CITATION
doi:10.1109/38.156018
Interval Bezier curve are new representation forms of parametric curves that can embody a complete description of coefficient errors. Using this new representation, the problem of lack of robustness in all state-of-the-art CAD systems can be largely overcome. In this paper we discuss this concept to form a new curve over rectangular and circular domain such that its parameter varies in an arbitrary range $[a, b]$ instead of standard parameter $[0, 1]$. Where $a$ and $b$ are real and, we also want that curve gets generated within the given error tolerance limit. Keywords: Interval Bézier curve, rectangular, circular, parameter varying range, error tolerance.