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实平面奇异代数曲线的全局B样条逼近

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Abstract

This paper proposes an algorithm for globally approximating real algebraic plane curves of degree k with B-spline curves of the same degree. Each connected component is approximated with a B-spline curve. It is suitable for all irreducible real plane algebraic curves with arbitrary genus (including singular curves). This method is based on our blowup sampling method of algebraic curves, which solves the difficult problem of sampling around singular points in essence. The experimental results show that the algorithm achieves better accuracy than the existed methods.

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摘要

提出了一种用 k 次B样条曲线全局逼近实平面 k 次代数曲线的算法, 每个连通部分用一条B样条曲线逼近. 它适合于任意亏格的不可约的实平面代数曲线(包括含奇异点的曲线). 这种逼近建立在所提出的代数曲线胀开采样的基础上, 这种胀开采样算法从本质上解决了奇异点周围采样难的问题. 实验结果表明, 该方法的逼近精度高于已有算法.

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References:

- [1] Montaudouin Y, Tiller W, Vold H. Application of power series in computational geometry. *Computer Aided Design*, 1986,18(10): 514-524.
- [2] Bajaj C, Xu GL. Piecewise rational approximations of real algebraic curves. *Journal of Computational Mathematics*, 1997,15(1): 55-71.
- [3] Gao XS, Li M. Rational quadratic approximation to real algebraic curves. *Computer Aided Geometric Design*, 2004,21(10): 805-828.
- [4] de Figueiredo LH, Stolfi J. Adaptive enumeration of implicit surfaces with affine arithmetic. *Computer Graphics Forum*, 1996, 15(5):287-296.

[5] Witkin A, Heckbert P. Using particles to sample and control implicit surfaces. *Computer Graphics*, 1994,28(5):269-277.

[6] Tanaka S, Morisaki A, Nakata S, Fukuda Y, Yamamoto H. Sampling implicit surfaces based on stochastic differential equations with converging constraint. *Computers & Graphics*, 2000,24(3):419-431.

[7] Taubin G. An accurate algorithm for rasterizing algebraic curves. *Solid Modeling and Applications*, 1993(2):221-230.

[8] Tanaka S, Shibata A, Yamamoto H, Kotsuru H. Generalized stochastic sampling method for visualization and investigation of implicit surfaces. *Computer Graphics Forum*, 2001,20(3):359-367.

[9] Hartshorne R; Feng KG, Liu ML, Xu MW, Trans. *Algebraic Geometry*. Beijing: Science Press, 2001 (in Chinese).

[10] Bajaj C, Jonestone K. Sorting points along an algebraic curve. *SIAM Journal on Computing*, 1990,19(5):925-967.

[11] de Cusatis Junior A, de Figueiredo LH, Gattass M. Interval methods for ray casting implicit surfaces with affine arithmetic. In: *Proc. of the SIBGRAP'99*. IEEE Press, 1999. 65-72.

[12] Fang ME, Man JJ, Wang GZ, Quan HY. Unilingual algorithm of solving control vertexes of multiple knots matrix. *Applied Mathematics A Journal of Chinese Universities*, 2006,21(1):95-104 (in Chinese).

附中文参考文献:

[9] 哈茨霍恩,著;冯克勤,刘木兰,胥鸣伟,译.代数几何.北京:科学出版社,2001.

[12] 方美娥,满家巨,汪国昭,全惠云.重型值点阵的样条插值统一求解算法.高校应用数学学报,2006,21(1):95-104.