

Accepted Manuscript

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PII: S0377-0427(17)30208-X
DOI: <http://dx.doi.org/10.1016/j.cam.2017.04.037>
Reference: CAM 11117

To appear in: *Journal of Computational and Applied Mathematics*

Received date: 12 October 2016

Revised date: 18 April 2017

Please cite this article as: C.-J. Li, et al., Curve and surface fitting models based on the diagonalizable differential systems, *Journal of Computational and Applied Mathematics* (2017), <http://dx.doi.org/10.1016/j.cam.2017.04.037>

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Curve and Surface Fitting models based on the diagonalizable differential systems [☆]

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Abstract

Curve and surface fitting is an important problem in computer aided geometric design, including many methods, such as the B-spline method, the NURBS method and so on. However, many curves and surfaces in the natural or engineering fields need to be described by differential equations. In this paper, we propose a new curve and surface fitting method based on the homogeneous linear differential systems. In order to approximate general curves or surfaces well, the diagonalizable differential systems with variable coefficients are adopted, which have explicit solutions. The fitting algorithms are presented for curves and surfaces from discrete points. Some numerical examples show that the two algorithms can obtain good fitting accuracy as the B-spline method.

Keywords: Curve fitting; Surface fitting; Differential system; Explicit solution; B-spline

1. Introduction

Curve and Surface reconstruction is an important process in Computer Aided Design and Manufacturing. Many surfaces, such as aeroengine blades and airfoils need be designed to satisfy some corresponding aerodynamic differential equations. However, the traditional surface construction methods based on the

[☆]This work was supported by the National Natural Science Foundation of China (Nos. 11290143 and 11471066), the Fundamental Research of Civil Aircraft (MJF-2012-04), and the Fundamental Research Funds for the Central Universities (DUT15LK44).

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