Lorentz

Multivariate Birkhoff Interpolation



The subject of this book is Lagrange, Hermite and Birkhoff (lacunary Hermite) interpolation by multivariate algebraic polynomials. It unifies and extends a new algorithmic approach to this subject which was introduced and developed by G.G. Lorentz and the author. One particularly interesting feature of this algorithmic approach is that it obviates the necessity of finding a formula for the Vandermonde determinant of a multivariate interpolation in order to determine its regularity (which formulas are practically unknown anyways) by determining the regularity through simple geometric manipulations in the Euclidean space. Although interpolation is a classical problem, it is surprising how little is known about its basic properties in the multivariate case. The book therefore starts by exploring its fundamental properties and its limitations. The main part of the book is devoted to a complete and detailed elaboration of the new technique. A chapter with an extensive selection of finite elements follows as well as a chapter with formulas for Vandermonde determinants. Finally, the technique is applied to non-standard interpolations. The book is principally oriented to specialists in the field. However, since all the proofs are presented in full detail and since examples are profuse, a wider audience with a basic knowledge of analysis and linear algebra will draw profit from it. Indeed, the fundamental nature of multivariate nature of multivariate interpolation is reflected by the fact that readers coming from the disparate fields of algebraic geometry (singularities of surfaces), of finite elements and of CAGD will also all find useful information here.

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