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Rational Bernstein and spline approximation. A new approach

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Abstract

Some new families of rational Bernstein and spline approximants in one and several variables are defined and some of their properties are studied.

Keywords: Rational Bernstein operators, rational spline operators.

MSC: Primary 41A20; Secondary 41A36, 41A63.

§1. Introduction

In standard references on curves and surfaces (e.g.[7, 8, 9, 10, 16]), rational Bernstein Bézier approximants are generally defined as quotients of polynomials of the same (total) degree. Recently, we defined new families of univariate rational Bernstein operators [17] $\mathcal{R}_n f := P_n/Q_{n-1}$ using quotients of type $[n/n-1]$, the numerator P_n and the denominator Q_{n-1} being connected in such a way that the operators are exact on affine polynomials. In the present paper, we extend this idea to rational Bernstein approximants on triangles and to univariate and bivariate splines. It has potential applications both to approximation theory and to CAGD. Various kinds of rational finite elements and splines are also considered in [1, 2, 3, 6, 15, 18], from different points of view.

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