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Hermite spline interpolation on a three direction mesh from Powell-Sabin and Hsieh-Clough-Tocher finite elements

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Abstract

In this paper we develop a general local method to define Hermite interpolants of prescribed order $r \geq 1$ and global class C^s on the three direction mesh of the real plane. They are defined from Powell-Sabin and Hsieh-Clough-Tocher finite elements in such a way that the interpolation operators have fundamental functions with compact support and reproduce a given space $\mathbb{P}_m$ of polynomials included in the spline space.

Key words: Hermite interpolation, Powell-Sabin finite element, Hsieh-Clough-Tocher finite element, Unisolvent configuration
PACS: 41A05, 41A15, 65D05, 65D07

1 Introduction

For Hermite interpolation in the plane if a global method is adopted, we should normally solve a linear system of equations of a very high order, although frequently the matrix of coefficients is sparse. As a consequence, the associated fundamental functions may have non bounded supports. This fact has theoretical as well as practical consequences, since it is difficult to obtain error estimates and to design efficient algorithms. In that case, another strategy consists in using a local scheme to define the interpolants: the problem is first decomposed into *smaller* problems, which consist in solving linear systems of

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