COMPATIBLE DISCRETIZATIONS IN ISOGEOMETRIC ANALYSIS

ANNALISA BUFFA, GIANCARLO SANGALLI, AND RAFAEL VÁZQUEZ

Abstract. Isogeometric analysis (IGA) is a method for the discretization of partial differential equations, that was introduced in [1]. In this seminal paper, the method is based on non-uniform rational B-splines (NURBS), a group of functions that are spreadly used in CAD software.

The concept of IGA was extended to the definition of discrete differential forms in [2]. In that paper we introduced compatible discretizations of the spaces $\mathbf{H}(\mathbf{curl})$ and $\mathbf{H}(\mathrm{div})$, which are particularly important for electromagnetic applications. The method is based on the construction of an exact sequence of B-spline spaces with mixed degree, and it can be understood as a generalization of edge and face finite elements with higher continuity.

The main drawback of the methods in [1, 2] is that B-splines and NURBS spaces are defined by tensor products, and a local refinement procedure for these spaces is not feasible. To overcome this problem, it was proposed in [3] a discretization based on T-splines, a familiy of functions that are defined on meshes with T-junctions (similar to hanging nodes in finite elements), and that are well suited for local refinement. It was after [4] that the properties of T-splines and its use in isogeometric analysis were better understood.

Discrete differential forms for T-splines appeared for the first time in [5]. The method of that paper introduces compatible discretizations of $\mathbf{H}(\mathbf{curl})$ and $\mathbf{H}(\mathrm{div})$ that allow to perform local refinement maintaining the high continuity of B-splines.

In this talk we present a review of the theoretical and numerical results in [2] and [5].

Keywords: compatible discretizations, computational electromagnetics, isogeometric analysis, T-splines

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Istituto di Matematica Applicata e Tecnologie Informatiche "Enrico Magenes"-CNR, via Ferrata 1, 27100, Pavia
E-mail address: annalisa@imati.cnr.it

Dipartimento di Matematica, Università id Pavia, via Ferrata 1, 27100, Pavia
E-mail address: giancarlo.sangalli@unipv.it

Istituto di Matematica Applicata e Tecnologie Informatiche "Enrico Magenes"-CNR, via Ferrata 1, 27100, Pavia
E-mail address: vazquez@imati.cnr.it