DEPARTAMENTO DE ANÁLISIS MATEMÁTICO Y MATEMÁTICA APLICADA

Facultad de Ciencias MATEMÁTICAS

Instituto de Matemática Interdisciplinar

SEMINARIO DE ANÁLISIS MATEMÁTICO Y MATEMÁTICA APLICADA

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Discrete Exterior Calculus Method. Application to the Resolution of Partial Differential Equations

The numerical analysis of PDEs is a classic and highly active investigation area. There is a wide variety of established methods such as finite differences, finite elements, finite volume, spectral, etc., all of them of analytical origin. In recent decades, geometric methods based on Exterior Calculus have been proposed. This is due to the geometric content of many Physics theories. In this group, we can highlight the Finite Exterior Element Calculus (FEEC), which is a theoretical approximation of finite element methods for the numerical solution of various types of PDEs. An alternative method in this field is Discrete Exterior Calculus (DEC). Exterior Calculus generalizes vector calculus to high dimensions and differential manifolds. Discrete Exterior Calculus is one of their discretizations, which produces a numerical method for solving PDEs on simplicial complexes. In DEC, geometric operators are used, and equivalent discrete versions of the Exterior Calculus are proposed for objects and differential operators, such as differential forms, vector fields, etc. DEC is proposed as a method for solving partial differential equations that consider the geometric and analytical characteristics of the operators and the domains over which that applies.

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