POLITECNICO DI TORINO

DISMA Dipartimento di Scienze Matematiche G. L. Lagrange

ECCELLENZA 2018 · 2022

Monday, May 20, 2019 at 13:00
Politecnico di Torino, DISMA, Aula Buzano (third floor)


## Matteo CICUTTIN

Software Engineer at CERMICS - École Nationale des Ponts et Chaussées


# Hybrid High-order methods: Overview, implementation and latest developments

Prof. Stefano Berrone introduces the seminar


### Abstract

The Hybrid High-order method, a member of the Discontinuous Skeletal methods family, presents several attractive features as the dimension-independent mathematical construction, the possibility to use arbitrary polynomial orders and the support for meshes with polytopal cells with matching and non-matching interfaces. Positioning unknowns at mesh faces is also a natural way to express locally the fundamental balance properties satisfied by the boundary-value problem at hand.

Implementations of DiSk methods should conserve their mathematical peculiarities: a single piece of code should be able to work with arbitrary space dimension and cell shapes. It is infrequent to find this approach in software: a major reason is that programming languages commonly used by the scientific computing community are not readily amenable to an implementation which is general and efficient at the same time. With DiSk++ [3], a C++ template library, we efficiently replicated the mathematical flexibility of DiSk methods in software, obtaining a "write once, run on any kind of mesh" numerical framework.

In the first part of this talk, Dr Cicuttin presents the HHO method, and then the software library supporting it will be discussed. In the second half of the talk, two variants of HHO will be introduced: the Unfitted HHO method, allowing to use meshes not conforming to interfaces, and the Multiscale HHO method, capable to handle efficiently problems with highly oscillatory material parameters.


### Biography

Matteo Cicuttin is currently working as Software Engineer at P1 Security, Paris. He obtained his PhD in Industrial Engineering from the University of Udine and in collaboration with Emilab. He was a postdoc researcher for two years and a half at the CERMICS laboratory of the École Nationale des Ponts et Chaussées, where he worked on numerical methods for PDEs, and in particular on their computational aspects. His scientific interests span from numerical methods, especially applied to electromagnetism, to high-performance computing (CPU architectures and networking technologies used in HPC).

***Save the date for the next event: May 22, 2019***

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