

4th Latin American SCAT Workshop

Facultad de Ciencias Físicas y Matemáticas

Universidad de Chile

Satellite School on Numerical Methods — 29 Sept. to 3 Oct. 2008

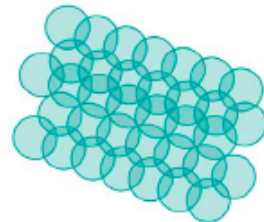
Meshfree Methods and Vortex Methods

Lecturer:

Dr Lorena Barba, University of Bristol / Boston Universi

Duration

4 hours.



Description

Over the last few years, there has been an explosive increase in interest in so-called meshfree numerical methods. The idea of using disconnected points, rather than connected elements, for discretization of differential equations is just as old as the most traditional method of finite differences. Point vortices were used for the first time in 1931 to simulate a surface of discontinuity in an incompressible fluid. But, for many reasons, this approach did not develop, while the use of elements has reached widespread acceptance and industrial success.

Some significant advances in meshfree methods were made in the 1970s-80s, with the introduction of the smooth particle hydrodynamics method and the vortex blob method, and several improvements thereof. However, it is not until the last decade that major interest has been sparked in the field. The reasons are several advances in algorithms, which make particle methods more efficient, and increased preoccupation with problems involving complex geometries, deformations, discontinuities and general nonlinear behaviour.

We will discuss the development of meshfree methods, the difficulties faced in the field, and the main features of some of these methods -- in particular vortex methods, radial basis functions, and smooth particle hydrodynamics. We will present an overview of the state of the art, and give a glimpse of the implementation details, where time permits. We will finish showing some recent research results and successes in the field.

For more information, visit www.scats-alfa.eu