Seminários CGE/UE

COMPUTATIONAL FLUID DYNAMICS
THE BOUNDARY ELEMENT METHOD

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Hora: 16:00
Data: 8 de Novembro de 2006
Local: Anf. 1, - Colégio Luís António Verney
Promove: Centro de Geofísica de Évora

Resumo

The objective of this presentation is to present the boundary element method (BEM) to simulate numerically general viscous incompressible and compressible fluid flow problems governed by the Navier-Stokes set of equations.

Several alternative formulations of the Navier-Stokes equations in terms of primitive or derived field functions are feasible, but only velocity-vorticity formulation will be discussed. Advantage of the velocity-vorticity approach lies with the numerical decoupling of the kinematics and kinetics of the flow from pressure computation.

The main difficulty of applying singular boundary-domain integral equation approach is the lack of fundamental solutions for the fluid flow governing nonlinear equations. Thus, it is necessary to reformulate the governing partial differential transport equations in terms of linear differential operators with known fundamental solutions, and with the nonlinear parts appearing as non-homogenous pseudo body source terms. In general, one may assume two possible linearizations of the Navier-Stokes equations, such as Stokes and Oseen fluid flow.

Several fluid flow studies will be presented,e.g. linear and nonlinear solutions for a flow around cylindrical obstacle, natural convection in a closed cavity with large temperature gradient, thermoacoustic waves in an enclosure under zero- and normal-gravity conditions.