A time-space adaptive semi-DWR method

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Resumen

We present in this talk a time-space adaptive semi-DWR method in the framework of finite elements. We use goal oriented adaptation of a functional $J(u)$ of the solution to estimate the error based on the Dual Weighted Residual methodology. The main ingredients of our new time-space adaptive method are: (1) Use of both structured and unstructured meshes. (2) Estimation of the local truncation error by solving backward at each time step a dual problem in the subinterval $[t_{n-1}, t_n]$; so that we avoid to solving backward the dual problem in the whole time integration interval $[0, T]$. (3) The local error estimators for the goal functional $J(u)$ yield a very effective adaptive algorithm which allows to having a control on both the size of the time step and the size of the mesh elements.

We shall illustrate the capabilities of our method when it is applied to solve several reaction-diffusion-convection problems as well as the Navier-Stokes equations, in which the convection terms are treated in a semi-Lagrangian manner.