A Stabilized bi-grid method for both Allen-Cahn and Navier-Stokes equations

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Abstract

In this talk, we propose a bi-grid scheme framework for both Allen-Cahn and Navier-Stokes equations in Finite Element Method. The new techniques are based on the use of two finite element spaces, a coarse one and a fine one, and on a decomposition of the solution into mean and fluctuant parts. This separation of the scales, in both space and frequency, allows to build a stabilization on the high modes components: the main computational effort is concentrated on the coarse space on which an implicit scheme is used while the fluctuant components of the fine space are updated with a simple semi-implicit scheme; they are smoothed without deterioring the consistency. A coupling for both equations is made and the numerical examples we give show the good stability and the robustness of the new method. An important reduction of the computation time is also obtained when comparing our methods with fully implicit ones.

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