Title	Numerical Simulations of Unsteady Navier-Stokes Equations for Incompressible Newtonian Fluids using FreeFem++ based on Finite Element Method
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Abstract

The goal of this paper is concerned to numerical approach of the unsteady Navier-Stokes equations for incompressible Newtonian fluids based on finite element method and we present here the numerical simulations implemented with FreeFem++. We first give the constitutive formulation of these equations. The unknowns are **u** the velocity and *p* the pressure. The constitutive equations lead to a non-linear elliptic system of partial differential equations for (**u**, *p*) . We find the variational formulation of the unsteady Navier-Stokes equations and obtain the results of numerical simulations through a programming code developed in FreeFem++. The approximation of the velocity and pressure are P2 continuous and P1 continuous finite element respectively.