1 Introduction

2 Numerical study

2.1 Spatial discretization

Suppose that the problem we are studying takes place in a bounded domain $\Omega \subset \mathbb{R}^m$ with $1 \leq m \leq 3$ depending on the case. In order to solve the problem numerically, the domain is discretized into nonoverlapping control volumes and a control node is placed at the center of each one [1]. There exist two manners to discretize the domain, namely, the cell–centered and the node–centered discretization. The former places discretization nodes over the domain and then generates a control volume centered on each node. The latter begins generating the control volumes and then places a node at the center of each one.

2.2 Time discretization

$$\frac{\partial \rho}{\partial t} + \boldsymbol{\nabla} \cdot (\rho \mathbf{v}) = 0$$

$$\frac{\partial (\rho \mathbf{v})}{\partial t} + \boldsymbol{\nabla} \cdot (\rho \mathbf{v} \otimes \mathbf{v}) = -\boldsymbol{\nabla} p + \mu \nabla^2 \mathbf{v} + \rho \mathbf{F}$$