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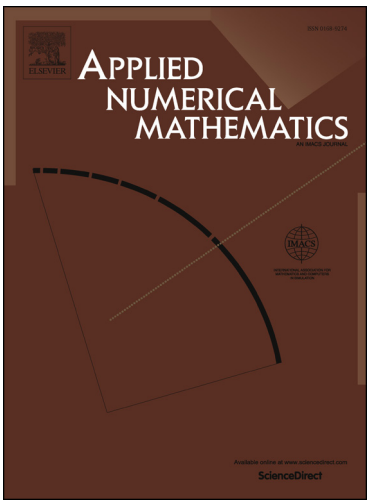

Stabilized Lagrange multiplier method for elliptic and parabolic interface problems

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Stabilized Lagrange multiplier method for elliptic and parabolic interface problems

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Abstract

In this paper, we discuss a new stabilized Lagrange multiplier method for finite element solution of multi-domain elliptic and parabolic initial-boundary value problems with non-matching grid across the subdomain interfaces. The proposed method is consistent with the original problem and its stability is established without using the inf-sup (well known as LBB) condition. In the first part of this article, optimal error estimates are derived for second order elliptic interface problems. Then, the analysis is extended to parabolic initial and boundary value problems with interface and optimal error estimates are established for both semi-discrete and completely discrete schemes. The results of numerical experiments support the theoretical results obtained in this article.

Keywords: elliptic problem, parabolic initial-boundary value problem, interface, Lagrange multiplier, stabilization, fully discrete scheme.

1. Introduction

In domain decomposition methods for solving partial differential equations, mortar finite elements are most suitable techniques for tackling non-matching

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