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A FINITE DIFFERENCE NON-OVERLAPPING NON-MATCHING DOMAIN DECOMPOSITION ALGORITHM FOR HEAT EQUATION

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Abstract. In this paper, we provide a maximum norm analysis of a finite difference scheme defined on non-overlapping non-matching grid for the heat equation. We consider a domain decomposition which each subdomain has its own independently generated grid. The grid points on the subdomain boundaries need not match the grid points from adjacent subdomain. In this procedure, interface values between subdomain are found by an explicit finite difference formula. Once these values are calculated, interior values are determined by backward differencing in time. Maximum norm error estimates for these procedures are derived.
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1 Introduction

Many problems in mathematical economics, engineering and mechanics reduce to large, sparse and unstructured problems. Because of their size and lack of structure, these problems are hard to solve by classical and global method which are not adapted to modern parallel computers. In this setting, decomposition method is very attractive, because the solution of the global problem can be reduced to the solutions of many subproblems of small size. Domain decomposition method is one of the most important approaches for solving partial differential equations numerically. For simplicity, domain decomposition is a realization of the divide and conquer strategy in which one attempts to treat a computationally intractable problem by replacing it with two or more simpler problems, each of which is presumably tractable. A