Seminar-Thesis

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Tuesday, August 25, 2015
1:45p.m.-2:30p.m., HH 3026

Optimized Schwarz Domain Decomposition Approaches for the Generation of Equidistributing Grids

Abstract

The main purpose of this thesis is to develop and analyze improved iterations arising from domain decomposition methods for equidistributing meshes. Adaptive mesh methods are powerful techniques to obtain the efficient numerical solution of physical boundary value problems (BVPs) which arise from science and engineering. If a solution of BVPs has sharp changes moving mesh methods can give a reasonable solution for the BVP with a fixed number of mesh points. Our concern is to solve the involved nonlinear mesh BVP using optimized domain decomposition approach and efficiently provide a nonuniform coordinate for the original boundary value problem. We derive an implicit solution on each subdomain from the optimized Schwarz method for the mesh BVP, and then introduce an interface iteration from the Robin transmission condition, which is a nonlinear iteration. Using the theory of *M*-functions we provide an alternate analysis of the optimized Schwarz method on two subdomains and extend this result to an arbitrary number of sub-domains. *M*-function theory guarantees that these iterations will converge monotonically under some restriction on p where p is the Robin parameter. The iteration can be computed by nonlinear (block) Gauss Jacobi or Gauss Seidel methods. We conclude our study with numerical experiments.