

Stony Brook University

The Graduate School

Doctoral Defense Announcement

Abstract

Solving Elliptic Interface Problem Using Mixed Finite Element Method

By

Shuqiang Wang

The elliptic boundary value/interface problem is very important in many applications, for example, in incompressible flow, MHD etc. Many methods are used to solve these problems in a complex domain, including the finite volume method, the finite element method and the boundary element method.

For a complex computational domain, the better choice of the partition of the computational domain is to use an unstructured grid. However, it is not a straight forward task to implement a mesh generation program. It also requires extra computing time and resources (such as computer memory) to generate unstructured mesh. Thus people like to use structured mesh if possible.

Popular methods using structured Cartesian grids for the elliptic boundary value/interface problem include the immersed boundary method, the immersed interface method, the ghost fluid method, and the embedded boundary method.

This thesis solves the elliptic problem using several versions of the mixed finite element method on unstructured mesh. The results are compared for speed and accuracy to the embedded boundary method.

The ghost fluid method for elliptic boundary value/interface problem is also investigated. A simple derivation is given. It is shown to be capable of second order accuracy. Its application on incompressible will be given.

Date: August 8th, 2007

Time: 10:00 a.m.

Place: AMS Seminar Room 1-222

Program: Department of Applied Math and Statistics

Dissertation Advisor: James Glimm, Ph.D.