

MANE 6760 (FEM for Fluid Dyn.) Fall 2022: Midterm Project

1 Proposal

I would like to attempt and solve the questions assigned in the Midterm project using an Advection-Diffusion-Reaction solver written in C++/MATLAB. I have come up with an Object-Oriented approach to make the solver modular and efficient. Additionally, the code is also set up to use higher-order (Standard Galerkin) Finite Elements. Any specified problem can be solved by adding its corresponding Boundary or Domain Integrators. So far, I have been able to generate the Sparse Matrices in C++. I utilize MATLAB to solve the linear system in order to get required solutions. There are no-dependencies (except MATLAB installation) for this C++ solver because, all required Linear Algebra except, Sparse Matrix operations and Linear System solvers have been manually coded. All Sparse matrices are represented in the form of a Linked-list which also has the same specifications as that of MATLAB.

2 Modifications

In this code, I would like to add Stabilized Finite Element techniques (SUPG, GLS, VMS) introduced in class. On top of that, non-uniform mesh generation will be added (like the ones specified in the project) and if time permits, bring in Linear System solver capabilities in C++ directly.

3 Questions

1. Will it be possible to first run a C++ script and then a MATLAB script subsequently from your end to verify my results?
2. Should I also write the corresponding Python scripts for the same just in case?
3. If this process seems to take a bit longer than I expected, can I request some extension on the deadline?