MTH 655/9 Winter 2017
Finite Elements
student contributions

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Solvers used

• Solvers used:
  • Fem1d_2017
  • ACF
  • IFISS
  • MFEM
  • Deal ii
  • FeNiCS
  • Moose

• Student contributors:
  • Math + Engrg (Nuclear, CCE, Wood)
  • AA, CS, DF, DH, ME, EH, TA, DW, JH, GX, ZY, DW, YQ, JU, WM, SK
Grids with distmesh, mesh2d solution to Poisson’s equation
Grids, cd

- Use deal ii, and Blossom for meshing
More exotics

AA/CS
Sometimes something goes wrong (Lab 5)
Lack of coercivity
More exotic domains: solution to an elliptic equation and to the wave equations
Eigenfunctions for an exotic domain

- Figure 1: Final solution to heat equation for Cayuga Lake with homogenous Dirichlet boundary conditions; the negative space represents a fictitious island.

- Figure 2: Eigenvectors for n = 1 and n = 5 for the final solution of the heat equation.

ME/EH
More exotic domains and eigenfunctions
Sometimes something goes wrong (Lab 5)

- But can be corrected
And eventually gets corrected
Eigenfunctions for Dirichlet problem
Eigenfunctions

Solution of the Problem
Stokes/Darcy, (Final project)
Stokes, with FeNics
Stokes, with deal ii

JU
Complex physics model: bound water in wood engineering (diffusion with sorption)

Figure 8. Bound water concentration profile after 2 days
More complex physics: work in progress

\[(I + \eta A_\phi) \dot{\phi}_t + A_\phi (\alpha(\phi) + P) = \nabla \cdot (1 - \phi)\nabla \Delta^{-1} F, \quad \phi(0) = \phi_0,\]

DH
Time dependent problems
• Thanks for a great term and your hard work!