Abstract: We consider two modifications of the Arrow-Hurwicz (AH) iteration for solving the incompressible steady Navier-Stokes equations for the purpose of accelerating the algorithm: grad-div stabilization, and Anderson acceleration. AH is a classical iteration for general saddle point linear systems and it was later extended to Navier-Stokes iterations in the 1970s which has recently come under study again. We apply recently developed ideas for grad-div stabilization and divergence-free finite element methods along with Anderson acceleration of fixed point iterations to AH in order to improve its convergence. Analytical and numerical results show that each of these methods improves AH convergence, but the combination of them yields an efficient and effective method that is competitive with more commonly used solvers.

SIAM Student Chapter Seminar