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Constantin Bacuta and **Jacob Jacavage*** (jjacav@udel.edu). *Preconditioning for mixed variational formulations.*

We consider a general approach to precondition and discretize boundary value problems written as primal mixed variational formulations. This approach connects the classical theory of symmetric saddle point problems with the theory of preconditioning symmetric positive definite operators. For the proposed discretization method, a discrete inf-sup condition is automatically satisfied by natural choices of test and trial spaces. In addition, bases are needed only for the test spaces and assembly of a global saddle point system is avoided. Efficient iterative solvers utilizing standard multilevel preconditioners are proposed. Applications include discretizations of second order PDEs, in which the coefficients may be discontinuous, and first order systems of parametric PDEs, such as the time-harmonic Maxwell equations. (Received September 20, 2018)