

## REGULARIZATION AND STABILIZATION OF DISCRETE SADDLE-POINT VARIATIONAL PROBLEMS\*

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**Abstract.** Our paper considers parameterized families of saddle-point systems arising in the finite element solution of PDEs. Such saddle point systems are ubiquitous in science and engineering. Our motivation is to explain how these saddle-point systems can be modified to avoid onerous stability conditions and to obtain linear systems that are amenable to iterative methods of solution. In particular, the algebraic and variational perspectives of regularization and stabilization are explained.

**Key words.** constrained minimization, saddle point systems, mixed finite elements, regularization, stabilization, penalty, Stokes problem, Darcy flow problem

**AMS subject classifications.** 65F15, 65N25, 65N30, 65N22, 65M60, 65N55, 65M55

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