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The selfdual approach to inverse problems, optimal control, and numerical schemes

The theory of selfduality which provides a variational formulation and resolution for non self-adjoint partial differential equations and evolutions, leads to a new variational approach for solving inverse as well as optimal control problems related to certain elliptic and parabolic systems. It also provides new templates for solving large non-symmetric linear systems, which consist of combining a new scheme that simultaneously preconditions and symmetrizes the problem, with various well known iterative methods for solving linear and symmetric problems. The approach seems to be efficient when dealing with certain ill-conditioned, and highly non-symmetric systems.