

DEFLATED MINRES FOR THE GINZBURG-LANDAU PROBLEM

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Abstract

We consider the extreme type-II Ginzburg-Landau equations which describe phenomena of superconductivity with a nonlinear PDE model. Newton's method and discretization yield a sequence of ill-conditioned linear algebraic systems. The Jacobian operators are self-adjoint with respect to a special inner product and the linear algebraic systems can thus be solved with the preconditioned MINRES method. However, the operators become singular once the Newton iterate is close to a solution and convergence of MINRES may stagnate. Luckily, additional information can be derived from theoretical properties of the Ginzburg-Landau equation and we show how the “deflated” MINRES method can use this information to improve convergence.