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Perturbation Theory of Generalized Inverse Operators and Ill-Posed Inverse Problems

A perturbation theory of generalized inverses of bounded linear operators will be presented from the perspective of regularizers of ill-posed linear operator equations. This leads to a new approach of using outer inverses for regularizing ill-posed linear operator equations in Hilbert and Banach spaces. For nonlinear operator equations or for least squares nonlinear problems, the approach provides an effective stable substitute for the inverse or generalized inverse of the derivative of the nonlinear operator.