Rescaling the GSVD with application to ill-posed problems

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The generalized singular value decomposition (GSVD) of a pair of matrices expresses each matrix as a product of an orthogonal, a diagonal, and a nonsingular matrix. The nonsingular matrix, which we denote by X^T, is the same in both products. Available software for computing the GSVD scales the diagonal matrices and X^T so that the squares of corresponding diagonal entries sum to one. We propose a scaling that seeks to minimize the condition number of X^T. The rescaled GSVD gives rise to new truncated GSVD methods, one of which is well suited for the solution of linear discrete ill-posed problems. Numerical examples show this new truncated GSVD method to be competitive with the standard truncated GSVD method as well as with Tikhonov regularization with regard to the quality of the computed approximate solution.