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COMPUTATION OF THE MOORE-PENROSE INVERSE FOR BIDIAGONAL MATRICES (PAPERBACK)



Createspace Independent Publishing Platform, 2017. Paperback. Condition: New. Language: English . Brand New Book ***** Print on Demand *****. The Moore-Penrose inverse is the most popular type of matrix generalized inverses, or pseudoinverses, which has many applications both in matrix theory and numerical linear algebra. A common use of the Moore-Penrose inverse is to compute the least squares solution to the systems of linear algebraic equations. It is well known that the Moore-Penrose inverse can be found via singular value decomposition. In this regard, there is the most effective algorithm which consists of two stages. In the first stage, with the help of Householder reflections, the initial matrix is reduced to an upper bidiagonal form (the Golub-Kahan bidiagonalization algorithm). The second stage is known in scientific literature as the Golub-Reinsch algorithm. This is an iterative procedure which with the help of Givens rotations generates a sequence of bidiagonal matrices converging to a diagonal form. Acting in this way, an iterative approximation to the singular value decomposition of the bidiagonal matrix is obtained. The principal intention of the present research monograph booklet is to develop a method which can be considered as an alternative to the Golub-Reinsch iterative algorithm. Realizing the approach proposed in the study, the following two main results were achieved. First, we obtain explicit expressions for the entries of the Moore-Penrose inverse of upper bidigonal matrices. Secondly, based on the closed form formulae, we get a finite numerical algorithm of optimal order of computational complexity. Thus, we can compute the Moore-Penrose inverse of an upper bidiagonal matrix without using the singular value decomposition. This book is intended for scientists interested in linear algebra and the theory of generalized inverses. We hope that the work should also be useful for research workers in numerical analysis and computational practitioners.

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