Accepted Manuscript

Decompositions of a matrix by means of its dual matrices with applications

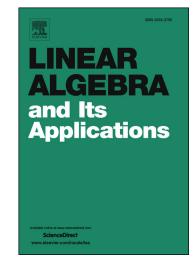
Ik-Pyo Kim, Arnold R. Kräuter

PII:S0024-3795(17)30565-7DOI:https://doi.org/10.1016/j.laa.2017.09.031Reference:LAA 14337To appear in:Linear Algebra and its Applications

Received date:22 May 2017Accepted date:27 September 2017

Please cite this article in press as: I.-P. Kim, A.R. Kräuter, Decompositions of a matrix by means of its dual matrices with applications, *Linear Algebra Appl.* (2017), https://doi.org/10.1016/j.laa.2017.09.031

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.



ACCEPTED MANUSCRIPT

Decompositions of a matrix by means of its dual matrices with applications $\stackrel{\text{tr}}{\Rightarrow}$

Ik-Pyo Kim^{a,*}, Arnold R. Kräuter^b

^aDepartment of Mathematics Education, Daegu University, Gyeongbuk, 38453, Republic of Korea

^bDepartment für Mathematik und Informationstechnologie, Lehrstuhl für Mathematik und Statistik, Montanuniversität Leoben, Franz-Josef-Strasse 18, 8700 Leoben, Austria

Abstract

We introduce the notion of dual matrices of an infinite matrix A, which are defined by the dual sequences of rows of A and naturally connected to the Pascal matrix $P = \begin{bmatrix} i \\ j \end{bmatrix}$ (i, j = 0, 1, 2, ...). We present the Cholesky decomposition of the symmetric Pascal matrix by means of its dual matrix. Decompositions of a Vandermonde matrix are used to obtain variants of the Lagrange interpolation polynomial of degree $\leq n$ that passes through the n + 1 points (i, q_i) for i = 0, 1, ..., n.

Keywords: Dual sequence, Dual matrix, Vandermonde matrix, Hankel matrix, Toeplitz matrix, Lagrange interpolation polynomial

2010 MSC: 15B05, 11B39, 11B65

1. Introduction

Let \mathbf{R}^{∞} denote the infinite dimensional real vector space consisting of all real sequences $\mathbf{a} = (a_0, a_1, a_2, \ldots)^T$, and let $\Delta \mathbf{a}$ denote the *difference sequence* of \mathbf{a} , defined by:

$$\Delta \mathbf{a} = (\Delta a_0, \Delta a_1, \Delta a_2, \ldots)^T,$$

where $\Delta a_i = a_{i+1} - a_i$ for each i = 0, 1, 2, ... Let $\Delta^k \mathbf{a} = (\Delta^k a_0, \Delta^k a_1, \Delta^k a_2, ...)^T$, k = 0, 1, 2, ...,be the *k*th difference sequence defined inductively by $\Delta^k \mathbf{a} = \Delta (\Delta^{k-1} \mathbf{a})$, where $\Delta^0 \mathbf{a} = \mathbf{a}$. For a sequence $\mathbf{a} = (a_0, a_1, a_2, ...)^T \in \mathbf{R}^{\infty}$, let $\mathbb{M}^{\mathbf{a}}$ denote the *difference matrix* of **a** defined by:

$$\mathbb{M}^{\mathbf{a}} = \begin{bmatrix} \mathbf{a}^{T} \\ (\Delta \mathbf{a})^{T} \\ (\Delta^{2} \mathbf{a})^{T} \\ \vdots \end{bmatrix}$$
(1.1)

[†]Research supported by Daegu University Research Grant 2014

^{*}Corresponding author

Email addresses: kimikpyo@daegu.ac.kr (Ik-Pyo Kim), arnold.kraeuter@unileoben.ac.at (Arnold R. Kräuter)

Download English Version:

https://daneshyari.com/en/article/5772927

Download Persian Version:

https://daneshyari.com/article/5772927

Daneshyari.com