ghessenbergd() — Generalized Hessenberg decomposition

Syntax

void ghessenbergd(numeric matrix A, B, H, R, U, V)
void _ghessenbergd(numeric matrix A, B, U, V)

Description

ghessenbergd(A, B, H, R, U, V) computes the generalized Hessenberg decomposition of two general, real or complex, square matrices, A and B, returning the upper Hessenberg form matrix in H, the upper triangular matrix in R, and the orthogonal (unitary) matrices in U and V.

_ghessenbergd(A, B, U, V) mirrors ghessenbergd(), the difference being that it returns H in A and R in B.

_ghessenbergd_la() is the interface into the LAPACK routines used to implement the above function; see [M-1] LAPACK. Its direct use is not recommended.

Remarks and examples

The generalized Hessenberg decomposition of two square, numeric matrices (A and B) can be written as

\[ U' \times A \times V = H \]

\[ U' \times B \times V = R \]

where H is in upper Hessenberg form, R is upper triangular, and U and V are orthogonal matrices if A and B are real or are unitary matrices otherwise.

In the example below, we define A and B, obtain the generalized Hessenberg decomposition, and list H and Q.

: A = (6, 2, 8, -1\-3, -4, -6, 4\0, 8, 4, 1\-8, -7, -3, 5)
: B = (8, 0, -8, -1\-6, -2, -6, -1\-7, -6, 2, -6\1, -7, 9, 2)
: ghessenbergd(A, B, H=., R=., U=., V=.)
: H

<table>
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<th>2</th>
<th>3</th>
<th>4</th>
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<td>0</td>
<td>0</td>
<td>6.997043028</td>
<td>-3.524816722</td>
</tr>
</tbody>
</table>
Conformability

ghessenbergd(A, B, H, R, U, V):

input:
A: \( n \times n \)
B: \( n \times n \)

output:
H: \( n \times n \)
R: \( n \times n \)
U: \( n \times n \)
V: \( n \times n \)

_ghessenbergd(A, B, U, V):

input:
A: \( n \times n \)
B: \( n \times n \)

output:
A: \( n \times n \)
B: \( n \times n \)
U: \( n \times n \)
V: \( n \times n \)

Diagnostics

_ghessenbergd() aborts with error if \( A \) or \( B \) is a view.

ghessenbergd() and _ghessenbergd() return missing results if \( A \) or \( B \) contains missing values.

Also see

[M-1] LAPACK — The LAPACK linear-algebra routines
[M-5] gschur() — Generalized Schur decomposition
[M-4] matrix — Matrix functions