Variation-diminishing properties and bidiagonal decompositions of eigenvector matrices of totally positive matrices.

We will present a full characterization of the eigenvector matrices of the totally positive (TP) matrices. This characterization is in terms of the bidiagonal decompositions of the eigenvector matrices themselves.

Namely, if a matrix and its resigned converse are both lowerly totally positive, then this matrix is an eigenvector matrix of some TP matrices and vice versa.

This condition is easy to check in practice and is very useful in theory in practice:

1. It allows one to establish the sign pattern of the eigenvector matrices through simple and straightforward arguments using bidiagonal decompositions.

2. It allows for a simple check to verify if a given matrix is an eigenvector matrix of a TP matrix.

3. It allows one to generate such eigenvector matrices without the need to run an eigenvalue algorithm on a TP matrix. (Received February 18, 2013)