Quasiseparable Hessenberg triangular reduction for some diagonal plus low rank matrices

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We present a quasiseparable version of the classical Moler and Stewart's algorithm for the computation of the Hessenberg triangular form of a pencil $xA-B$. The classical algorithm computes two matrices H and T respectvely upper Hessenberg and upper triangular such that there exists two unitary matrices Q and Z for which $Q(xA - B)Z^* = xT - H$. This is usually the preliminary transformation carried out before applying the QZ iteration. We consider the particular case where $A = I + U_A V_A^*$ and $B = D_B + U_B V_B^*$ where D_B is real $n \times n$ diagonal matrix and U_A, U_B, V_A, V_B are rectangular $n \times k$ matrices with $k < n$. We provide a characterization of the quasiseparable structures of the partially reduced matrices obtained in the steps of a slight variant of the original algorithm and we propose an appropriate parametrization of these structures that leads to an asymptotic cost for the reduction of $O(n^2 k)$ flops. We discuss the issues that arise in the implementation of a stable method for the Hessenberg triangular reduction and we present some numerical experiments. Some generalizations of the above setting are discussed, with examples of possible applications.