Quasiseparable Approach to A Fast Schur-Euclid-type Algorithm

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Abstract

Most problems in applied mathematics and electrical engineering can be reduced to numerical linear algebra problems. Unfortunately, due to large dense matrices we are unable to use standard methods to solve systems involved in such matrices. Fortunately, one can explore structures of those matrices in order to design more efficient fast algorithms, i.e., those requiring significantly less arithmetic operations. Simply, the displacement equations of the structured matrices can be used to design fast Schur-type algorithms having complexity $\mathcal{O}(n^2)$.

In this talk we address a fast $\mathcal{O}(n^2)$ Schur-type algorithm for recursive LU factorization of a Bezoutian matrix associated with quasiseparable polynomials. The new algorithm applies to a fairly general class of quasiseparable polynomials including real orthogonal and Szegö polynomials as subclasses. While the algorithm can be seen as the Schur-type for the Bezoutian matrix it can also be seen as a Euclid-type for quasiseparable polynomials via non-casual factorization of a displacement equation. Finally, we show that the displacement equation satisfied by Bezoutian and Confederate matrices will lead to a Schur-Euclid-type algorithm having $\mathcal{O}(n^2)$ complexity.