Ammar, G. S.; Calvetti, D.; Reichel, L.
Continuation methods for the computation of zeros of Szegő polynomials. (English)

Szegő polynomials are families of polynomials that are orthogonal with respect to an inner product on the
unit circle in the complex plane. The authors shortly review the role of such polynomials in time series
and signal processing applications, where there is a need of computing the zeros of Szegő polynomials
in real time. The zeros of a Szegő polynomial can be represented as eigenvalues of an upper Hessenberg
matrix. Starting with the eigenvalue problem for a unitary upper Hessenberg matrix, for which an efficient
algorithm is known, two continuation methods are described for tracking the eigenvalue paths in order to
determine the eigenvalues of the original upper Hessenberg matrix. Numerical tests are presented which
demonstrate the efficiency of the methods. Only $O(n^2)$ arithmetic operations are required for determining
the zeros of a Szegő polynomial of degree $n$. The structure of the algorithms makes it easy to implement
them on a parallel computer.

Reviewer: W.Zulehner (Linz)

MSC:
65H05 Numerical computation of solutions to single equations
65F15 Numerical computation of eigenvalues and eigenvectors of matrices
65Y05 Parallel numerical computation
65D20 Computation of special functions and constants, construction of tables
42C05 Orthogonal functions and polynomials, general theory of nontrigonometric harmonic analysis
65H20 Global methods, including homotopy approaches to the numerical solution of nonlinear equations

Keywords:
time series analysis; parallel computation; numerical tests; Szegő polynomials; zeros; continuation methods;
eigenvalues; Hessenberg matrix

Software:
UDC; EISPACK

Full Text: DOI

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