EIGENVALUE PROBLEMS ON THE UNIT DISK BY THE HYPERSPHERICAL METHOD

LEONARDO FIGUEROA[1]

ABSTRACT. Olver and Townsend's novel hyperspherical method is a fast and stable tau-type spectral method and it is based on a number of identities connecting both Gegenbauer polynomials and their derivatives with Gegenbauer polynomials with their parameter shifted by one via banded (infinite) matrices.

Acting on the recent discovery of analogous relations involving the Zernike class of orthogonal polynomials on the unit disk we adapt the hyperspherical method to the approximation of eigenvalue problems posed in this geometry.

REFERENCES

[1] C. CANUTO, M. Y. HUSSAINI, A. QUARTERONI, AND T. A. ZANG, *Spectral methods: Fundamentals in single domains*, Springer-Verlag, Berlin, 2006.

[2] C.F. DUNKL AND Y. XU, *Orthogonal polynomials of several variables*, Cambridge University Press, Cambridge, 2001.

[3] S. OLVER AND A. TOWNSEND, *A fast and well-conditioned spectral method*, SIAM Rev., 55(3) (2013), 462–489.

[4] A. WÜNSCHE, *Generalized Zernike or disc polynomials*, J. Comput. Appl. Math., 174(1) (2005) 135–163.

Departamento de Ingeniería Matemática, Universidad de Concepción, Concepción, Chile.