

Moment problems with applications in shape reconstruction

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Abstract

Let μ be a finite positive Borel measure with compact support in the complex plane, and let $\{p_n(\mu, z)\}_{n=0}^{\infty}$ denote the sequence of the orthonormal polynomials, with positive leading coefficients, defined by the inner product

$$\langle f, g \rangle_{\mu} := \int f(z) \overline{g(z)} d\mu(z).$$

The purpose of the talk is to report on some recent developments regarding the asymptotics of $\{p_n(\mu, z)\}_{n=0}^{\infty}$, in cases when μ belongs to a special class of measures that includes area-type measures and arc-length measures. This leads to algorithms for recovering the shape of the support of μ , from a finite set of the moments

$$\mu_{i,j} := \int z^i \overline{z^j} d\mu(z) \quad i, j = 0, 1, \dots, n,$$

and thus, via the Radon transform, to applications in 2D geometric tomography.

Key words: Orthogonal polynomials, Moment problems, Shape reconstruction, Geometric tomography.