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# Image analysis by generalized Chebyshev-Fourier and generalized pseudo Jacobi-Fourier moments

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## Abstract

In this paper, we present two new sets, named the generalized Chebyshev-Fourier radial polynomials and the generalized pseudo Jacobi-Fourier radial polynomials, which are orthogonal over the unit circle. These generalized radial polynomials are then scaled to define two new types of continuous orthogonal moments, which are invariant to rotation. The classical Chebyshev-Fourier and pseudo Jacobi-Fourier moments are the particular cases of the proposed moments with parameter  $\alpha = 0$ . The relationships among the proposed two generalized radial polynomials and Jacobi polynomials, shift Jacobi polynomials, and the hypergeometric functions are derived in detail, and some interesting properties are discussed. Two recursive methods are developed for computing radial polynomials so that it is possible to improve computation speed and to avoid numerical instability. Simulation results are provided to validate the proposed moment functions and to compare their

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