

On the optimal estimates and comparison of Gegenbauer expansion coefficients

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Abstract. In this talk, I will give some progress on the optimal estimate and comparison of the coefficients in the Gegenbauer series expansion. First, we propose a simple derivation of the contour integral representation of the Gegenbauer expansion coefficients by using the connection formula between two different families of Gegenbauer polynomials. Our proof is simpler than the proof provided in [Cantero and Iserles, SIAM J. Numer. Anal., 50 (2012), pp.307C 327]. With this representation, we show that optimal estimates for the Gegenbauer expansion coefficients can be derived, which in particular includes Legendre coefficients as a special case. In addition, we compare the decay rates of the Chebyshev and Legendre coefficients. Asymptotic behaviour of the ratio of the n th Legendre coefficient to the n th Chebyshev coefficient is given, which provides us an illuminating insight for the comparison of the Legendre and Chebyshev spectral methods.