

Approximation in cosine space using tent-transformed lattice rules

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Tractability of high-dimensional approximation of periodic functions using lattice rules has been studied before, see, e.g., Kuo, Sloan & Woźniakowski (2006). Also spectral collocation and reconstruction methods using Fourier expansions have been studied before in combination with lattice points, e.g., Li & Hickernell (2003), Munthe-Kaas & Sørensen (2012) and Kramer (2013).

In a current manuscript, together with Suryanarayana and Cools, we investigated the use of lattice points for the approximation and collocation of d -variate non-periodic functions with frequency support on a weighted hyperbolic cross of cosine series. For this we use tent-transformed lattice rules which have been studied for the integration problem before in Hickernell (2002) and Dick, Nuyens & Pillichshammer (2013). We show that tent-transformed rank-1 lattice points can be used as collocation points in the approximation of non-periodic functions and these lattice points can be constructed by a component-by-component algorithm.

Together with Kuo we extend this work to analyze the worst-case approximation error using tent-transformed lattice rules in the cosine space. We then recover the tractability results of Kuo, Sloan & Woźniakowski (2006) for our non-periodic space.