

A Randomized Algorithm to Approximate the Star Discrepancy Based on Threshold Accepting

Michael Gnewuch, Magnus Wahlströhm, Carola Winzen

We present a new algorithm for estimating the star discrepancy of arbitrary point sets. Similar to the algorithm for discrepancy approximation of Winker and Fang [SIAM J. Numer. Anal. 34 (1997), 2028–2042] it is based on the optimization algorithm threshold accepting. Our improvements include, amongst others, a non-uniform sampling strategy which is more suited for higher-dimensional inputs, and rounding steps which transform axis-parallel boxes, on which the discrepancy is to be tested, into *critical test boxes*. These critical test boxes provably yield higher discrepancy values, and contain the box that exhibits the maximum value of the local discrepancy. We discuss the results of numerical experiments. Our randomized algorithm computes the exact discrepancy frequently in all cases where this can be checked (i.e., where the exact discrepancy of the point set can be computed in feasible time). Most importantly, in higher dimension the new method behaves better than all previously known methods.