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On the mock-Chebyshev Polynomial Interpolation

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Abstract: Polynomial interpolation with equidistant nodes is notoriously unreliable due to the Runge phenomenon and is also numerically ill-conditioned. The general recommendation is to use the highly non-uniform Chebyshev nodes [2]. But, during an observation or measurement, the data are generally obtained only at equally spaced points. When we aim to obtain an approximation with polynomial interpolation using equispaced nodes, one of the best strategies is the use of the lately developed mock-Chebyshev points in order to avoid the Runge phenomenon and to get similarly better results as in case of using Chebyshev-Lobatto points [1, 4]. Mock-Chebyshev points asymptotically follow the Chebyshev distribution, and they are selected from a large set of equispaced nodes. A disadvantage here is that the computational cost is higher and there are not many studies in the existing literature. The algorithms proposed in the recent papers [3, 4] provide robust methods for computing the mock-Chebyshev nodes for a given set of (n+1) Chebyshev-Lobatto points. In this study, by using the symmetry property of the mock-Chebyshev nodes, we propose modifications of the algorithms by reducing the computational costs by half. We also compare timings of the methods for the computation of the mock-Chebyshev nodes.

Keywords: Polynomial interpolation, Runge phenomenon, Mock-Chebyshev points.

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