On positive quadrature formulas on the unit circle and the interval with prescribed nodes

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Abstract.

Let $\mathring{\mu}$ be a positive measure on the unit circle $\mathbb{T} := \{z \in \mathbb{C} : |z| = 1\}$. In this talk we revise positive interpolatory quadrature formulas on the unit circle (see e.g. [2, 4, 5, 6]) that approximate integrals of the form $I_{\mathring{\mu}}(f) = \int_{\mathbb{T}} f(z) d\mathring{\mu}(z)$. These rules may have some of the nodes fixed in advance and they are connected with Gauss-type quadrature formulas on the interval, that approximate integrals of the form $I_{\mu}(g) = \int_{-1}^{1} g(x) d\mu(x)$, when the measures μ and $\mathring{\mu}$ are related by the Joukowsky transformation.

In addition, recent results due to B. Beckermann et. al. (see [1] and also [3]) on Gauss-type quadrature formulas on the interval with prescribed nodes can be deduced in a simpler way by passing to the unit circle and making use of the Joukowsky transformation. Some numerical examples will illustrate such connection.

References

[1] Beckermann, B.; Bustamante, J.; Martínez-Cruz, R.; M. Quesada, J. Gaussian, Lobatto and Radau positive quadrature rules with a prescribed abscissa. *Submitted.* (2013).

[2] Bultheel, A.; Cruz-Barroso, R.; Deckers K.; González-Vera, P. Rational Szegő quadratures associated with Chebyshev weight functions. *Math. Comp.* **78** (2009), 1031-1059.

[3] Bultheel, A.; Cruz-Barroso, R.; Van Barel, M. On Gauss-type quadrature formulas with prescribed nodes anywhere on the real line. *Calcolo* **47(1)** (2010), 28-41.

[4] Cantero, M.J.; Cruz-Barroso, R.; González-Vera, P. A matrix approach to the computation of quadrature formulas on the unit circle. *Appl. Numer. Math.* **58** (2008), 296-318.

[5] Cruz-Barroso, R.; Daruis, L.; González-Vera, P.; Njåstad, O. Sequences of orthogonal Laurent polynomials, bi-orthogonality and quadrature formulas on the unit circle. *J. Comp. Appl. Math.* **200** (2007), 424-440.

[6] Cruz-Barroso, R.; Delvaux, S. Orthogonal Laurent polynomials on the unit circle and snake-shaped matrix factorizations. *J. Approx. Theory* **161** (2009), 65-87.