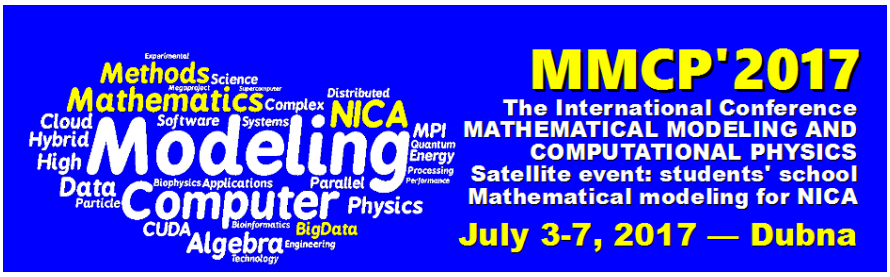

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Disentangling complexity in Bayesian automatic adaptive quadrature

Wednesday, July 5, 2017 9:00 AM (30 minutes)

The present report discusses a Bayesian automatic adaptive quadrature (BAAQ) solution for numerical integration which is simultaneously robust, reliable, and efficient, hence able to yield guaranteed output in numerical experiments involving sudden unexpected modifications of the behavior of the integrand function.
An essential ingredient of the solution is the multiscale approach [1]. Within it, for integration ranges of macroscopic length, which are of primary practical interest, an early decision path for the integrand profile (IP) scrutiny is defined which enables fast solution of four basic problems: (i) identification of simple integrals; (ii) check of the need to relax the user requested accuracy parameters; (iii) end of computation diagnostic for simple integrals; (iv) hints on manifestly ill-conditioning IP features.
For integrals which are neither trivial, nor manifestly ill-conditioned, the Clenshaw-Curtis quadrature is activated within the approach discussed in [2]. This enables further identification of unresolved ill-conditioning features. We are thus left either with a hopefully well-conditioned integral, for which the standard automatic adaptive quadrature [3] is expected to yield reliable output, or with a manifestly ill-conditioned problem for which an improved version of the full BAAQ machinery [4] is activated.

References

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