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Computing Cauchy principal value integrals using a standard adaptive quadrature. (English)

Summary: We investigate the possibility of fast, accurate and reliable computation of the Cauchy principal value integrals \( \int_a^b f(x)(x-\tau)^{-1}dx \) \( (a < \tau < b) \) using a standard adaptive quadrature. In order to properly control the error tolerance for the adaptive quadrature and to obtain a reliable estimation of the approximation error, we research the possible influence of round-off errors on the computed result. As the numerical experiments confirm, the proposed method can successfully compete with other algorithms for computing such type integrals. Moreover, the presented method is very easy to implement on any system equipped with a reliable adaptive integration subroutine.

MSC:
65D32 Numerical quadrature and cubature formulas
41A55 Approximate quadratures

Keywords:
Cauchy principal value integral; numerical integration; adaptive quadrature; round-off errors; numerical experiment; algorithm

Software:
QUADPACK; quadgk; Maple; Matlab

Full Text: DOI arXiv

References:


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