Interval Arithmetic Error Estimation for the Solution of Cauchy Singular Integral Equations

Babuška, Ivo; Liu, Kang-Man

Abstract

Finite element method with a posteriori estimation using interval arithmetic is discussed for a Fredholm integral equation of the second kind. This approach is general. It leads to the guaranteed $L \infty$ asymptotically exact estimate without the usual overestimation when interval arithmetic is used. An algorithm is provided for determination of an approximate solution such that the computed error bound between the exact solution and its approximation in $L \infty$ is less than the given tolerance ϵ. Numerical solution for the equation with only $C 1$ kernel illustrates the approach.