Study on a Family of Optimal Fourth-Order Multiple-Root Solver

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Abstract : In this paper,we develop the complex dynamics of a family of optimal fourth-order multiple-root solvers and plot their basins of attraction. Mobius conjugacy maps and extraneous fixed points applied to a prototype quadratic polynomial raised to the power of the known integer multiplicity m are investigated. A 300 x 300 uniform grid centered at the origin covering 3 x 3 square region is chosen to visualize the initial values on each basin of attraction in accordance with a coloring scheme based on their dynamical behavior. The illustrative basins of attractions applied to various test polynomials and the corresponding statistical data for convergence are shown to confirm the theoretical convergence.

Keywords : basin of attraction, conjugacy, fourth-order, multiple-root finder

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