512/E1

Finite difference Weerakoon-Fernando method to solve nonlinear equations without using derivatives

Shadi Heenatigala,*[1] T.G.I. Fernando,[2] and Sunethra Weerakoon[1]

[1]*Department of Mathematics, University of Sri Jayewardenepura, Gangodawila, Nugegoda, Sri Lanka*
[2]*Department of Computer Science, University of Sri Jayewardenepura, Gangodawila, Nugegoda, Sri Lanka*

This research was mainly conducted to explore the possibility of formulating an efficient algorithm to find roots of nonlinear equations without using the derivative of the function. The Weerakoon-Fernando method had been taken as the base in this project to find a new method without the derivative. After several unsuccessful attempts we were fortunate to be able to formulate the Finite Difference Weerakoon-Fernando Method (FDWFM) presented here. We noticed that the FDWFM approaches the root faster than popular nonlinear equation solvers such as Secant method in the absence of the derivative. By implementing FDWFM on non-linear equations with complex roots and also on systems of non-linear equations, we received very encouraging results. When applying the FDWFM to systems of non-linear equations, we resolved the involvement of the Jacobian problem by following the procedure in the Broyden's method. The computational order of convergence of the FDWFM was close to 2.5 for all these cases.

shadiheenatigala92@gmail.com 0714497221