A High Order Convergent Adaptive Numerical Method for Singularly Perturbed Non-linear Systems

Shashikant Kumar*, Sumit, Sunil Kumar

Department of Mathematical Sciences, Indian Institute of Technology (BHU), Varanasi, Uttar Pradesh-221005

*Corresponding Author

ABSTRACT

In this work, we develop a high-order convergent adaptive numerical method for a system of first-order singularly perturbed non-linear differential equations with distinct perturbation parameters. The problem is discretized by a hybrid finite difference scheme for which a posteriori error estimate in the maximum norm is derived. The layer-adapted meshes are generated using the equidistribution of the monitor function chosen based on the derived a posteriori error estimate. Numerical results are presented that validate the theory and show the effectiveness of the present numerical method.

Keywords: Singularly perturbed; Non-linear system; A posteriori analysis; Adaptive meshes.



© 2022 Copyright held by the author(s). Published by AIJR Publisher in "Book of Abstracts of the 2nd International Conference on Applied Mathematics and Computational Sciences (ICAMCS-2022), 12–14 October 2022. Organized by the DIT University, Uttarakhand, India.