

Numerical Solution of Electrodynamic Flow by Using Pseudo-spectral Collocation Method

Davood Rostamy · Kobra Karimi · Fateme Zabihi ·
Mohsen Alipour

Received: 21 February 2012
© Vietnam Academy of Science and Technology (VAST) and Springer Science+Business Media Singapore
2013

Abstract In this article, we consider the nonlinear boundary value problem (BVP) for the electrohydrodynamic flow of a fluid in an ion drag configuration in a circular cylindrical conduit. We present a pseudo-spectral collocation method for various values of the relevant parameters and discuss the convergence of these numerical solutions.

Keywords Electrohydrodynamic flow · Nonlinear boundary value problem · Pseudo-spectral collocation method · Chebyshev Gauss Lobatto points

Mathematics Subject Classification 65N36 · 65M70

1 Introduction

The spectral methods based in the fundamental problem of approximation of a function by interpolation on an interval and these are very much successful for the numerical solution of ordinary or partial differential equations. Spectral methods may be viewed as an extreme development of the class of discretization scheme for differential equations known generally as the method of weighted residuals (MWR) [5]. The key elements of the MWR are the trial functions (also called approximating functions) which are used as basis functions for a truncated series expansion of the solution, and the test functions (also known as weight

D. Rostamy · K. Karimi (✉) · F. Zabihi · M. Alipour
Department of Mathematics, Imam Khomeini International University, P.O. Box 34149-16818, Qazvin,
Iran
e-mail: Kobra.karimi@yahoo.com

D. Rostamy
e-mail: rostamyd@khayam.ut.ac.ir

F. Zabihi
e-mail: zabihi@ikiu.ac.ir

M. Alipour
e-mail: m.alipour2323@gmail.com