Preface

The variational iteration method: Reliable, efficient, and promising

In the last few decades, considerable work has been invested in developing new methods for analytical and numerical solutions of differential and integral equations, linear or nonlinear. There has been a great deal of research work done to address the issues of nonlinearity and singularity phenomena that arise in many scientific and engineering problems. Moreover, there has been a great need for effective algorithms to avoid the onerous work required by traditional techniques. As a result of this need, many analytical and numerical tools, such as grid points techniques, perturbation techniques, spline solutions, the Adomian method, and others, have been developed. However, each of these methods suffers from one or more limitations. The grid points techniques define the solution at grid points only. The spline solution requires restrictions on boundary points. The perturbation method suffers from a high computational workload especially when the degree of nonlinearity increases. In addition, the Adomian method suffers from the complication of the algorithms needed to calculate Adomian polynomials that are necessary for nonlinear problems.

This special issue of Computers and Mathematics with Applications conveys a strong, reliable, efficient, and promising development. Ji-Huan He developed the variational iteration method (VIM) in (1999). In this method, the equations are initially approximated with possible unknowns. A correction functional is established by a general Lagrange multiplier, which can be identified optimally via the variational theory. The method gives rapidly convergent successive approximations of the exact solution. The VIM has no restrictions or unrealistic assumptions, such as linearization or small parameters that are used for nonlinear operators. The VIM handles linear and nonlinear problems in a like manner. The convergence concept has been proved.

A substantial amount of research work has been directed to the study of the variational iteration method by many well known researchers. Several studies have been conducted to compare the VIM method with existing techniques, and it was shown by all that this method gives exact solutions faster than other methods. The method has been applied in a wide variety of scientific and engineering applications. These works confirmed the fact that this methodology is reliable, efficient, and promising as well as having a wider applicability.

Included herein is a collection of original refereed research papers by well established researchers in the field of applied mathematics. We hope that this issue will prove to be a timely and valuable reference for researchers in this area. Special thanks go to the referees for their valuable work. We here thank Dr. Ervin Y. Rodin for providing us with the opportunity to produce this special issue on this exciting method.

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