طريقة التغاير التكراري لحل بعض النماذج من المعادلات التفاضلية الجزئية

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Abstract

This thesis is concerned with theoretical and numerical study for solving some linear and nonlinear boundary and initial value problems, which are involved partial differential equation or system of partial differential equations by using recent method that is called, variational iteration method (VIM). Beside that, we have given proof for the convergence of this method theoretically, through the analytical study of the convergence. The objective of this thesis determines the efficiency of the variational iteration method to find the approximation solution and/or the exact solution for some linear and nonlinear models of partial differential equations with various dimensions.

This issue is considered to be extended for the application of the virational iteration method, because it involves new applications for this method. Here, many linear and nonlinear boundary-initial value problems are solved. Moreover, there is no application for handling most of them by using this method. Perhaps there are few (if any) applications for some problems, but we are sure that those problems are different with the properties of our problems.

We also compare the results obtained by this method with the available exact solution, and with the results of the other numerical methods in literatures such as; The iterative method(ITM), differential quadruture method (DQM), The Paceman-Rachford ADI method P-R ADIM, The Adomian decomposion method(ADM) and The explicit finite difference technique (FTCS). Comparison reveals that the solutions of the proposed method convergence to the available solutions (exact or numerical) are faster than those methods. Where, the VIM yields an approximate solution in the form of a quickly convergent series, and it has less time. All these facts are represented in tables and figures. We concluded that VIM is very powerful and efficient in finding analytical and/or numerical solutions for wide classes of linear and nonlinear partial differential equations, as well as, we found that this method is capable of greatly reducing the size of the computational work. Moreover, we can say that, it is an easy method for solving complicated problems.

The Variational Iteration Method For Solving Some Models Of Partial Differential Equations

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