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Abstract: In this study, Reconstruction of Variational Iteration Method (RVIM) is used for computing the Generalized Hirota-Satsuma coupled KdV equation, Kawahara equation and FKdV equations. This new applied algorithm is a powerful and efficient technique in finding the approximate solutions for the linear and nonlinear equations. RVIM as a method that based on Laplace transform has high rapid convergence and reduces the size of calculations using only few terms, so many linear and nonlinear equations can be solved by this method. Results are compared with those of Adomian’s Decomposition Method (ADM). The results of Reconstruction of Variational Iteration Method (RVIM) are of high concentration and the method is very effective and succinct.

Keywords: Generalized Hirota-Satsuma coupled KdV equation, Kawahara equation, Reconstruction of Variational Iteration Method (RVIM), some FKdV equations

INTRODUCTION

Nonlinear phenomena play a crucial role in applied mathematics and physics. The results of solving nonlinear equations can guide authors to know the described process deeply. But it is difficult for us to obtain the exact solution for these problems. In recent decades, there has been great development in the numerical analysis (Burden and Faires, 1993) and exact solution for nonlinear partial Equations. Reaching to a high accurate approximation for linear and nonlinear equations has always been important while it challenges tasks in science and engineering. Therefore, several numbers of approximate methods have been established like Homotopy Perturbation Method (HPM) (Yildirim 2010; Moallemi et al., 2012) Variational Iteration Method (VIM) (Nikkar and Mighani, 2012a; Saadati et al., 2009; He, 1999 and 2000), Energy Balance Method ( Nikkar et al., 2011) Homotopy Analysis Method (Khan et al., 2012) and so on each of which has advantages and disadvantages. We introduce a new analytical method of nonlinear problems called the reconstruction of variational iteration method, which in the case of comparing with VIM (Nikkar and Mighani, 2012; Saadati et al., 2009; He, 1999 and 2000), HPM (Yildirim, 2010; Moallemi et al., 2012) not uses Lagrange multiplier as variational methods do and not requires small parameter in equations as the perturbation techniques. RVIM has been shown to solve a large class of nonlinear problems with approximations converging to solutions rapidly, effectively, easily and accurately. The method used gives rapidly convergent successive approximations. As stated before, we aim to achieve analytic solutions to problems. We also aim to prove that the reconstruction of variational iteration method is powerful, efficient and promising in handling scientific and engineering problems. Besides the aim of this letter is to show that RVIM is strongly and simply capable of solving a large class of linear or nonlinear differential equations without the tangible restriction of sensitivity to the degree of the nonlinear term and also is very user friend because it reduces the size of calculations by not requiring calculating Lagrange multiplier. The most sensible advantages of RVIM are using Laplace Transform and choosing initial conditions simply and easily in solving linear and nonlinear equations. Effectiveness and convenience of this method is revealed in comparisons with the exact solution. The results illustrate that the RVIM can faithfully capture the posteriori distribution in a computationally efficient way. In this study we consider RVIM to find the solution of the Generalized Hirota-Satsuma coupled KdV equation, Kawahara equation (Polat et al., 2006; Kaya and Al-Khaled, 2007) and FKdV equations.

DESCRIPTION OF THE METHOD

In the following section, an alternative method for finding the optimal value of the Lagrange multiplier by the use of the Laplace transform (Hesameddini and Latifizadeh, 2009; Nikkar et al., 2012), will be