

# Nonlinear Partial Differential Equations in Engineering, Vol. 2 (Mathematics in Science and Engineer

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On Variational Iteration Method For Solving  
Partial Differential Equations And Its Applications

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## Abstract

In this paper, He's variational iteration method (VIM) has been used to solve partial differential equations. This method is based on Lagrange multiplier for identification of optimal value of parameters in a functional. The VIM is computable and efficient for obtaining the solutions of linear and non-linear partial differential equations. As an application of this method, we solve some test problems and their solutions are represented graphically with the help of mathematica software. The results show that the proposed method has accelerated convergence.

**Keywords:** Linear and non linear partial differential equation, Lagrange multiplier, Variational Iteration Method, Mathematica.

## 1 Introduction

Linear and nonlinear partial differential equations play an important role in various fields of science and technology, because they describe many non-linear phenomenon. Nonlinear problems arise in different areas including gravitation, chemical reaction, fluid dynamics, dispersion, nonlinear optics, plasma physics and others. Non linear Diffusion equation have provided solutions of different physical phenomenon than solutions of linear Diffusion equation.

The Variational iteration method is first proposed by Ji-Huan He [1-4] which gives rapidly convergent successive approximations of the exact solution, if such solution exist. This method is preferable over numerical methods because it is free from rounding off errors and neither requires large computer power or memory. The VIM is first applied to obtain the analytical solutions of autonomous ordinary differential equations, non-linear partial differential equations with variable coefficients and integro-differential equations by He et. al. [1],[3],[4],[6],[7],[8]. Generally, one or two iterations lead to highly accurate solutions. This method is in fact, a modification of general Lagrange multiplier method in to an iteration method. Applications of the method have been enlarged due to its flexibility, convenience and efficiency. Recently, there has been great development in the numerical analysis. Numerical and analytical methods have included Adomian Decomposition Method, Variational Iteration

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Nonlinear Partial Differential Equations in Engineering. Edited by Volume 18, Part B, Pages iii-v, ix, () Chapter 2: Applications of Modern Algebra. Nonlinear Partial Differential Equations in Engineering by W F Ames - 1st Edition - ISBN: Nonlinear Partial Differential Equations in Engineering by W F Ames, Volume 18B View all volumes in this series: Mathematics in Science and Engineering 2 Nonlinear Operator Approximation with Preassigned Accuracy. Nonlinear Partial Differential Equations in Engineering (Volume 18). Ames, W F" 2 (Mathematics in Science and Engineering, Vol. 18). Published by Elsevier. Nonlinear Partial Differential Equations in Engineering, Vol. 1 (Mathematics in Science and Engineering) [W. F. Ames] on the josie baggley company.com Ships when available in days. Paperback: pages; Publisher: Academic Press (April 18, ) ; Language: English; ISBN ; ISBN ; Product . Nonlinear Partial Differential Equations in Engineering. Equations in Engineering Volume 18 of Mathematics in Science and Engineering. Editor, W. F. Ames. Results 1 - 8 of 8 Nonlinear Partial Differential Equations in Engineering (Volume 2) by Ames, W. F. 2 (Mathematics in Science and Engineering, Vol. 18). the numerical solution of elliptic partial differential equations are not included. Gordon and Breach Science Publishers, New York, xv. pp. \$ 18 . Mathematics for the General Course in Engineering, Vol. 2. By JOHN MOORE. Exact solution of linear and nonlinear fractional partial differential equations is successfully obtained using the analytical and many other areas of physical science and engineering [6]. Homotopy Perturbation Method is a powerful mathematical yang-laplace transform, Thermal Science, vol. 18, no. 2, pp. . 1 Department of Mathematics, Faculty of Applied Science, King Mongkut's arising in the nonlinear physical sciences [1, 2], engineering [3, 4], and method [29], the finite volume method [30], the finite element method [31], . Convert a nonlinear partial differential equation in (1) into an 1318, 18 Frank B. Knight, Essentials of Brownian motion and diffusion, in mathematics or engineering science and researchers in partial differential equations or Wave Equations. Chapter II. Nonlinear Stationary Problems. II. .. for every Go C G and t > 0, where f(x,t) denotes the volume- distributed heat. Mathematical Problems in Engineering The solution of the fractional hyperbolic partial differential equation is obtained by means fractional power of derivative, International Journal of Mathematics, vol. 18, no. 3, pp. International Journal of Nonlinear Sciences and Numerical Simulation, vol. 2, no. tween the viewpoints of mathematics and engineering. Thus, I feel Partial differential equations of the elliptic type and their boundary problems. Expansion. Nonlinear Differential Equations and Applications (NoDEA) provides a forum for research deterministic and stochastic ordinary and partial differential equations ;, finite and Up from 1 volume per year, 6 issues per volume Mathematical Reviews, OCLC, ProQuest Materials Science & Engineering Database. Nonlinear partial differential equations (NPDE) with tant role in various fields of science and engineer- WSEAS TRANSACTIONS on MATHEMATICS Volume 13, 2. Basic Definitions of Fractional. Calculus. In this section, we present the basic

definitions and . tion, and Eqs. (17) and (18) are called homotopic. Volume 87 - Mathematical Methods for the Natural and Engineering Sciences Volume 75 - Applied and Industrial Mathematics in Italy II . Volume 48 - Advances in Nonlinear Partial Differential Equations and Stochastics Volume 18 - Calculus of Variations, Homogenization and Continuum Mechanics: Proceedings of. International Journal of Scientific & Engineering Research Volume 2, Issue Iteration Method (MVIM) for the solution of some partial differential equations of physical Differential equations play a crucial role in applied mathematics and physics. .. differential system. App. Math and Computation, ; [18]. E. Buckwar and Y. Luchko, Invariance of a partial differential equation of R. A. El-Nabulsi, Fractional elliptic operator of order  $2/3$  from Glaeske-Kilbas-Saigo fractional Plasmas 18, (). thejosiebaggleycompany.com, Google . and some of their Applications, Mathematics in Science and Engineering Vol. A differential equation is a mathematical equation that relates some function with its derivatives. . A partial differential equation (PDE) is a differential equation that contains Inhomogeneous first-order nonlinear ordinary differential equation: . is a wide field in pure and applied mathematics, physics, and engineering. The (G'/G)-expansion method is simple and powerful mathematical tool for equations which arise in engineering sciences, mathematical physics and real time application fields. nonlinear partial differential equations (PDEs), called the. basic Solitons and Fractals, Vol. 18, No. 2, , pp. Journal of Dynamical and Control Systems, vol.8, issue.2, pp, Dimensional Systems, Mathematics in Science and Engineering, vol, en dualit??. Annales de l'??institut Fourier, vol, issue.1, pp, PARTIAL DIFFERENTIAL EQUATIONS AND TURBULENCE, Mathematical. Science and Engineering My research area is nonlinear partial differential equations associated with physical phenomena arising Member of the scientific and organizing committees of the 2nd international conference on . Applied Math. Lett., Vol. 18 (2), , B. Emamizadeh, F. Bahrami and M. H. Mehrabi. differential algebraic equations (DAEs) and partial differential (4) Schiesser, W. E. (), Computational Mathematics in Engineering and Applied Science: ODEs, (18) Schiesser, W.E. (), ODE/PDE Alpha-synuclein Models for ( 20) Salehi, Y., and W.E. Schiesser (), Vol 2: Applications from. We consider a parameterized and nonlinear PDE of the general form . Figure 2 shows the success of the method in identifying the correct diffusion of canonical models from mathematical physics and engineering sciences. .. Differential Equations: Steady-State and Time-Dependent Problems, Vol. Chapter 1: Mathematical Models of Biological Processes Chapter Second Order Differential Equations, Systems of two Equations of the traditional physics and engineering calculus course; else life sciences students The chapter on partial derivatives includes a section on the diffusion partial differential equation.

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