A Numerical Study of Partial Differential Equations using Variational Iteration Method.

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ABSTRACT

In this paper, we considered the Variational Iteration Method for the series solution of some selected initial value problems. The series solution obtained by the method converges to the exact solution of the equations. Eight numerical examples are presented to prove the efficiency and applicability of the method.

(*Keywords*: partial differential equations, Lagrange multiplier, variational iteration method)

INTRODUCTION

Differential equations are widely used to describe real life problems. Many Authors [1-12] have used different numerical methods to solve different types of differential equations in attempt to search for better, accurate, efficient, and elegant method for the solution. Variational Iteration Method has been shown to solve a large class of linear and nonlinear problems with approximation converging to exact solution rapidly.

In this work, we present VIM for finding the exact solution of selected initial value problems that arise in mathematical, physical sciences and engineering.

VARIATIONAL ITERATION METHOD

The basic idea of the He's Variational Iteration Method (VIM) [3-6], can be explained by considering the following nonlinear partial differential equations

$$Lu + Nu = g(x) \quad \textbf{(1)}$$

Where L is the linear operator, N is the nonlinear operator and $g(x)$ is the inhomogeneous term. According to the method, we can construct a correction functional as follows:

The corresponding variational iteration method for solving (1) is given as:

$$u_{n+1}(x) = u_n(x) + \int_0^x \lambda(s)\left[Lu_n(s) + N\bar{u}_n(s) - g(s)\right]ds, \quad \textbf{(2)}$$

where λ is a Lagrange multiplier which can be identified optimally by variational iteration method. The subscript n denote the nth approximation, $\bar{u}_n$ is considered as a restricted variation (i.e., $\delta\bar{u}_n = 0$). The successive approximation $u_{n+1,} n \geq 0$ of the solution u can be easily obtained by determine the Lagrange multiplier and the initial guess u_0, consequently, the solution is given by $u = \lim_{n\to\infty} u_n$. $\lambda = -1$ for problems under consideration.

Numerical Examples

In this section, eight numerical problems are solved with the method described.

Example 1: Consider initial value problem:

$$xu_x + u_y = u \qquad \textbf{(3)}$$

with initial condition:

$$u(x,0) = 1 + x, \;\; u(0,y) = e^y \qquad \textbf{(4)}$$

The correction functional and iterative formula becomes:

$$u_{n+1}(x,y) = u_n(x,y) + \int_0^y \lambda(\xi)\left(x\frac{\partial}{\partial x}u_n(x,\xi) + \frac{\partial}{\partial \xi}u_n(x,\xi) - u_n(x,\xi)\right)d\xi \qquad \textbf{(5)}$$

When $n = 0$

$$u_1(x,y) = u_0(x,y) - \int_0^y \left(x\frac{\partial}{\partial x}u_0(x,\xi) + \frac{\partial}{\partial \xi}u_0(x,\xi) - u_n(x,\xi)\right)d\xi$$

$$= 1 + x - \int_0^y \left(x\frac{\partial}{\partial x}(1+x) + \frac{\partial}{\partial \xi}(1+x) - 1 - x\right)d\xi$$

$$= 1 + x - \int_0^y \left(x(1) - 1 - x\right)d\xi$$

$$= 1 + x + \int_0^y d\xi$$

$$= 1 + x + [\xi]_0^y$$

$$= 1 + x + y \qquad \textbf{(6)}$$

When $n = 1$

$$u_2(x,y) = 1 + x + y - \int_0^y \left(x\frac{\partial}{\partial x}(1+x+\xi) + \frac{\partial}{\partial \xi}(1+x+\xi) - 1 - x - \xi\right)d\xi$$

$$= 1 + x + y - \int_0^y \left(x(1) + 1 - 1 - x - \xi\right)d\xi$$

$$= 1 + x + y - \int_0^y \xi d\xi$$

$$= 1 + x + y + \left[\frac{\xi^2}{2}\right]_0^y$$

$$= 1 + x + y + \frac{y^2}{2} \qquad \textbf{(7)}$$

When $n = 2$

$$u_3(x,y) = 1 + x + y + \frac{y^2}{2} - \int_0^y \left(x\frac{\partial}{\partial x}\left(1 + x + \xi + \frac{\xi^2}{2}\right) + \frac{\partial}{\partial \xi}\left(1 + x + \xi + \frac{\xi^2}{2}\right) - 1 - x - \xi - \frac{\xi^2}{2}\right)d\xi$$

$$= 1 + x + y + \frac{y^2}{2} - \int_0^y \left(x(1) + 1 + \xi - 1 - x - \xi - \frac{\xi^2}{2}\right)d\xi$$

$$= 1 + x + y + \frac{y^2}{2} + \int_0^y \frac{\xi^2}{2}d\xi$$

$$= 1 + x + y + \frac{y^2}{2} + \left[\frac{\xi^3}{6}\right]_0^y$$

$$= 1 + x + y + \frac{y^2}{2} + \frac{y^3}{6} + \cdots \qquad \textbf{(8)}$$

$$u = \lim_{n\to\infty} u_n = u(x,y) = x + e^y \qquad \textbf{(9)}$$

Example 2: Consider initial value problem:

$$u_x + u_y = x^2 + y^2 \qquad \textbf{(10)}$$

with initial condition:

$$u(x,0) = \frac{1}{3}x^3, \; u(0,y) = \frac{1}{3}y^3 \qquad \textbf{(11)}$$

The correction functional and iterative formula becomes:

$$u_{n+1}(x,y)=u_n(x,y)+\int_0^x \lambda(\xi)\left(\frac{\partial}{\partial\xi}u_n(\xi,y)+\frac{\partial}{\partial y}u_n(\xi,y)-\xi^2-y^2\right)d\xi \quad \textbf{(12)}$$

When $n=0$

$$u_1(x,y)=\frac{y^3}{3}-\int_0^x\left(\frac{\partial}{\partial\xi}\left(\frac{y^3}{3}\right)+\frac{\partial}{\partial y}\left(\frac{y^3}{3}\right)-\xi^2-y^2\right)d\xi$$

$$=\frac{y^3}{3}+\int_0^x \xi^2 d\xi$$

$$=\frac{y^3}{3}+\left[\frac{\xi^3}{3}\right]_0^x$$

$$=\frac{y^3}{3}+\frac{x^3}{3} \quad \textbf{(13)}$$

When $n=1$

$$u_2(x,y)=\frac{y^3}{3}+\frac{x^3}{3}+$$
$$\int_0^x \lambda(\xi)\left(\frac{\partial}{\partial\xi}\left(\frac{y^3}{3}+\frac{\xi^3}{3}\right)+\frac{\partial}{\partial y}\left(\frac{y^3}{3}+\frac{\xi^3}{3}\right)-\xi^2-y^2\right)d\xi \quad \textbf{(14)}$$

$$=\frac{y^3}{3}+\frac{x^3}{3} \quad \textbf{(15)}$$

Similarly , the exact solution becomes:

$$u_3(x,y)=\frac{y^3}{3}+\frac{x^3}{3} \quad \textbf{(16)}$$

Example 3: Consider initial value problem:

$$u_x+yu_y=u, \quad \textbf{(17)}$$

with initial condition:

$$u(x,0)=e^x,\ u(0,y)=1+y \quad \textbf{(18)}$$

The correction functional and iterative formula becomes:

$$u_{n+1}(x,y)=u_n(x,y)+$$
$$\int_0^x \lambda(\xi)\left(\frac{\partial}{\partial\xi}U_n(\xi,y)+y\frac{\partial}{\partial y}u_n(\xi,y)-u_n(\xi,y)\right)d\xi \quad \textbf{(19)}$$

When $n=0$

$$U_1(x,y)=1+y-\int_0^x\left(\frac{\partial}{\partial\xi}(1+y)+y\frac{\partial}{\partial y}(1+y)-1-y\right)d\xi$$

$$=1+y-\int_0^x\left(y(1)-1-y\right)d\xi$$

$$=1+y+\int_0^x d\xi$$

$$=1+y+x \quad \textbf{(20)}$$

When $n=1$

$$u_2(x,y)=1+y+x-\int_0^x\left(\frac{\partial}{\partial\xi}(1+y+\xi)+y\frac{\partial}{\partial y}(1+y+\xi)-1-y-\xi\right)d\xi$$

$$=1+y+x+\int_0^x(\xi)d\xi$$

$$=1+y+x+\left[\frac{\xi^2}{2}\right]_0^x$$

$$=1+y+x+\frac{x^2}{2}. \quad \textbf{(21)}$$

When $n=2$

$$u_3(x,y) = 1 + y + x + \frac{x^2}{2} -$$

$$\int_0^x \left(\frac{\partial}{\partial \xi}\left(1 + y + \xi + \frac{\xi^2}{2}\right) + y\frac{\partial}{\partial y}\left(1 + y + \xi + \frac{\xi^2}{2}\right) - 1 - y - \xi - \frac{\xi^2}{2} \right) d\xi$$

$$= 1 + y + x + \frac{x^2}{2} -$$

$$\int_0^x \left(1 + \xi + y(1) - 1 - y - \xi - \frac{\xi^2}{2}\right) d\xi$$

$$1 + y + x + \frac{x^2}{2} + \int_0^x \left(\frac{\xi^2}{2}\right) d\xi$$

$$= 1 + y + x + \frac{x^2}{2} + \left[\frac{\xi^3}{6}\right]_0^x$$

$$= 1 + y + x + \frac{x^2}{2} + \frac{x^3}{6} \quad \textbf{(22)}$$

When $n = 3$

$$u_4(x,y) = 1 + y + x + \frac{x^2}{2} + \frac{x^3}{6} -$$

$$\int_0^x \left(\frac{\partial}{\partial \xi}\left(1 + y + \xi + \frac{\xi^2}{2} + \frac{\xi^3}{6}\right) + y\frac{\partial}{\partial y}\left(1 + y + \xi + \frac{\xi^2}{2} + \frac{\xi^3}{6}\right) - 1 - y - \xi - \frac{\xi^2}{2} - \frac{\xi^3}{6} \right) d\xi$$

$$u_4(x,y) = 1 + y + x + \frac{x^2}{2} + \frac{x^3}{6} -$$

$$\int_0^x \left(1 + \frac{2\xi^2}{2} + \frac{3\xi^3}{6} + y - 1 - \xi - \frac{\xi^2}{2} - \frac{\xi^3}{6}\right) d\xi$$

$$u_4(x,y) = 1 + y + x + \frac{x^2}{2} + \frac{x^3}{6} -$$

$$\int_0^x \left(1 + y + \xi + \frac{\xi^2}{2} + \frac{\xi^3}{6}\right) d\xi$$

$$u_4(x,y) = 1 + y + x + \frac{x^2}{2} + \frac{x^3}{6} + \frac{x^4}{24} \quad \textbf{(23)}$$

$$u = \lim_{n \to \infty} u_n = u(x,y) = y + e^x \quad \textbf{(24)}$$

Example 4: Consider initial value problem:

$$u_x + u_y = u \quad \textbf{(25)}$$

with initial condition:

$$u(x,0) = 1 + e^x,\ u(0,y) = 1 + e^y \quad \textbf{(26)}$$

The correction functional and iterative formula becomes:

$$u_{n+1}(x,y) = u_n(x,y) +$$

$$\int_0^y \lambda \left(\frac{\partial u_n(x,\xi)}{\partial x} + \frac{\partial u_n(x,\xi)}{\partial \xi} - u_n \right) d\xi \quad \textbf{(27)}$$

When $n = 0$

$$u_1(x,y) = 1 + e^x - \int_0^y \left(\frac{\partial(1 + e^x)}{\partial x} + \frac{\partial(1 + e^x)}{\partial \xi} - 1 - e^x \right) d\xi$$

$$= 1 + e^x - \int_0^y (e^x - 1 - e^x) d\xi$$

$$= 1 + e^x + y \quad \textbf{(28)}$$

When $n = 1$

$$u_2(x,y) = 1 + e^x + y -$$

$$\int_0^y \left(\frac{\partial(1 + e^x + \xi)}{\partial x} + \frac{\partial(1 + e^x + \xi)}{\partial \xi} - 1 - e^x - \xi \right) d\xi$$

$$= 1 + e^x + y + \int_0^y (\xi) d\xi$$

$$= 1 + e^x + y + \frac{y^2}{2} \quad \textbf{(29)}$$

When $n = 2$

$$u_3(x,y) = 1 + e^x + y + \frac{y^2}{2} -$$

$$\int_0^y \left(\frac{\partial(1 + e^x + \xi + \frac{\xi^2}{2})}{\partial x} + \frac{\partial(1 + e^x + \xi + \frac{\xi^2}{2})}{\partial \xi} - 1 - e^x - \xi - \frac{\xi^2}{2} \right) d\xi$$

$$=1+e^x+y+\frac{y^2}{2}-\int_0^y (e^x+1+\xi-1-e^x-\xi-\frac{\xi^2}{2})d\xi$$

$$=1+e^x+y+\frac{y^2}{2}+\int_0^y\left(\frac{\xi^2}{2}\right)d\xi$$

$$=1+e^x+y+\frac{y^2}{2!}+\frac{y^3}{3!}$$

$$=e^x+1+y+\frac{y^2}{2!}+\frac{y^3}{3!}$$

As $n\to\infty$

$$u(x,y)=e^x+e^y \quad \textbf{(30)}$$

Example 5: Consider initial value problem:

$$u_x+yu_y+zu_z=u \quad \textbf{(31)}$$

with initial condition:

$$u(0,y,z)=1+y+z,$$
$$u(x,0,z)=z+e^x, u(x,y,0)=y+e^y \quad \textbf{(32)}$$

The correction functional and iterative formula becomes:

$$u_{n+1}(x,y)=u_n(x,y)+\int_0^x \lambda\left(\frac{\partial u_n(\xi,y,z)}{\partial\xi}+y\frac{\partial u_n(\xi,y,z)}{\partial y}+z\frac{\partial u_n(\xi,y,z)}{\partial z}-u_n\right)d\xi$$

(33)

When $n=0$

$$u_1(x,y)=1+y+z-\int_0^x\left(\frac{\partial(1+y+z)}{\partial\xi}+y\frac{\partial(1+y+z)}{\partial y}+z\frac{\partial(1+y+z)}{\partial z}-1-y-z\right)d\xi$$

(34)

$$=1+y+z-\int_0^x (0+y+z-1-y-z)d\xi$$

$$=1+y+z+\int_0^x d\xi$$

$$=1+y+z+x \quad \textbf{(35)}$$

When $n=1$

$$u_2(x,y)=1+x+y+z-\int_0^x\left(\frac{\partial(1+\xi+y+z)}{\partial\xi}+y\frac{\partial(1+\xi+y+z)}{\partial y}+z\frac{\partial(1+\xi+y+z)}{\partial z}-1-\xi-y-z\right)d\xi$$

(36)

$$=1+x+y+z-\int_0^x (1+y+z-1-\xi-y-z)d\xi$$

(37)

$$=1+x+y+z+\frac{x^2}{2} \quad \textbf{(38)}$$

When $n=2$

$$u_3(x,y)=1+x+y+z+\frac{x^2}{2}-\int_0^x\left(\frac{\partial(1+\xi+y+z+\frac{\xi^2}{2})}{\partial\xi}+y\frac{\partial(1+\xi+y+z+\frac{\xi^2}{2})}{\partial y}+z\frac{\partial(1+\xi+y+z+\frac{\xi^2}{2})}{\partial z}-1-\xi-y-z-\frac{\xi^2}{2}\right)d\xi$$

(39)

$$=1+x+y+z+\frac{x^2}{2}-\int_0^x (1+\xi+y+z-1-\xi-y-z-\frac{\xi^2}{2})d\xi$$

$$=1+x+y+z+\frac{x^2}{2}+\int_0^x\left(\frac{\xi^2}{2}\right)d\xi$$

$$=1+x+y+z+\frac{x^2}{2}+\frac{x^3}{6} \quad \textbf{(40)}$$

When $n=3$

$$u_4(x,y)=1+x+y+z+\frac{x^2}{2}+\frac{x^3}{6}-\int_0^x\left(\frac{\partial(1+\xi+y+z+\frac{\xi^2}{2})}{\partial\xi}+y\frac{\partial(1+\xi+y+z+\frac{\xi^2}{2})}{\partial y}+z\frac{\partial(1+\xi+y+z+\frac{\xi^2}{2})}{\partial z}-1-\xi-y-z-\frac{\xi^2}{2}\right)d\xi$$

(41)

$$= 1 + x + y + z + \frac{x^2}{2} + \frac{x^3}{6} - \int_0^x \begin{pmatrix} 1 + \xi + \frac{\xi^2}{2} + y + z - 1 - \\ \xi - y - z - \frac{\xi^2}{2} - \frac{\xi^3}{6} \end{pmatrix} d\xi$$

$$= 1 + x + y + z + \frac{x^2}{2} + \frac{x^3}{6} + \int_0^x \left(\frac{\xi^3}{6}\right) d\xi$$

$$= 1 + x + y + z + \frac{x^2}{2} + \frac{x^3}{6} + \frac{x^4}{24}$$

$$= y + z + 1 + x + \frac{x^2}{2!} + \frac{x^3}{3!} + \frac{x^4}{4!} \qquad \textbf{(42)}$$

As $n \to \infty$

$$u(x, y) = e^x + y + z \qquad \textbf{(43)}$$

Example 6: Consider inhomogeneous initial value problem:

$$u_x + u_y = x + y \qquad \textbf{(44)}$$

with initial condition:

$$u(0, y) = 0, \; u(x, 0) = 0 \qquad \textbf{(45)}$$

The correction functional for the equation is:

$$u_{n+1}(x, y) = u_n(x, y) + \int_0^x \lambda(\xi)\left(\frac{\partial u_n(\xi, y)}{\partial \xi} + \frac{\partial u(\xi, y)}{\partial y} - \xi - y\right) d\xi \qquad \textbf{(46)}$$

When $n = 0$

$$u_1(x, y) = u_0(x, y) - \int_0^x \left(\frac{\partial u_0(\xi, y)}{\partial \xi} + \frac{\partial u_0(\xi, y)}{\partial y} - \xi - y\right) d\xi \qquad \textbf{(47)}$$

$$= 0 - \int_0^x (0 + 0 - \xi - y) d\xi$$

$$= \left[\frac{\xi^2}{2} + y\xi\right]_0^x$$

$$= \frac{x^2}{2} + xy \qquad \textbf{(48)}$$

When $n = 1$

$$u_2(x, y) = u_1(x, y) - \int_0^x \left(\frac{\partial u_1(\xi, y)}{\partial \xi} + \frac{\partial u_1(\xi, y)}{\partial y} - \xi - y\right) d\xi \qquad \textbf{(49)}$$

$$= \frac{x^2}{y} + xy - \int_0^x \left[\frac{\partial}{\partial \xi}\left(\frac{\xi^2}{2} + \xi y\right) + \frac{\partial}{\partial y}\left(\frac{\xi^2}{2} + \xi y\right) - \xi - y\right] d\xi \qquad \textbf{(50)}$$

$$= \frac{x^2}{2} + xy - \int_0^x (\xi + y + \xi - \xi - y) d\xi$$

$$= \frac{x^2}{2} + xy - \left[\frac{\xi^2}{2}\right]_0^x$$

$$= xy \qquad \textbf{(51)}$$

When $n = 2$

$$u_3(x, y) = u_2(x, y) - \int_0^x \left(\frac{\partial u_2(\xi, y)}{\partial \xi} + \frac{\partial u_2(\xi, y)}{\partial y} - \xi - y\right) d\xi \qquad \textbf{(52)}$$

$$= xy - \int_0^x \left[\frac{\partial(\xi y)}{\partial \xi} + \frac{\partial(\xi y)}{\partial y} - \xi - y\right] d\xi$$

$$= xy - \int_0^x (y + \xi - \xi - y) d\xi$$

$$= xy \qquad \textbf{(53)}$$

Example 7: Consider initial value problem:

$$xu_x + u_y = 2u \quad \textbf{(54)}$$

with initial condition:

$$u(0,y) = 0, u(x,0) = x \quad \textbf{(55)}$$

Using general formula:

$$u_{n+1}(x,y) = u_n(x,y) + \int_0^y \lambda(\xi)\left[x\frac{\partial u_n(x,\xi)}{\partial x} + \frac{\partial u_n(x,\xi)}{\partial \xi} - 2u_n(x,\xi)\right]d\xi \quad \textbf{(56)}$$

The successive approximation becomes:

$$u_1(x,y) = x + 2xy \quad \textbf{(57)}$$

$$u_2(x,y) = x + xy + xy^2 \quad \textbf{(58)}$$

$$u_3(x,y) = x + xy + \frac{xy^2}{2} + \frac{xy^3}{3} \quad \textbf{(59)}$$

Example 8: Consider initial value problem:

$$u_x + yu_y = 2u \quad \textbf{(60)}$$

with initial condition:

$$u(x,0) = 0, \quad u(0,y) = y \quad \textbf{(61)}$$

$$u_{n+1}(x,y) = u_{n+1}(x,y) + \int_0^x \lambda(\xi)\left[\frac{\partial u_n(\xi,y)}{\partial \xi} + y\frac{\partial u_n(\xi,y)}{\partial y} - 2u_n(\xi,y)\right]d\xi \quad \textbf{(62)}$$

to obtain the following results:

$$u_1(x,y) = y + xy. \quad \textbf{(63)}$$

$$u_2(x,y) = y + xy + \frac{x^2 y}{2}y. \quad \textbf{(64)}$$

$$u_3(x,y) = y\left(1 + x + \frac{x^2}{2!} + \frac{x^3}{3!}\right) \approx ye^x. \quad \textbf{(65)}$$

CONCLUSION

Variational Iteration Method (VIM) is used to compute successive approximation to initial value problems. It is observed that the method converged to closed form solution after some iterations. The method is straightforward and requires less computational efforts. It is observed that the method is robust and suitable to different types of differential equations.

This method can also be applied in tracer tests which is one of the applications in solute transport in porous media.

REFERENCES

1. Fallahzadeh, A. and K. Shakibi. 2015. "A Method to Solve Convection-Diffusion Equation based on Homotopy Analysis Method." *Journal of Interpolation and Approximation in Scientific Computing*. 2015(1):1-38.

2. Hassan, N., A Ismail, K. Raslam, A. Aziza, and A. Rabboh. 2004. "Adomian Decomposition Method for Generalized Burger's-Huxley and Burger's-Fisher Equation". *Applied Mathematics and Computation*. 159:291-301.

3. He, J.H. 1998. "Approximate Analytical Solution for Seepage Flow with Fractional Derivatives in Porous Media". *Compt. Math. App. Mech. Eng.* 167:57-68.

4. He, J.H. 1998. "Approximate Solution of Nonlinear Differential Equations with Convolution Product Nonlinearities". *Comp. Math. Apply Mech. Eng.* 167:69-73.

5. Ji-Huan, H. 1999. "Variational Iteration Method: A Kind of Non-Linear Analytical Technique: Some Examples". *Int. Journal of Non-Linear Mechanics*. 3494:699-708.

6. He, J.H. 2000. "Variational Iteration Method for Autonomous Ordinary Differential System". *App. Maths and Computation*. 114:115-123.

7. Hossein, J., et al. 2008. "Application of Homotopy Perturbation Method for Solving Gas Dynamic Equation". *Applied Mathematical Sciences*. 2(48):2393-2396.

8. Inokuti, M. 1978. "General Use of the Lagrange Multiplier in Nonlinear Mathematical Physics". In: S. Nemat Nasser (ed.). *Variational Method in the Mechanics of Solid.* Pergamon Press: New York, NY. 156-162.

9. Masoudi S. and A. Nikkar. 2014. "Promising Technique for Analytic Treatment of Nonlinear Fifth-Order Equations". *World Journal of Modelling and Simulation*. 10(1):27-33.

10. Olayiwola, M.O. 2014. "An Improved Algorithm for the Solution of Generalized Burger-Fishers Equations". *Applied Mathematics*. 5:1609-1614.

11. Olayiwola, M.O. 2014. "Analytical Approximate to the Solution of Some Nonlinear Partial Differential Equations". *Journal of the Nigerian Association of Mathematical Physics*. 28(2): 69-72.

12. Olayiwola, M.O. 2015. "The Variational Iteration Method for Analytic Treatment of Homogeneous and Inhomogeneous Partial Differential Equations". *Mathematics and Decision Sciences*. 15(5):7-22.

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