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Letter to the Editor

Comment on "Variational Iteration Method for Fractional Calculus Using He's Polynomials"

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Recently Liu applied the variational homotopy perturbation method for fractional initial boundary value problems. This note concludes that the method is a modified variational iteration method using He's polynomials. A standard variational iteration algorithm for fractional differential equations is suggested.

1. Introduction

The variational iteration method [1, 2] has been shown to solve a large class of nonlinear differential problems effectively, easily, and accurately with the approximations converging rapidly to accurate solutions. In 1998, the method was first adopted to solve fractional differential equations [2]. Recently Liu applied the variational homotopy perturbation method for fractional initial boundary value problems [3]; however, the method is nothing but a modified variational iteration method.

2. Liu's Work

Liu used the following example to elucidate the solution process [3]:

$$\frac{\partial^{\alpha} u}{\partial t^{\alpha}} - \frac{1}{2} x^2 \frac{\partial^2 u}{\partial x^2} = 0. \tag{2.1}$$

The classical variational iteration algorithm reads [4]

$$u_{n+1}(x,t) = u_n(x,t) - \int_0^t \left\{ \frac{\partial^\alpha u_n(x,s)}{\partial s^\alpha} - \frac{1}{2}x^2 \frac{\partial^2 u_n(x,s)}{\partial x^2} \right\} \mathrm{d}s, \tag{2.2}$$

which is exactly the same as that in Liu's work [3], where the nonlinear term is expanded into He's polynomials [5]. So what Liu used is exactly the variational iteration method using He's polynomials, which has been widely used for solving various nonlinear problems [6–8].

3. Conclusion

The so-called variational homotopy perturbation method is nothing but the variational iteration method using He's polynomials. A standard variational iteration algorithm using He's polynomials is suggested to follow Guo and Mei's work [9], and the variational iteration algorithm using Adomian's polynomials was given in [10].

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References

[1] J.-H. He, "Some asymptotic methods for strongly nonlinear equations," *International Journal of Modern Physics B*, vol. 20, no. 10, pp. 1141–1199, 2006.
[2] J.-H. He, "Approximate analytical solution for seepage flow with fractional derivatives in porous media," *Computer Methods in Applied Mechanics and Engineering*, vol. 167, no. 1-2, pp. 57–68, 1998.
[3] Y. Liu, "Variational homotopy perturbation method for solving fractional initial boundary value problems," *Abstract and Applied Analysis*, vol. 2012, Article ID 727031, 10 pages, 2012.
[4] J. H. He, "Asymptotic methods for solitary solutions and compactons," *Abstract and Applied Analysis*, vol. 2012, Article ID 916793, 130 pages, 2012.
[5] A. Ghorbani, "Beyond Adomian polynomials: He polynomials," *Chaos, Solitons and Fractals*, vol. 39, no. 3, pp. 1486–1492, 2009.
[6] M. A. Noor and S. T. Mohyud-Din, "Variational iteration method for solving higher-order nonlinear boundary value problems using He's polynomials," *The International Journal of Nonlinear Sciences and Numerical Simulation*, vol. 9, pp. 141–156, 2008.
[7] S. T. Mohyud-Din, "Solving heat and wave-like equations using He's polynomials," *Mathematical Problems in Engineering*, vol. 2009, Article ID 427516, 12 pages, 2009.
[8] M. A. Noor and S. T. Mohyud-Din, "Variational iteration method for fifth-order boundary value problems using He's polynomials," *Mathematical Problems in Engineering*, vol. 2008, Article ID 954794, 12 pages, 2008.
[9] S. Guo and L. Mei, "The fractional variational iteration method using He's polynomials," *Physics Letters A*, vol. 375, no. 3, pp. 309–313, 2011.
[10] J. Ji, J. Zhang, and Y. Dong, "The fractional variational iteration method improved with the Adomian series," *Applied Mathematics Letters*, vol. 25, no. 12, pp. 2223–2226, 2012.