

*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]:

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

The classical variational iteration algorithm reads [4]

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

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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