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TRACKING TRENDS & PERFORMANCE IN BASIC RESEARCH



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2008 : July 2008 - New Hot Papers : Ji-Huan He

NEW HOT PAPERS - 2008

July 2008



Ji-Huan He talks with *ScienceWatch.com* and answers a few questions about this month's New Hot Paper in the field of Mathematics.



Article Title: Variational iteration method - Some recent results and new interpretations

Authors: He, JH

Journal: J COMPUT APPL MATH

Volume: 207

Issue: 1

Page: 3-17

Year: OCT 1 2007

* Donghua Univ, Coll Sci, 1882 Yanan Xilu Rd, Shanghai 200051, Peoples R China.

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SW: Why do you think your paper is highly cited?

This paper is an elementary introduction to the concepts of the variational iteration method. First, the main concepts in the variational iteration method, such as the general Lagrange multiplier, restricted variation, and correction functional, are explained heuristically. Subsequently, the solution procedure is systematically illustrated, which is helpful for a beginner. Particular attention is paid throughout the paper to give an intuitive grasp for the method, and the paper provides a universal approach to various nonlinear equations—these might be the main reasons for the higher citation rate.

SW: Does it describe a new discovery, methodology, or synthesis of knowledge?

Yes, the paper does describe a new application of the Lagrange multipliers, which are used to construct a correction functional for a nonlinear equation, and it can be optimally identified using the calculus of variations, whereby the solution converges quickly into an exact one.

SW: Would you summarize the significance of your paper in layman's terms?

To fully grasp the identification of the Lagrange multipliers in the correction functionals requires some knowledge of the calculus of variations, but the result is changed as we tabulated the identified results for various different equations in our article: Ji-Huan He and Xu-Hong Wu: "Variational iteration method: New development and applications," (*Computers & Mathematics with Applications* 54: 881-94, 2007).

Anyone who knows nothing of variational theory in mathematics can apply the method to calculate various nonlinear equations; including nonlinear ordinary equations, nonlinear partial differential equations, stochastic equations, differential-difference equations, integral equations, integral-differential equations, and differential-algebraic equations, making the method most attractive for a layman.

SW: How did you become involved in this research, and were there any problems along the way?

The story began in 1997 while defending my Ph.D. thesis entitled: "A New Approach to Establishing Generalized Variational Principles in Fluids and C.C. Lin's Constraints". It is well known that it is very difficult to establish a variational formulation for a fluid problem, and in my thesis the restricted variation was used to approximately construct variational formulae for various fluid problems. The concept of the restricted variation is the landmark in developing the method, and makes the identification of Lagrange multipliers extremely simpler in the variational iteration method.

This method can be used to solve various nonlinear problems, but it is still under development. Unnecessary repeated iteration occurs and this problem was partly solved in my last publication, Ji-Huan He and Xu-Hong Wu: "Variational iteration method: New development and applications," (*Computers & Mathematics with Applications* 54: 881-94, 2007).

A number of authors have contributed their considerable efforts to the development of the method and have suggested various modified versions of these methods, among which the works of Wazwaz, Ganji, Dehghan, Abbasbandy, Abdou, Yusufoglu, Bekir, Odibat, Momani, Noorani, Hashim, Soliman, Mohyud-Din, El-Wakil, Biazar, Coskun, Atay, Javidi, Golbabai, Fa-Zhan Geng and Lan Xu should receive special emphasis.

"The concept of the restricted variation is the landmark in developing the method..."

SW: Where do you see your research leading in the future?

The method might find potential applications in difference-differential equations—a two-variable equation consisting of a coupled ordinary differential equation and recurrence equation—and in numerical simulation.

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Also see: a *ScienceWatch.com* featured scientist interview with [Ji-Huan He](#).

Keywords: variational iteration method, Lagrange multiplier, Lagrange multipliers.



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