The Two - Variable (G/ G ,) (1/ G) - Expansion Method for Solving Nonlinear Dynamics of Microtubles - A New Model, Mostafa...

Article · May 2015

CITATIONS
0

READS
15

2 authors:

Mostafa M A Khater
Jiangsu University
43 PUBLICATIONS **161** CITATIONS
SEE PROFILE

Emad H.M. Zahran
College of engineering Shubra.
27 PUBLICATIONS **113** CITATIONS
SEE PROFILE

Global Journal of Science Frontier Research: A
Physics and Space Science
Volume 15 Issue 2 Version 1.0 Year 2015
Type : Double Blind Peer Reviewed International Research Journal
Publisher: Global Journals Inc. (USA)
Online ISSN: 2249-4626 & Print ISSN: 0975-5896

The Two - Variable $(\frac{G'}{G}, \frac{1}{G})$ - Expansion Method for Solving Nonlinear Dynamics of Microtubles - A New Model

By Emad H. M. Zahran & Mostafa M. A. Khater

Mansoura University, Egypt

Abstract- In this paper, we employ the $(\frac{G'}{G}, \frac{1}{G})$-expansion method to find the exact traveling wave solutions involving parameters of nonlinear dynamics of microtubulesa New Model . When these parameters are taken to be special values, the solitary wave solutions are derived from the exact traveling wave solutions. It is shown that the proposed method provides a more powerful mathematical tool for constructing exact traveling wave solutions for many other nonlinear evolution equations.

Keywords: The $(\frac{G'}{G}, \frac{1}{G})$-expansion method; Nonlinear dynamics of microtubules; Traveling wave solutions; Solitary wave solutions; Kink-anti kink shaped.

GJSFR-A Classification : FOR Code: 35A05, 35A20, 65K99, 65Z05, 76R50, 70K70

Strictly as per the compliance and regulations of :

- *Remark:* All the obtained results have been checked with Maple 16 by putting them back into the original equation and found correct.

IV. Conclusion

The $(\frac{G'}{G},\frac{1}{G})$ expansion method has been applied in this paper to find the exact traveling wave solutions and then the solitary wave solutions of two nonlinear evolution equations, namely, Nonlinear dynamics of microtubules - A new model. Let us compare between our results obtained in the present article with the well-known results obtained by other authors using different methods as follows: Our results of Nonlinear dynamics of microtubules - a new model and The Kundu- Eckhaus equation are new and different from those obtained in [29], [30], [31] and fig. 1, 2 and 3 show the solitary traveling wave solution of Nonlinear dynamics of microtubules - a new model. We can conclude that the $(\frac{G'}{G},\frac{1}{G})$-expansion method is is a very powerful and efficient technique in _nding exact solutions for wide classes of nonlinear problems and can be applied to many other nonlinear evolution equations in mathematical physics. Another possible merit is that the reliability of the method and the reduction in the size of computational domain give this method a wider applicability.

References Références Referencias

1. W. Maliet, Solitary wave solutions of nonlinear wave equation, Am. J. Phys., 60 (1992)650-654.
2. W. Maliet, W. Hereman, The tanh method: Exact solutions of nonlinear evolution and wave equations, Phys.Scr., 54 (1996) 563-568.
3. A. M. Wazwaz, The tanh method for travelling wave solutions of nonlinear equations, Appl. Math. Comput., 154 (2004) 714-723.
4. S. A. EL-Wakil, M.A.Abdou, New exact travelling wave solutions using modi_ed extended tanh-function method, Chaos Solitons Fractals, 31 (2007) 840-852.
5. E. Fan, Extended tanh-function method and its applications to nonlinear equations, Phys. Lett. A 277 (2000) 212-218.
6. Mahmoud A.E. Abdelrahman, Emad H. M. Zahran Mostafa M.A. Khater, Exact Traveling Wave Solutions for Modi_ed Liouville Equation Arising in Mathematical Physics and Biology, (International Journal of Computer Applications (0975 8887) Volume 112 - No. 12, February 2015).
7. A. M. Wazwaz, Exact solutions to the double sinh-Gordon equation by the tanh method and a variable separated ODE. method, Comput. Math. Appl., 50 (2005) 1685-1696.
8. A. M.Wazwaz, A sine-cosine method for handling nonlinear wave equations, Math. Comput. Modelling, 40 (2004) 499-508.
9. C. Yan, A simple transformation for nonlinear waves, Phys. Lett. A 224 (1996) 77-84.
10. E. Fan, H.Zhang, A note on the homogeneous balance method, Phys. Lett. A 246 (1998)403-406.
11. M. L. Wang, Exct solutions for a compound KdV-Burgers equation, Phys. Lett. A 213(1996) 279-287.
12. Emad H. M. Zahran and Mostafa M.A. Khater, The modified simple equation method and its applications for solving some nonlinear evolutions equations in mathematical physics, (Jokull journal-Vol. 64. Issue 5 - May 2014).
13. Y. J. Ren, H. Q. Zhang, A generalized F-expansion method to _nd abundant families of Jacobi elliptic function solutions of the (2+1)-dimensional Nizhnik-Novikov-Veselov equation, Chaos Solitons Fractals, 27 (2006) 959-979.
14. J. L. Zhang, M. L. Wang, Y. M. Wang, Z. D. Fang, The improved F-expansion method and its applications, Phys.Lett.A 350 (2006) 103-109.
15. J. H. He, X. H. Wu, Exp-function method for nonlinear wave equations, Chaos Solitons Fractals 30 (2006) 700-708.
16. H. Aminikhad, H. Moosaei, M. Hajipour, Exact solutions for nonlinear partial differential equations via Exp-function method, Numer. Methods Partial Differ. Equations, 26 (2009)1427-1433.
17. Z. Y. Zhang, New exact traveling wave solutions for the nonlinear Klein-Gordon equation, Turk. J. Phys., 32 (2008) 235-240.
18. M. L. Wang, J. L. Zhang, X. Z. Li, The $(\frac{G'}{G})$-expansion method and travelling wave solutions of nonlinear evolutions equations in mathematical physics, Phys. Lett. A 372 (2008) 417-423.
19. S. Zhang, J. L. Tong, W.Wang, A generalized $(\frac{G'}{G})$-expansion method for the mKdv equation with variable coefficients, Phys. Lett. A 372 (2008) 2254-2257.
20. E. M. E. Zayed and K. A. Gepreel, The $(\frac{G'}{G})$-expansion method for finding traveling wave solutions of nonlinear partial differential equations in mathematical physics, J. Math. Phys., 50 (2009) 013502-013513.
21. E.H.M.Zahran and mostafa M.A. khater, Exact solutions to some nonlinear evolution equations by the $(\frac{G'}{G})$- expansion method equations in mathematical physics, Jökull Journal, Vol. 64, No. 5; May 2014.
22. C. Q. Dai , J. F. Zhang, Jacobian elliptic function method for nonlinear differential difference equations, Chaos Solutions Fractals, 27 (2006) 1042-1049.
23. E. Fan , J .Zhang, Applications of the Jacobi elliptic function method to special-type nonlinear equations, Phys. Lett. A 305 (2002) 383-392.
24. S. Liu, Z. Fu, S. Liu, Q.Zhao, Jacobi elliptic function expansion method and periodic wave solutions of

nonlinear wave equations, Phys. Lett. A 289 (2001) 69-74.
25. Emad H. M. Zahran and Mostafa M.A. Khater, Exact Traveling Wave Solutions for the System of Shallow Water Wave Equations and Modified Liouville Equation Using Extended Jacobian Elliptic Function Expansion Method, American Journal of Computational Mathematics (AJCM) Vol.4 No.5 (2014).
26. X. L. Li, Q. E. Li and L. M. Wang; The $(\frac{G'}{G},\frac{1}{G})$-expansion method and its application to traveling wave solutions of Zakharov equations, Appl. Math. j. Chinese Univ. 25, 454 – 462 (2010).
27. E. M. E. Zayed and M. A. M. Abdelaziz; the two variable $(\frac{G'}{G},\frac{1}{G})$-expansion method for solving the nonlinear KdV-MKdV equation, Math. Prob. Engineering. Volume 2012, Article ID 725061, 14 pages.
28. Zayed, E. M. E., and M. A. M. Abdelaziz. The Two-Variable $(\frac{G'}{G},\frac{1}{G})$-Expansion Method for Solving the Nonlinear KdV-mKdV Equation. Mathematical Problems in Engineering (2012). âĂŔ
29. S. Zdravkovic, M. V. Sataric, S. Zekovic, Nonlinear dynamics of microtubules âĂŞ A new model, (arXiv:1210.4726 or arXiv:1210.4726v1).
30. Sataric MV, Tuszynsky JA, Zakula RB. Kink like excitations as an energy-transfer mechanism in microtubules. Phys. Rev. E ; 48 (1): 589-597(1993).
31. Zdravkovic, Slobodan, et al. Modified extended tanh-function method and nonlinear dynamics of microtubules. Chaos, Solitons Fractals 45.11: 1378-1386(2012). âĂŔ

Global Journals Inc. (US) Guidelines Handbook 2015

www.GlobalJournals.org