Convergence of Modified Homotopy Perturbation Method for Fredholm-Volterra Integro-Differential Equation of order "m'

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Abstract:

Homotopy perturbation method (HPM) [1, 2] is the combination of two methods: the homotopy and perturbation method. In recent years, the application of HPM in mathematical problems has been applied by many researchers. This method deforms complicated problem into a simple problem which is easy to solve.

HPM has been used for a wide range of problems; for finding the exact and approximate solutions of linear and nonlinear: ordinary differential equations(ODEs), Partial differential equations, integral equations and integro-differential equations of Volterra-Fredholm type.

In this note Modied homotopy perturbation method (MHPM) has applied to solve the Fredholm-Volterro integrodifferential equation (FVIDE) of the third kind with the derivative of order m. Selective functions and unknown parameters helped us to obtain two step iterations. This proposed method could avoid complex computations. It is found that MHPM is a semianalytical method and easy to apply for FVIDE. Convergence and numerical examples are given to present the efciency and reliability of the method.

Keywords: Integral equation, Homotopy perturbation method, Numerical method

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References

[1] J.-H. He, "Homotopy perturbation technique", Comp. Methods Appl. Mech. Engrg., vol. 178, pp. 257-262, 1999.

[2] J.-H. He, "A coupling method of a homotopy technique and a perturbation technique for non-linear problems", Int. J. Nonlinear Mech, vol. 35, pp. 37-43, 2000.