Application of He's Homotopy Perturbation Method to Fractional Diffusion Equations

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In this paper, the approximate analytical solutions of a general diffusion equation with fractional time derivative in the presence of a linear external force are obtained with the help of the homotopy perturbation method (HPM). The explicit solutions of the problem for the initial condition as a function of *x* have been obtained. It reveals that a few iterations are needed to obtain accurate approximate analytical solutions. The numerical calculations are carried out when the initial conditions are like exponential and periodic functions and the results are depicted through graphs. The examples prove that the method is extremely effective due to its simplistic approach and performance.

Key words: Fractional Diffusion Equation; Homotopy Perturbation Method; Inital Value Problem; Mittag-Leffler Function.