A Computational Study of HIV Infection Model using Galerkin and Wavelet Collocation Method

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Abstract

In this work we implement two numerical schemes namely continuous Galerkin-Petrov (cGP(2)) and Legendre Wavelet Collocation Method (LWCM) for the approximate solution of the mathematical model which describes the behavior of CD4+ T-cells, infected CD4+T-cells and free HIV virus particles after HIV infection. The present study discuss and analyse the effect of constant and different variable source terms (depending on the viral load) used for the supply of new CD4+ T-cells from thymus on the dynamics of CD4+ T-cells, infected CD4+ T-cells and free HIV virus. Furthermore, the model is also solve using fourth order Runge Kutta (RK4) method. Finally, the validity and reliability of the proposed schemes are verified by comparing the numerical and graphical results with the results of RK4-method. Comparison of the numerical and graphical results of cGP(2) and LWCM with RK4-method confirmed that cGP(2) and LWCM performs excellent accuracy. The present study highlights the accuracy and efficiency of the proposed schemes with the other traditional schemes such as the Laplace Adomian Decomposition Method (LADM), Variational Iteration Method (VIM), Homotopy Analysis Method (HAM), Homotopy Perturbation Method (HPM), Genetic Algorithm (GA), Interior Point Algorithm (IPA), Active Set Algorithm (ASA), Multistep Laplace Adomian Decomposition Method (MSLADM) etc.

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