On the reaction-diffusion equations with delay time

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A numerical convergent method for reaction-diffusion equations with delay time

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Abstract

In this manuscript, we consider the delay reaction-diffusion equation and implement an efficient spectral collocation method to approximate the solution of this equation. We first replace the delay function in equation and achieve an equivalent system of equations without delay. We then utilize the Legendre-Gauss-Lobatto and two-dimensional interpolating polynomial to approximate the solution of obtained system. Moreover, we prove the convergent of method under some mild conditions. Finally, the capability and efficiency of the method is illustrated by providing several numerical examples and comparing them with others.

Keywords: Delay reaction-diffusion equations, Spectral collocation method, Shifted Legendre-Gauss-Lobatto points.