Natural Cubic Spline for the Solution of Parabolic Equation with Constant and Variable Coefficient

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ABSTRACT

In this paper, we implemented Natural Cubic Spline for solving general Second-order Partial differential equations with Constant and Variable coefficients. The developed method is applicable for parabolic and hyperbolic equations with constant and variable coefficients. Here we considered parabolic partial differential equations with constant and variable coefficients. The developed method is Implicit in which Spatial derivatives are replaced by Natural cubic spline and time derivatives by finite difference approximation. Numerical examples with different boundary conditions are considered to check the efficiency and applicability of the proposed method. Applications include the telegraph equation which is utilized to outline the reaction-diffusion in numerous branches of emerging sciences. It is used to demonstrate the vibrations of structures, e.g., structures, shafts, and machines. It is also utilized as a part of signal investigation for transmission and proliferation of electrical signs. We have also compared our results with existing methods to check the accuracy of our proposed method. We obtained an accuracy of $O(k^4 + h^4)$. Plotted graphs for different step sizes which compare implemented method with an exact solution. Error plots are presented to check the efficiency of the proposed method.

Keywords: Second-order Parabolic equation; Natural Cubic Spline; Finite difference scheme; Absolute errors.

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