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AN EFFECTIVE EXTENDED CUBIC B-SPLINE APPROACH FOR SOLVING CAPUTO-FABRIZIO TIME-FRACTIONAL DIFFUSION WAVE EQUATION

A spline is a curve that is composed of smooth segments. The B-spline functions are highly effective tools for achieving the desired results in computational analysis. As a result of their versatility, smoothness and precision, they have also been applied in computer-aided design and computer graphics. This study introduces and applies an innovative method based on extended cubic B-spline (ExCuBS) functions for numerically solving time fractional diffusion wave equations (TFDuWEs). The current method utilizes the exponential kernel fractional derivative in combination with the θ-weighted approach. The Caputo-Fabrizio fractional derivative is discretized using the conventional finite difference technique, and the ExCuBS functions are used to approximate the derivatives in space. Moreover, convergence and stability of the presented scheme are provided. The proposed technique demonstrates unconditional stability and achieves second-order convergence in both spatial and temporal directions. To show the scheme's applicability and viability, numerical analysis of some examples is presented.

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