



## RESEARCH ARTICLE

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# Numerical wavelets scheme to complex partial differential equation arising from Morlet continuous wavelet transform

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**Abstract**

In this article, a new wavelets approximation scheme based on operational matrices has been discussed for the solutions of proposed initial value complex partial differential equation (CPDE) which is arising from continuous wavelet transform. We developed an algorithm using transformation to obtain the numerical solution of CPDE with a numerical wavelet collocation method based on two-dimensional Legendre wavelet (TDLW) and two-dimensional Bernoulli wavelet (TDBW) operational matrices. We converted CPDE into a system of partial differential equations (PDEs) and this system of PDEs converted into couple PDEs in terms of the real and imaginary component. Finally, we obtained a system of partial integro-differential equations (PIDEs) with nonlocal boundary conditions. After implementation of wavelets scheme on PIDEs, PIDEs reduced into a system of algebraic equations. In the sequence of this, we also investigated the convergence analysis of TDLW, TDBW, and error analysis, respectively. Finally, illustrative examples are included to demonstrate the validity and applicability of the presented wavelet scheme for the proposed problem.

**KEYWORDS**

Bernoulli wavelet, collocation method, Legendre wavelet, operational matrices, partial differential equation

