THE SOLUTIONS OF A CONFORMABLE TIME FRACTIONAL NLPDE VIA IBSEFM

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Abstract

The nonlinear conformable time-fractional the simplified modified Camassa-Holm (MCH) equation plays an important role in physics. It is an interesting model to define change waves with weak nonlinearity. In this paper, the space-time fractional derivatives are defined in the sense of the new conformable fractional derivative. The new exact solutions of MCH equation using Improved Bernoulli Sub-Equation Function Method (IBSEFM) are constructed, the 2D graphs and 3D graphs acquired from the values of the solutions are given.The results show that IBSEFM is a powerful mathematical tool to solve nonlinear conformable time-fractional partial differantial equations (CTFPDEs) arising in mathematical physics.

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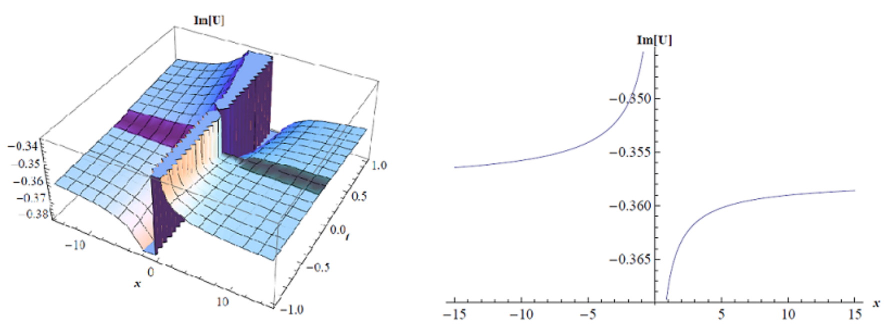

Figure 2b: The 3D and 2D surfaces of the exact solution $u_2(x,t)$ for imaginary part. By considering the values $\sigma = 0.4; r = 0.2; c = 0.9; d = 0.3; \varepsilon = 0.1;$ $\alpha = 0.1;$ $s = 0.5;$ $-15 < x < 15,$ $-1 < t < 1$ for 3D surface and $-15 < x < 15;$ $t = 0.1$ for 2D surface.

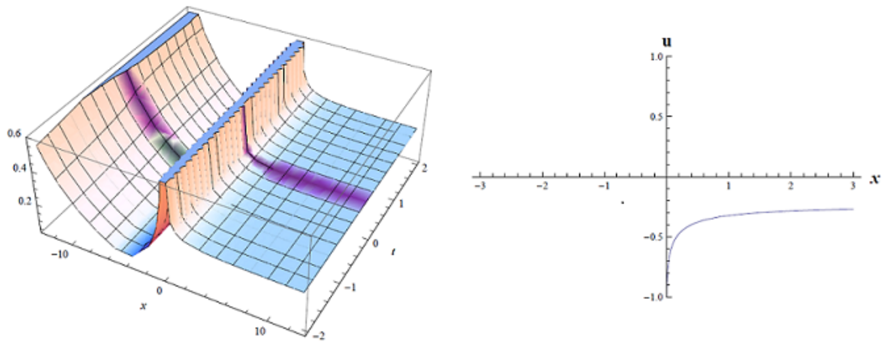

Figure 3: The 3D and 2D surfaces of the exact solution $u_3(x,t)$. By considering the values $\sigma = 0.4; a_2 = 0.1; c = 0.1; d = 0.2; \varepsilon = 0.3; \alpha = 0.5; b_0 = 0.4; -13 < x < 13, -2 < t < 2$ for 3D surface and $-3 < x < 3; t = 0.1$ for 2D surface.

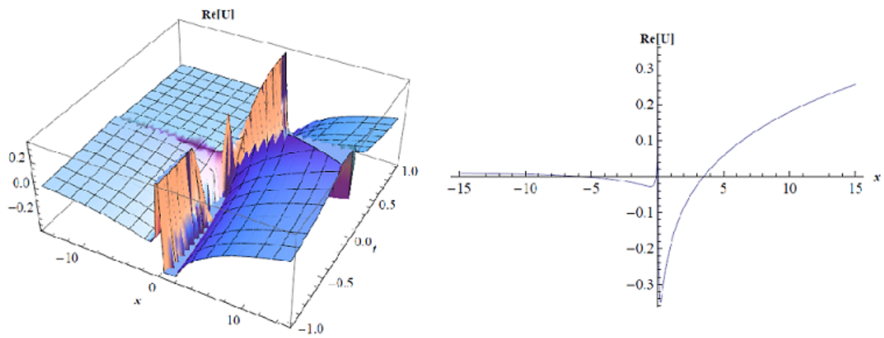

Figure 1a: The 3D and 2D surfaces of the exact solution $u_1(x,t)$ for real part. By considering the values $d = 0.6; p = 0.2; c = 0.7; b_0 = 0.3; a_2 = 0.4; \alpha = 0.1; r = 0.3; -15 < x < 15, -1 < t < 1$ for 3D surface and $-15 < x < 15; t = 0.1$ for 2D surface.

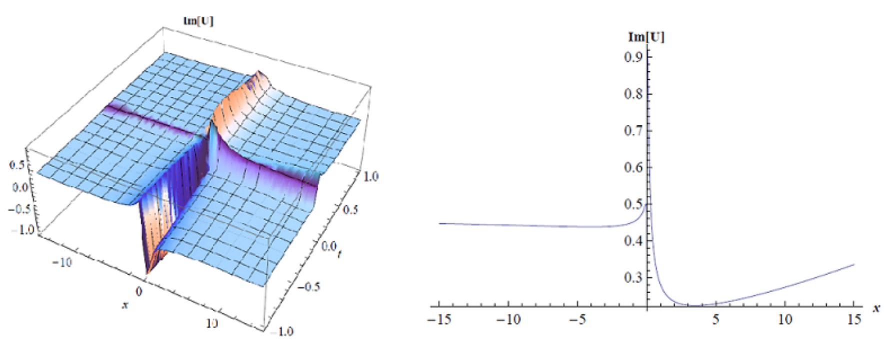

Figure 1b: The 3D and 2D surfaces of the exact solution $u_1(x,t)$ for imaginary part. By considering the values $d = 0.6; p = 0.2; c = 0.7; b_0 = 0.3; a_2 = 0.4; \alpha = 0.1; r = 0.3; -15 < x < 15, -1 < t < 1$ for 3D surface and $-15 < x < 15; t = 0.1$ for 2D surface.

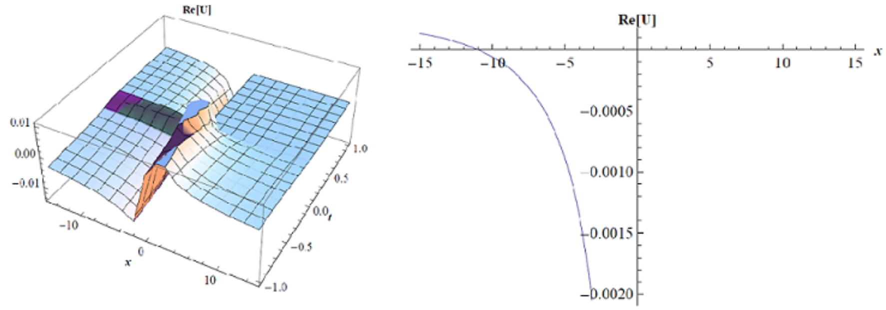

Figure 2a: The 3D and 2D surfaces of the exact solution $u_2(x,t)$ for real part. By considering the values $\sigma = 0.4$; $r = 0.2$; $c = 0.9$; $d = 0.3$; $\varepsilon = 0.1$; $\alpha = 0.1$; $s = 0.5$; $-15 < x < 15$, $-1 < t < 1$ for 3D surface and $-15 < x < 15$; $t = 0.1$ for 2D surface.