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Summary: The aim of the paper is to develop and analyze a spectrally accurate time-space pseudospectral method to the approximate solution of nonlinear time and space fractional coupled Burgers equations. Liouville-Caputo fractional derivative formula is used to evaluate the fractional derivatives matrix at CGL points. Using the Chebyshev fractional derivative matrices, the given problem is reduced to a system of nonlinear algebraic equations. A mapping is used to transform the nonhomogeneous initial-boundary values to homogeneous initial-boundary values. Error analysis of the proposed method for the equation is presented. A model example of fractional coupled Burgers equations is tested for a set of fractional-order derivatives. For the proposed method, highly accurate numerical results are obtained, which confirm the accuracy and efficiency of the proposed method.

MSC:
65-XX Numerical analysis
35C07 Traveling wave solutions
35C11 Polynomial solutions to PDEs
35R11 Fractional partial differential equations

Keywords:
Caputo fractional derivatives; Chebyshev-Gauss-Lobbato (CGL) points; error analysis; pseudospectral method; time and space fractional Burgers equation

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