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AN IMPLICIT NUMERICAL SCHEME FOR FRACTIONAL ADVECTION DIFFUSION EQUATION

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ABSTRACT
In this paper, a finite difference scheme is presented for time fractional advection diffusion equation (TFADE). This equation is derived from classical advection diffusion equation with variable coefficients on replacing classical integer order derivatives by their fractional counterpart. An advection diffusion equation describes physical phenomenon where particle, energy or other physical quantities are transferred inside a physical system due to combined effect of advection and diffusion. To address anomalous diffusion like sub diffusion or super diffusion, classical integer derivatives are replaced by corresponding fractional derivative to obtain TFADE. Using central difference approximations for both space and time fractional derivatives, it is found the present numerical scheme is unconditionally stable.

Keywords: Finite Difference Method, Advection-Diffusion Equation, Fractional Derivatives.

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