



Numerical Resolution of Transport-Diffusion Systems via Taylor Collocation Method

A. Chettouh^{1,2} and H. Laib^{2,3*}

¹*Laboratory of Applied Mathematics and Didactics, Higher Normal School El Katiba Assia
Djebar, Constantine, Algeria.*

²*University of Abdelhafid Boussouf, Mila, Algeria.*

³*Higher Normal School Echeikh Mohamed Elbachir Elibrahimi, Algiers, Algeria.*

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Abstract: The primary objective of this paper is to develop a numerical approach for solving a system of transport-diffusion equations. The proposed method is based on Taylor polynomials, which are employed within a collocation method in the space $S_{p-1}^{(-1)}(\Pi_{N,M})$ to approximate the solution of the corresponding Volterra integro-differential equation. The convergence of the method is established, and numerical experiments are conducted to demonstrate its accuracy. This work contributes to the field of system dynamics by introducing a new computational approach to understanding and predicting the behavior of transport-diffusion systems. The Taylor collocation method enables precise numerical approximations of these equations, which is fundamental in modeling dynamic processes such as pollutant dispersion in a moving fluid and thermal diffusion in engineered systems.

Keywords: *system of transport-diffusion equations; Volterra integro-differential equation; collocation method; Taylor polynomials; error analysis.*

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* Corresponding author: <mailto:hafida.laib@gmail.com>