Kumar, Sachin; Nieto, Juan J.; Ahmad, Bashir
Chebyshev spectral method for solving fuzzy fractional Fredholm-Volterra integro-differential equation. (English) Zbl 07431739

Summary: The fuzzy integral equation is used to model many physical phenomena which arise in many fields like chemistry, physics, and biology, etc. In this article, we emphasize on mathematical modeling of the fuzzy fractional Fredholm-Volterra integral equation. The numerical solution of the fuzzy fractional Fredholm-Volterra equation is determined in which model contains fuzzy coefficients and fuzzy initial condition. First, an operational matrix of Chebyshev polynomial of Caputo type fractional fuzzy derivative is derived in fuzzy environment. The integral term is approximated by the Chebyshev spectral method and the differential term is approximated by the operational matrix. This method converted the given fuzzy fractional integral equation into algebraic equations which are fuzzy in nature. The desired numerical solution is to find out by solving these algebraic equations. The different particular cases of our model have been solved which depict the feasibility of our method. The error tables show the accuracy of the method. We also can see the accuracy of our method by 3D figures of exact and obtained numerical solutions. Hence, our method is suitable to deal with the fuzzy fractional Fredholm-Volterra equation.

MSC:
65-XX Numerical analysis
45-XX Integral equations

Keywords:
fuzzy calculus; Chebyshev polynomial; operational matrix; mathematical modeling

Full Text: DOI

References:

This reference list is based on information provided by the publisher or from digital mathematics libraries. Its items are heuristically matched to zbMATH identifiers and may contain data conversion errors. It attempts to reflect the references listed in the original paper as accurately as possible without claiming the completeness or perfect precision of the matching.