Numerical solution of stochastic mixed Volterra-Fredholm integral equations driven by space-time Brownian motion via two-dimensional block pulse functions

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Abstract: The goal of this presentation is to give useful method for solving problems formulated by two dimensional stochastic integral equations driven by space-time white noise. Typically, some stochastic problems require numerical methods to obtain a solution and therefore is focused on stochastic integral and partial differential equations to construct a reliable and efficient computational methods.

Since solution of parabolic partial differential equations driven by space-time white noise leads to a stochastic integral equations, we introduce a new method by two dimensional block pulse functions and their operational integration matrix to transform a stochastic mixed Volterra-Fredholm integral equation to a system of algebraic equations. The benefit of this method is lower cost of setting up the system of equations without any integration. So, the computational cost of operations is low. The method is applied to test examples to illustrate the accuracy and implementation of the method.

Keywords: Two-dimensional block pulse functions; Operational matrix; Stochastic operational matrix; Stochastic mixed Volterra-Fredholm integral equations; Space-time white noise; Brownian sheet.

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References

[1] M. Khodabin, K. Maleknejad, F. Hosseini Shekarabi, Application of Triangular Functions to Numerical Solution of Stochastic Volterra Integral Equations, IAENG International Journal of Applied Mathematics, 43:1,(2013), IJAM-43-1-01.

[2] F. Hosseini Shekarabi, M. Khodabin, Numerical Solution of a Model for Stochastic Polymer Equation Driven by Space-Time Brownian Motion via Homotopy Perturbation Method, International Journal of Applied and Computational Mathematics 06/2015; DOI: 10.1007/s40819-015-0072-4, 2015.