Finite Difference Method for Solving Partial Integro-Differential Equations

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Extended Abstract

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Introduction

In this paper, we have introduced a new method for solving a class of the partial integro-differential equation with the singular kernel by using the finite difference method. One of the best subjects in the numerical analysis is a finite difference method (FDM). We used (FDM) to solve problems in mathematical physics, integral equations, and engineering, such as electromagnetic potential, fluid flow, radiation heats transfer, laminar boundary-layer theory and mass transport, Abel integral equations, and problem of mechanics or physics. Also in some physical problems such as fluid flow and heat transfer problems, the Laplace equations and the Poisson equations are describe by (FDM). In real life most phenomena are modelled by partial differential equations.

Material and methods

First, we employing an algorithm for solving the problem based on the Crank-Nicholson scheme with given conditions. Furthermore, we discrete the singular integral for solving of the problem. Also, the numerical results obtained here can be compared with the cubic B-spline method.

Results and discussion

In addition, solving some examples demonstrates the validity and applicability of the approached method, so that the results are reported in the tables and their figures are shown. The high speed of the calculations, and the assurance of having an approximate solution are obtain by proving the stability of the method.

Conclusion

The following conclusions were drawn from this research.

- Coefficients of the approximate function via Crank-Nicholson scheme are found very easily and therefore many calculations are reduced.
- The numerical results obtained here can be compared with the cubic B-spline method
- The assurance of having an approximate solution are obtain by proving the stability of the method.

Keywords: Partial integro-differential equation, Singular kernel, Finite difference method, Stability analysis.
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