Abstract

The numerical algorithms employed in the solution of Parabolic Partial Differential Equations are the subject of this paper. In particular, the Crank-Nicolson scheme, which is generally accepted as an improvement of the Schmidt scheme, is subjected not only to stability analysis, but also absolute relative error analysis to guide Mathematicians and Engineers alike to know the true performance of these numerical solution methods. The Heat Equation $T_t = cT_{xx}$ with Dirichlet conditions conducting heat is analysed by employing the analytical method of solution where the method of Separation of Variables is used. The same equation is then solved with the Schmidt scheme as well as the Crank-Nicolson scheme and the results compared to the analytical solution. It is shown that provided stability conditions for both numerical schemes are not compromised, the Schmidt scheme is better than the Crank-Nicolson scheme at the particular point 80% from the conducting end of the rod. With the rod discretized into six points, both ends of the rod produce the same results for both numerical schemes. With the remaining four points, it is shown that three points produced values which showed that the Crank-Nicolson scheme is better than the Schmidt scheme at those three points, but not the fourth.
Algorithm Analysis of Numerical Solutions to the Heat Equation


Index Terms

Computer Science Algorithms

Keywords
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