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REDUCED DIFFERENTIAL TRANSFORM METHOD FOR APPROXIMATING SOLUTIONS FOR LINEAR AND NON-LINEAR PARTIAL DIFFERENTIAL EQUATIONS

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In the literature, linear or non-linear partial differential equations, such as the heat equation and the wave equation which describe physical phenomena, are encountered. However, the non-linear models of real-life problems are still difficult to solve numerically or analytically. Much attention has recently been devoted to numerical methods that neither require discretization of space-time variables nor linearization of non-linear equations; for example, Adomian Decomposition Method (ADM) and Variational Iterative Method (VIM). The numerical methods can provide approximate solutions rather than analytic solutions to the problem. The Differential Transform Method (DTM) for solving differential equations has recently renewed interest due to many important applications, such as solving the pantograph equation. In 2009, the Reduced Differential Transform Method (RDTM), which is an alternative approach to DTM, was first proposed by Keskin, a Turkish mathematician, to overcome the demerit of complex calculation of DTM. In this research, three types of non-linear partial differential equations, namely Reaction-Convection-Diffusion equation, Brusselator system of equations (with $A = 1$, $B = 0$, $\alpha = 0.25$) and Volterra integral equations were solved using RDTM and DTM. For this process, CPU times have been calculated using MATLAB software. Present results show that the RDTM is an efficient and accurate numerical method to obtain an approximate solution for linear and non-linear partial differential equations and integral partial differential equations than DTM. Finally, the RDTM was used to find the approximate solutions of different partial differential equations, such as the Diffusion-Advection Equation and Brusselator system of equations with unknown exact solutions.

Keywords: Differential transform method, Iterative techniques, Linear and non-linear equations, Partial differential equations, Reduced differential transform method