On Space Discretization of One Dimensional Reaction Diffusion Equation

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Reaction diffusion equations arise in many fields of the applied sciences such as biology, ecology, physics and engineering. Due to the nonlinear nature of the reaction terms, their numerical approximations have fascinated many researchers and mathematical modelers. In this work, we consider a general approach in the space discretization of reaction diffusion equations in cases where the reaction term is of polynomial type. The approach involves splitting the partial differential equation into space independent and the time independent sub equations. A general approach is proposed for the discretization of the equation while exact schemes or the method of lines with higher order time integrators are proposed for the space independent equation. The derived schemes are found to have better stability properties and we validate our findings by presenting nonstandard finite difference schemes for the Fisher's and Nagumo reaction diffusion equations.

References

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