

On the Numerical Solution of Fisher's equation and Gray-Scott's equation

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In this work, we present non-standard finite difference method to solve two challenging problems described by diffusion-reaction equations.

Firstly we solve Fisher's equation prescribed with initial and boundary conditions by [1]. This problem was solved by a numerical technique called Moving Mesh Method proposed by Li and al. in simulating the profile accurately and in order to capture the correct wave speed. The results they obtained led them to conclude that Moving Mesh Method are not recommended for this problem in which the diffusion term is much less than the reaction term.

Secondly the problem considered is Gray-Scott equation which exhibits pulse splitting or shedding[3] ; a propagating pulse is unstable and the unstable eigen-solutions lag behind the pulse causing a daughter pulse to break off. This is tough test for numerical scheme as the splitting events and subsequent structure must be captured correctly both in space and time.

References

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