ADAPTED NUMERICAL SOLUTION OF REACTION-DIFFUSION PDES IN SEVERAL DIMENSIONS

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Sustainability-related applications, such as vegetation patterns in arid regions and degradation processes in solar cells, can be described by reaction-diffusion Partial Differential Equations (PDEs) in several spatial dimensions. These problems often require long-time integration and fine spatial discretizations, which can be especially demanding in tasks such as parameter estimation, where repeated solution of the PDEs within optimization algorithms may be required. Therefore, the derivation of numerical methods capable of providing a stable and accurate solution in short computing times is crucial. To this aim, we introduce new linearly implicit numerical methods [1], combined with suitable splitting [2] and matrix-oriented techniques (D'Autilia, Sgura, Simoncini, CAMWA, 2020). We analyze the properties of the new methods in terms of accuracy and stability. Numerical experiments confirm the theoretical analysis and underline the good performance of the schemes.

References

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