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Joint analytical and numerical investigation of blow-up in some mathematical models

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In some models (for example, in plasma physics and semiconductor physics), the blow-up phenomenon occurs, i. e. the solution's norm tends to infinity as time tends to a finite moment. There exist some methods to detect blow-up analytically: Pokhozhaev and Mitidieri's test function method, Levine's method, and Samarskii and Galaktionov's similarity solutions method. These methods typically provide us with an estimation of the blow-up moment. The numerical algorithm (based on N. N. Kalitkin and co-authors' ideas), however, allows us to specify the moment and the process of the solution's blow-up by using Richardson's effective accuracy order. In particular, one can obtain the blow-up moment with the accuracy up to mesh interval. Some numerical experiments will be presented in order to demonstrate the effectiveness of the method.

Short biography note

- 1. A.B. Al'shin, E.A. Al'shina, Numerical diagnosis of blow-up of solutions of pseudoparabolic equations, J. Math. Sci. 148(1) (2008), 143–162.
- 2. N.N. Kalitkin, A.B. Al'shin, E.A. Al'shina, B.V. Rogov, Computations on Quasi-uniform Grids, Fizmatlit, Moscow, 2005 (in Russian).
- 3. Korpusov M.O., Lukyanenko D.V., Panin A.A., Yushkov E.V. Blow-up for one Sobolev problem: theoretical approach and numerical analysis. JMAA, 442(2) (2016), 451-468.

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