A note on the numerical solution of the semilinear elliptic equation

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Abstract: The study of boundary value problems for elliptic equations were considered in [1-6]. A. V Bitsadze and A. A. Samarskii had proved existence and uniqueness of a classical solution to an elliptic second-order equation in a rectangle with nonlocal boundary conditions [7]. Previously, the Bitsadze-Samarskii type nonlocal boundary value problems for semilinear elliptic equations were studied [3]. The unique solvability of Bitsadze-Samarskii type nonlocal boundary value problems for the semi-linear elliptic equations in a Hilbert space was investigated in that work. In this paper, we consider the same problem for approximately solving this problem in a Hilbert Space [3] . The difference scheme is used to overcome the difficulties in numerical procedure.

References:
[1] D.G. Gordeziani, T.Z. Djioev, On solvability of one boundary value problem for non-linear elliptic equation, Bulletin of the Academy of Sciences of the Georgian, vol. 68, no. 2, pp. 289-292, 1972.

[2] H.B. Keller, Approximation methods for nonlinear problems with application to two-point boundary value problems, Mathematics of Computation, vol. 29, pp. 464-474, 1975.

[3] A. Ashyralyev, E. Ozturk, On Bitsadze-Samarskii type nonlocal boundary value problems for semi-linear elliptic equation. First International Conference on Analysis and Applied Mathematics (ICAAM 2012), AIP Conference Proceedings, vol. 1470, pp. 114-117, 2012.

[4] W. Hackbusch, On the fast solution of nonlinear elliptic equations, Numerical Mathematics, vol. 32, pp. 83-95, 1979.

[5] A. Ashyralyev, F.S. Ozesenli Tetikoglu, FDM for elliptic equations with Bitsadze-Samarskii-Dirichlet conditions, Abstract and Applied Analysis, vol. 2012, Hindawi Publishing Corporation, 2012.

[6] A. Ashyralyev, E. Ozturk, The numerical solution of the Bitsadze-Samarskii nonlocal boundary value problems with the Dirichlet-Neumann condition, Abstract and Applied Analysis, vol. 2012, no. 730804, 13 pages, 2012.

[7] A.V. Bitsadze , A.A. Samarskii, On some simple generalizations of linear elliptic boundary problems, Soviet Mathematics Doklady, vol. 10, no. 2, pp. 398-400, 1969.

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