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CONSERVATIVE MONOTONE DIFFERENCE SCHEMES FOR EQUATIONS WITH MIXED DERIVATIVES AND VARIABLE COEFFICIENTS

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For numerical solving boundary-value problems it is important to develop difference schemes satisfying the properties of both monotonicity, conservativeness and the second order of approximation because monotone schemes lead to the well-conditioned systems of algebraic equations and conservative algorithms converge significantly better on the coarse grids for functions strongly varying in time and space.

For elliptic and parabolic equations with mixed derivatives monotone and conservative difference schemes were proposed by Samarskii, Matus, Mazhukin, Mozolevski [2] and Shishkin [3]. But these schemes satisfy the grid maximum principle only for constant-sign coefficients. If the coefficients at mixed derivatives were alternating-sign then differential equation was rewritten in non-divergent form with the presence of first derivatives and monotone schemes were developed by the regularization principle [1, p. 183]. After such a transformation the property of conservativeness was lost. This situation is typical in theory of difference schemes.

In this presentation, new approximation of mixed derivatives is proposed. The main idea is based on using the stencil functionals with absolute values of the coefficients at mixed derivatives. Difference schemes for elliptic and parabolic equations developed on this approach are conservative, have the second order of approximation and satisfy the grid maximum principle not only for constant-sign coefficients but also for alternating-sign coefficients at mixed derivatives. For the proposed numerical algorithms the *a priori* estimations of stability and convergence in the grid norm C are obtained.

REFERENCES

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