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Integro-polynomials algorithms without accuracy saturation for evolution equations with algebraic nonlinearities.

We consider the questions of construction, theoretical justification and computer realization integro-polynomial method for the Cauchy problem for the first and the second order differential equations

$$a(t, u) \frac{du}{dt} + A(t) u = f(t, u), \quad t \in [0, T], \quad u(0) = u_0,$$

and

$$a(t, u) \frac{d^2 u}{dt^2} + A(t) u = f(t, u); \quad t \in [0, T], \quad u(0) = u_0, \quad u'(0) = u_1,$$

where $A(t)$, $a(t, u)$ — given matrix-valued and $f(t, u)$ — given vector-valued polynomial functions of corresponding number of variables.

We develop Dzjadyk's approximation methods using τ -method of Lanksosh-Ortiz [2], integro-interpolation method of A. Samarsky and the algorithms without accuracy saturation by Gavriilyuk-Makarov [3].

The results of computer experiments are also discussed and are compared with the results obtained by other methods.

- [1] V. K. Dzjadyk *Approximation methods for solution of differential and integral equation*. Kyiv. Naukova dumka, 1988. - 304p.
 - [2] V. I. Bilenko *Integro - approximations method for the modeling of certain class of nonlinear dynamic objects* // Math. Modeling and Scientific computation. - Sofia. BAS. - 1992. - p.146-158.
 - [3] Ivan P. Gavriilyuk and Volodymir L. Makarov *Algorithms without accuracy saturation for evolution equations in Hilbert and Banach spaces* // Mathematics and Computation. Volume 74, Number 250, P. 555–583.
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