

Splitting schemes with local refinement of a grid in time

Petr Vabishchevich¹ и Petr Zakharov²

¹Nuclear Safety Institute of RAS, Russian Federation;

²North-Eastern Federal University, Russian Federation;

In numerical solving time-dependent problems, dynamic processes in various subdomains of a computational domain very often demonstrate different rates. To take into account this feature of applied problems, it is necessary to use finer grids in time in some subdomains. Splitting schemes with spatially local refinement of temporal grids are constructed in the present work.

A boundary-value problem is considered for a parabolic equation. The operator of the problem is splitted into an additive representation with a separation of an individual operator term corresponding to a subdomain, where we want to use a finer grid in time. Unconditionally stable schemes with a local refinement of a grid in time are designed on the basis of classical additive schemes of componentwise decomposition. More attractive are vector additive schemes, which are schemes of full approximation.

The possibilities of the constructed splitting schemes with local refinement of the temporal grid are presented via numerical results for the model two-dimensional parabolic problem.

Keywords: Parabolic equation, numerical solution, splitting scheme, additive scheme, local refinement