Evolution equations with a positive memory term in adaptation to the composite finite element framework

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This article discusses the adaptation and convergence analysis by addressing an evolution equation employing the composite finite element method (abbreviated as CFE), incorporating a positive-type memory term. The CFE method is one modification of the standard finite element method (FEM). The benefit of this approach lies in its usage of the two-scale discretization across the domain- one with coarse scale grid size H, the other with fine scale grid size h. This helps in reducing the dimension of the considered domain space. This article examines an initial-boundary value problem involving an integro-differential equation of the Volterra type and we check the convergence using the proposed method. The memory term is a convolution product of an elliptic operator and the positive definite kernel. We discuss the fully discrete estimation for the error analysis, where both the time and space coordinates gets discretized. It is noted that the results obtained are optimal. We have carried out the numerical experiments for the validation of the theoretical results.

Keywords: Composite finite element method, Parabolic problems, Positive-type memory, Error estimation, Convergnce.
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