# A Fractional Step ELLAM Method for High-Dimensional Convection-Diffusion Problems

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**Abstract**

In this talk, a fractional step method combined with an Eulerian-Lagrangian localized adjoint method (ELLAM) is proposed to solve high-dimensional convection-diffusion problems. The method reduces high-dimensional problems to a series of uncoupled one-dimensional problems in each time step interval, in which one-dimensional ELLAM is used to solve the one-dimensional splitting equations. The approach takes the attractive advantages of the ELLAM method and the fractional step technique. It reduces computational complexities, large memory requirements, and long computation durations due to the application of the splitting technique. It reduces temporal errors and generates accurate numerical solutions even if large time and coarse spatial step sizes are used in computation. It effectively eliminates non-physical oscillation or excessive numerical dispersion and treats boundary conditions well in a natural way. Numerical experiments show the effcient performance of the approach.