DIFTA

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Error estimates for operator splitting of PDEs by generalized symmetries. Applications to convection-reaction-diffusion equations

Abstract: We study local splitting errors of partial differential equations (PDEs) on the form

$$u_t = A(u, \nabla_X u, \nabla_X^2 u, \dots) + B(u, \nabla_X u, \nabla_X^2 u, \dots),$$

where $X \in R^m$, $u \in R^q$, and A and B are operators.

The errors are estimated by Lie analysis and generalized symmetries. We study splittings of the exact problems as well as corresponding semi-discretized equations.

The formal errors are illustrated by examples from convection/diffusion/reaction equations.