

Error estimates for operator splitting for abstract boundary coupled systems

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The aim of the talk is twofold: (i) To show how functional analytic tools such as operator semigroup theory can be used for inventing and analysing new numerical methods, and (ii) as an example, to give error estimates for a numerical method, based on operator splitting approach, which we invented and applied to abstract boundary coupled systems.

Such problems arise e.g. when one has to solve a differential equation in a domain and another one on the boundary, and their solutions are coupled in some way. In the abstract framework, this corresponds to an abstract Cauchy problem on an appropriate Banach space, where the operator appearing can be split into three parts, so operator splitting procedures can be applied. The semilinear term is then treated by the variation of constants formula. The error analysis nicely combines the usual numerical analysis treatment with the functional analytic tools.

We will also show numerical experiments which illustrate our results. Furthermore, based on our numerical results, we conclude that our method converges of the expected order also in more general cases.

The talk is based on our joint work with Bálint Farkas (Wuppertal) and Balázs Kovács (Regensburg).