Operator splitting and its applications

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In the modelling of complex time-depending physical phenomena the simultaneous effect of several different sub-processes has to be described. The operators describing the sub-processes are as a rule simpler than the whole spatial differential operator. Operator splitting is a widely used procedure in numerical solution of such problems. The point in operator splitting is the replacement of the original model with one in which appropriately chosen groups of the sub-processes, described by the model, take place successively in time. This de-coupling procedure allows us to solve a few simpler problems instead of the whole one.
In the talk several splitting methods will be constructed (sequential splitting, Strang splitting, weighted splitting, additiv splitting, iterated splitting). We discuss the accuracy (local splitting error) of the methods. The stability and the convergence will be also discussed. We also examine the effect of the choice of the numerical method chosen to the numerical solution of the sub-problems in the splitting procedure. We list the main benefits and drawbacks of this approach.

References

[1] I- Farago, A. Havasi, *Operator Splittings and Their Applications*, Nova Science Publ., 2009.