Bálint Farkas
Bergische Universität Wuppertal

Operator splitting for delay equations

In this talk we will consider delay equations of the form

$$\begin{aligned}\frac{\mathrm{d}u(t)}{\mathrm{d}t} &= Bu(t) + \Phi u_t, \qquad t \geq 0,\\ u(0) &= x \in E,\\ u_0 &= f \in L^p\big([-1,0];E\big).\end{aligned}$$

for the E-valued unknown function u, where E is a Banach space, B is the generator of a (linear) C_0-semigroup on E, u_t is the history function defined by $u_t(s) = u(t+s)$ and Φ is the delay operator. We will employ the semigroup approach on L^p-phase space (in the spirit of [4] and [5]) to be able to apply numerical splitting schemes to this problem. We prove convergence of theses schemes, investigate their convergence order in various situations: point or distributed delays, and even for nonlinear delay operators (based on [5]). We also intend to present some results for the nonautonomous case, and to present numerical examples as illustration. The talk is based on joint works with András Bátkai, Petra Csomós and Gregor Nickel.

References

[1]A. Bátkai, P. Csomós, B. Farkas, *Operator splitting fo dissipative delay equations*, preprint, 2013.
[2]A. Bátkai, P. Csomós, B. Farkas, *Operator splitting for nonautonomous delay equations*, Computers & Mathematics with Applications **65** (2013), 315?-324.
[3]A. Bátkai, P. Csomós, B. Farkas, and G. Nickel, *Operator splitting for non-autonomous evolution equations*, J. Funct. Anal. **260** (2010), 2163–2190.
[4] A. Bátkai and S. Piazzera, *Semigroups for delay equations*, Research Notes in Mathematics, vol. 10, A K Peters Ltd., Wellesley, MA, 2005.
[5] G. F. Webb, *Functional differential equations and nonlinear semigroups in L^p-spaces*, J. Differential Equations **20** (1976), no. 1, 71–89.