Optimal control of parabolic equations using spectral calculus

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The subject of the talk is an optimal control problem

$$\min_{u\in\mathcal{H}} \{J(u)\colon \|y(T)-y^*\| \le \epsilon\},$$

where $\mathcal{H}$ is a Hilbert space, $y^* \in \mathcal{H}$, y is the solution of the Cauchy problem

$$\begin{cases} y'(t) + Ay(t) = 0 & \text{for } t \ge 0, \\ y(0) = u, \end{cases}$$

and

$$J(u) = \frac{\alpha}{2}\|u\|^2 + \frac{1}{2}\int_0^T \beta(t)\|y(t)-w(t)\|^2 \mathrm{d}t,$$

with $\alpha > 0$, $\beta \in L^\infty((0,T);[0,\infty))$, and $w \in L^2((0,T);\mathcal{H})$. We will assume that A is a non-negative self-adjoint operator in $\mathcal{H}$.

Our aim is to introduce a new method for solving this problem, which is based on the spectral calculus of the operator governing the evolution of the system, and describe its numerical implementation.

The talk is based on a joint work with L. Grubišić, M. Lazar and M. Tautenhahn.