The inverse problem of recovering the reaction coefficient in a linear diffusion equation

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Abstract. Let X be a complex Banach space and $A : D(A) \to X$ a quasi-m-sectorial operator in X. We shall describe the inverse problem consisting in the identification of the (unknown) diffusion coefficient $\nu > 0$ in the initial-value problem

$$\frac{d}{dt}u(t) + \nu Au(t) = 0, \quad t \in (0,T), \quad u(0) = x \in X,$$

under the additional condition $\|u(T)\| = \rho$, where $\rho > 0$ is given. Recalling that, in the case when ν is known (that is, the *direct problem*), the solution to the initial-value problem is given by the semigroup representation formula $u(t) := e^{-t\nu A}x \in C([0,T];X) \cap C^1((0,T];X)$, then our identification of ν is reduced to study the nonlinear equation $\|e^{-\nu TA}x\| = \rho$. It will be shown that the unique root $\nu = \nu(x,\rho)$ depends on (x,ρ) locally Lipschitz continuously if the datum (x,ρ) fulfills the restriction $\|x\| > \rho$.

As the above equation is a very important model for diffusion, the identification of ν from further measurements on the solution u is meaningful in many areas of application.

This is a joint work with N. Okazawa, J. Prüss & T. Yokota, and extends the results previously achieved in [1].

References

[1] G. Mola, *Identification of the diffusion coefficient in linear evolution equations in Hilbert spaces*, Journal of Abstract Differential Equations and Applications **2** (2011), 18–28.