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FAKULTÄT FÜR MATHEMATIK
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Einladung zur öffentlichen Defensio von

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Thema der Dissertation:

Improving the convergence behaviour of splitting algorithms for monotone inclusions in Hilbert spaces: from weak to strong convergence

Abstract:
A large variety of problems arising from nonsmooth convex optimization, variational inequalities and differential equations can be formulated by means of monotone inclusions. Over the past decade, significant effort has been put into the investigation of splitting algorithms which solve (possibly highly structured) monotone inclusions in Hilbert spaces efficiently. However, a drawback that usually comes along with these methods is that the generated sequence converges in general only weakly to a solution of the associated problem. To guarantee strong convergence of the generated iterates, restrictive assumptions, which in practical problems are often not fulfilled, have to be imposed on the involved operators, like strong monotonicity (respectively, strong convexity when considering optimization problems). The main purpose of this thesis is to establish and investigate splitting algorithms for monotone inclusions which generate sequences that converge strongly to a solution of the problem at hand without imposing further assumptions on the involved operators. After establishing a novel framework which unifies several splitting algorithms from the literature, we investigate by means of a Tikhonov regularization technique strongly convergent Douglas–Rachford and forward-backward methods, as well as primal-dual algorithms of corresponding type. We also study a forward-backward-forward algorithm for solving pseudo-monotone variational inequalities that converges strongly to a minimum norm solution of the associated problem. The last part of the thesis is devoted to Tikhonov regularized dynamical systems associated with monotone inclusions, where time-continuous counterparts to many of the discrete algorithms investigated earlier in our work are being studied. Throughout, we illustrate the benefits of our results on numerical experiments on, amongst others, split feasibility problems, variational image reconstruction and the problem of finding dynamic user equilibria in traffic theory.

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