Derivatives and optimal control of the stop operator

Martin Brokate and Constantin Christof and Pavel Krejčí

TU München, WIAS Berlin brokate@ma.tum.de

Keywords : sweeping process, hysteresis operators, stop operator, directional derivatives, optimality conditions

There are three main approaches to rate-independent evolutions: hysteresis operators (initiated by M.A. Krasnosel'skiĭ), sweeping processes (J.-J. Moreau) and energetic systems (A. Mielke). A basic special case common to all three approaches is given by the so-called stop operator which is a nonsmooth operator between appropriate function spaces. We discuss the existence and form of derivatives (mainly, the directional derivative) of the stop operator, as well as stationarity conditions for an associated optimal control problem. The talk is based on the references given below as well as on recent ongoing work.

[1] M. Brokate and P. Krejčí, A variational inequality for the derivative of the scalar play operator. *J. Appl. Numer. Optim.* 3 (2), 263-283, 2021.

[2] M. Brokate, Newton and Bouligand derivatives of the scalar play and stop operator. *Math. Model. Nat. Phenom.*, 15, 2020. Art. 51

[3] M. Brokate and C. Christof, Strong stationarity conditions for optimal control problems governed by a rate-independent variational inequality. *SIAM J. Control Optim.*, 61 (4): 2222-2250, 2023.