Berlin Mathematical School

BMS Friday Colloquium

Friday 21 June 2013 at 14:15

Tea & Cookies starting at 13:00

BMS Loft, Urania, An der Urania 17, 10787 Berlin

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Etienne Emmrich

(TU Berlin)

On monotone operators, evolution equations, and existence via discretization

The mathematical description of many processes in science and engineering leads to nonlinear time-dependent partial differential equations. A particular example is the Navier-Stokes equation describing the flow of an incompressible, viscous fluid, which is of first order in time. Equations of second order appear in elastodynamics, e.g. in the description of a vibrating membrane. One of the main goals is to prove existence of solutions to such equations. In order to do so, we may consider a numerical approximation providing a sequence of approximate solutions. Stability of the numerical scheme allows us to derive a priori bounds for these approximate solutions, which implies (weak or weak*) convergence of a subsequence. It turns out that the underlying differential operators often share a property that generalizes the notion of a monotonically increasing function. It is this property that allows us to identify the limit of a subsequence of approximate solutions as a solution to the original problem. Another interesting point is that stability of a numerical scheme like a time discretization method is nothing else than an appropriate discrete counterpart of the integration-by-parts formula.

In his talk, Emmrich will focus on a few of the above main steps and will end with a discussion of new results concerning the existence of solutions to nonlinear evolution equations of second order.

Etienne Emmrich has been professor of mathematics at TU Berlin since February 2012. He did his doctorate and habilitation in numerical analysis at TU Berlin, and then spent two and a half years as a professor at U Bielefeld before returning to Berlin.

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