

Variational methods for problems with inertia and their limits

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For static and quasi-static problems, (iterated) minimization has long been one of the most important tools to prove existence of solutions. The main advantage of these variational approaches is that they are able to deal with complicated nonlinearities and nonconvexities in a rather natural fashion, directly relying on the description of a problem in terms of its physical energy. In contrast, for dynamic problems, i.e. those involving inertia, such variational approaches so far have been much less used in practical existence proofs.

The aim of this talk is to present our recent and not so recent attempts at bridging this gap, using a "time-delayed" approach which uses energetical descriptions and minimization as both a modelling approach, as well as a way of showing existence of solutions. This will be illustrated with a number of problems from recent publications, involving solids, fluids and their interaction. Furthermore we will see how the same ideas can be used to study limit systems of parameter-dependent families of such problems in a similarly general fashion.

This is based on joint works with, among others, B. Benešová, D. Breit, A. Češík, G. Gravina, M. Kružík and S. Schwarzacher.