

Variational methods for dynamical problems

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For static and quasi-static problems, (iterated) minimization has long been one of the most important tools to show 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, abstract variational characterizations of solutions have been long known, but prove to be much less useful in showing existence.

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 energetic descriptions and minimization to both show existence of solutions, as well as as a modelling approach. This will be illustrated with a number of problems from mostly recent works, involving solids, fluids and in particular their interaction. This is based on joint works with (among others) B.Benesova, D.Breit, A.Cesik, G.Gravina and S.Schwarzacher.

The informal introduction will discuss the mathematics of the static and quasi-static case and give a short overview of some of the physics involved as well.