

A variational proposal for Navier-Stokes.

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Abstract

We will describe the main ingredients of a variational approach to the Navier-Stokes system that consists in setting up an error functional measuring the departure of fields from being a solution. The strategy to show directly existence of (very regular) weak solutions consists of: 1. Showing that there are global minimizers for the error in suitable classes of fields. This involves coercivity and convexity. There is no problem with the second, but the first is crucial, and indeed, it is the single, most relevant difference between dimension 2 and 3. 2. By using optimality, one can try to show that critical points of the error functional can only occur at zero error. Proving this leads to care about the linearized system. This strategy has already been successfully used in other circumstances like ODEs and controllability problems. The whole point of this talk is to explore to what extent this same approach may be helpful for the Navier-Stokes system.