

A Finite-Element Approach to Free-Energy Minimisation

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ABSTRACT: Numerical simulation tools for fluid and solid mechanics are often based on the discretisation of coupled systems of partial differential equations, which can easily be identified in terms of physical conservation laws. In contrast, much physical insight is often gained from the equivalent formulation of the relevant energy or free-energy functional, possibly subject to constraints. Motivated by the nonlinear static and dynamic behaviour of nematic liquid crystals and of magnetosensitive elastomers, we propose a finite-element framework for minimising these free-energy functionals, using Lagrange multipliers to enforce additional constraints. This talk will highlight challenges, limitations, and successes, both in the formulation of these models and their use in numerical simulation. This is joint work with PhD students Thomas Benson, David Emerson, and Dong Han, and with James Adler, Timothy Atherton, and Luis Dorfmann.

ALL ARE WELCOME!!!