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A finite element approach for minimizing line and surface energies arising in the study of singularities in liquid crystals

I will present an algorithm designed to calculate minimizers T of a geometric energy arising in the theory of liquid crystal colloids. The energy involves the two dimensional area of T outside an obstacle, a contribution from T on the obstacle surface, and the length of the boundary ∂T reduced by a prescribed curve to make the problem nontrivial. It can be seen as a generalization of both the obstacle and Plateau problem. We discretize the energy by a finite element method and apply an ADMM scheme to carry out the minimization. We validate our algorithm in the case of a spherical obstacle and give examples of minimizing configurations in the case of a peanut- and croissant-shaped obstacle.