A Level-Set Framework for Shape Optimisation

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We will give a brief introduction into the level-set method to describe shapes as well as the speed method in normal direction to evolve these shapes in time. A Hopf-Lax formula can be used to represent the time evolution, for which efficient numerical methods (based on Sethian's Fast Marching Method) can be developed.

Our representation formula also allows us to derive a shape calculus that requires very little smoothness of the involved domains, as well as other interesting results. We show how steepest-descent methods can be formulated based in this framework. They are demonstrated on example problems for image segmentation and PDE-constrained shape optimisation.