Solution of Steady PDE's on Adjustable Meshes in Multidimensions using Local Descent Methods

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The method of lines advances a discrete space approximation in time using an ODE package but it can also be used to converge to a steady state. If the space discretization provides information about the mesh movement as well as the solution evolution the package can also be used to move the mesh to an optimal position. The implementation of a local approach to the movement of the mesh has given new control in the adjustment of the mesh. The local approach can be used with other space discretization techniques in multidimensions, for example in finite-dimensional approximations within variational principles. The technique can also be extended to least squares best fit problems and least squares methods for first order PDEs and systems, such as conservation laws. In the latter case a link has been shown with the equidistribution of PDE residuals. We analyse the techniques and give examples.