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A W-1-∞-appraoch for Shape Optimization using ADMM

Thursday, August 15, 2024 9:30 AM (30 minutes)

The talk discusses the efficiency and robustness aspects of a first-order approach based on ADMM (Alternating Direction Method of Multipliers) for approximating the direction of the steepest descent in $W^{1,\infty}$ with Lipschitz domains. The robustness of an implementation with respect to certain parameters is crucial for the technical application of shape optimization problems. For example, when considering large deformations, the quality of the computational grid may become insufficient and requires remeshing and, thus, user interaction after a certain number of shape updates. In addition, many implementations need a variety of user-defined parameters, e.g., penalty factors and step size values of an augmented Lagrange method, the maximum p-value using a p-Laplace relaxation of the steepest descent direction, or relaxation factors for fine-tuning the solution procedure. These parameters are usually problem-dependent, and choosing values requires expert knowledge and many experiments to determine; thus, reducing the number of input parameters improves the robustness and usability of the implementation. Although the challenges mentioned above occur in many disciplines, we focus on fluid dynamic applications here. The method is applied to the minimal drag problem and compared to a p-Harmonic approach. We present the results of different numerical experiments in two and three spatial dimensions for well-known example problems in fluid dynamics.

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