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A MODIFIED SEARCH DIRECTION METHOD WITH WEAKLY IMPOSED KARUSH-KUHN-TUCKER CONDITIONS FOR GRADIENT-BASED CONSTRAINED OPTIMIZATION FOR VERY LARGE PROBLEMS

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Motivated by the applications of the Vertex Morphing method [1] for very large shape optimization problems, where various response evaluations and multiple physics are often considered in a constrained optimization, we propose a robust modified search direction method for the optimization procedure. The solution of a general constrained gradient-based optimization problem satisfies the necessary Karush-Kuhn-Tucker (KKT) conditions [2]. There exist numerous methods to solve constrained optimization problems, which try to travel along the active constraint to find the local minimum [2][3]. This might lead to inefficiency in the optimization process for very large problems. In the proposed method, the KKT conditions are weakly imposed in each optimization step. The search direction is modified and designed to find a solution where the KKT conditions can be better fulfilled. To accomplish this, the singular-value decomposition method [4] is applied to both the objective and constraint sensitivity. The results are shown first with analytical 2D problems and then the results of shape optimization problems with a large number of design variables are discussed. In order to robustly deal with complex geometries, the Vertex Morphing method is used.

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