Application of Newton-Gauss-Seidel method for solving multi-objective constrained optimization problems

ABSTRACT

Many problems in life are composed of conflicting and influencing multiple objectives, and people often encounter the optimization problem of simultaneously optimizing multiple objectives in each area, which is called multiobjective optimization problem. Therefore, solving such problems has important scientific research value and practical significance. This paper proposes a Newton Gauss-Seidel iteration method for solving multi-objective constrained optimization problems by constructing Newton directions and introducing Gauss-Seidel (GS) iterative method for solving linear equations. The solution of this combination between Newton, Gauss-seidel and Lagrange multiplier method involves two stages: objective function and constraint condition processing stage. In the first stage, the original multi-objective function is scalarized, and only the decision-maker needs to give each objective function a weight, by transforming it into a single objective constrained optimization problem. Then the Lagrange multiplier method was used to transform the constrained optimization problem into an unconstrained optimization problem. The second stage is to use the NewtonGauss-Seidel (NGS) iterative method to solve the transformed constrained optimization problem. Finally, numerical experiments showed that our proposed algorithm can achieve good results.