MODIFIED CONJUGATE GRADIENT COEFFICIENTS UNDER STRONG WOLFE LINE SEARCH AND ITS APPLICATION

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ABSTRACT

In the context of optimization, the Conjugate Gradient (CG) method can be applied to solve unconstrained optimization problems. The CG method is often used in the context of unconstrained optimization due to its simplicity and efficiency when dealing with large-scale problems. However, some of CG methods yielded a higher number of iteration (NOI) and Central Processing Unit (CPU) time to solve the unconstrained optimization problems as well as not applicable for daily life. So, the modified CG coefficients are studied and compared with lesser NOI and CPU time for data fitting in order to overcome these problems. This research focuses on four modified CG methods which are RMIL+, SM+, LAMR+ and RMAR+. The RMIL+ method is an improvement of RMIL method by eliminating the negative values of RMIL. This is applied to other methods as well. All of the CG coefficients have been tested with different number of variables from 2 to 10000 by using Matlab subroutine programming. Four different initial points have been chosen for each unconstrained optimization functions to find the efficiency and robustness of the methods. The number of iteration (NOI) and CPU time for the tested methods are recorded and analyzed by using performance profile. Then, the applicability of the modified CG coefficients is demonstrated by implementing them on data fitting via regression analysis. A real data set which is Labour Force Participation Rate in Malaysia has been selected to construct the linear model. Based on numerical results analysis, LAMR+ method is able to solve all the functions and followed by RMIL+, SM+ and RMAR+ methods which solve 88.27%, 98.15% and 99.38% of functions respectively. Only SM+, LAMR+ and RMAR+ are proven to be applicable in daily life problems. As a conclusion, LAMR+ yields the most efficient and robust method.

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